Bioimpedance measurement based evaluation of wound healing

Objective: Our group has developed a bipolar bioimpedance measurement-based method for determining the state of wound healing. The objective of this study was to assess the capability of the method.

Methods: To assess the performance of the method, we arranged a follow-up study of four acute wounds. The wounds were measured using the method and photographed throughout the healing process. Results: Initially, the bioimpedance of the wounds was significantly lower than the impedance of the undamaged skin, used as a baseline. Gradually, as healing progressed, the wound impedance increased and finally reached the impedance of the undamaged skin.

Conclusion: The clinical appearance of the wounds examined in this study corresponded well with the parameters derived from the bioimpedance data. Hard-to-heal wounds are a significant and growing socioeconomic burden, especially in the developed countries, due to aging populations and to the increasing prevalence of various lifestyle related diseases. The assessment and the monitoring of chronic wounds are mainly based on visual inspection by medical professionals. The dressings covering the wound must be removed before assessment; this may disturb the wound healing process and significantly increases the work effort of the medical staff. There is a need for an objective and quantitative method for determining the status of a wound without removing the wound dressings. This study provided evidence of the capability of the bioimpedance based method for assessing the wound status. In the future measurements with the method should be extended to concern hard-to-heal wounds.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Personal Electronics Group, Research group: Physiological Measurement Systems and Methods Group
Authors: Kekonen, A., Bergelin, M., Eriksson, J., Vaalasti, A., Ylänen, H., Viik, J.
Keywords: (Acute wound, Bioimpedance, Bipolar measurement, Chronic wound, Evaluation, Skin, Wound healing)
Pages: 1373-1383
Publication date: 22 Jun 2017
Peer-reviewed: Yes
Early online date: 1 Mar 2017

Publication information
Journal: Physiological Measurement
Volume: 38
Issue number: 7
ISSN (Print): 0967-3334
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.696 1.09
Publication Forum (2016): 1
Scopus rating (2015): 0.815 1.371
Web of Science (2015): 1.576 1.774 7.4 0.57 0.00562 0.493
Publication Forum (2015): 1
Scopus rating (2014): 0.59 1.388
Web of Science (2014): 1.808 1.895 7.2 0.438 0.00584 0.53
Publication Forum (2014): 1
Scopus rating (2013): 0.751 1.678
Publication Forum (2013): 1
Scopus rating (2012): 0.576 1.285
Publication Forum (2012): 1
Scopus rating (2011): 0.654 1.252
Scopus rating (2010): 0.619 1.544
Scopus rating (2009): 0.622 1.445
Scopus rating (2008): 0.675 1.342
Scopus rating (2007): 0.892 1.402
Scopus rating (2006): 0.797 1.3
Scopus rating (2005): 0.59 1.13
Scopus rating (2004): 0.501 1.047
Scopus rating (2003): 0.591 0.958
Scopus rating (2002): 0.592 0.975
Scopus rating (2001): 0.36 1.016
Scopus rating (2000): 0.355 0.882
Method for Evaluation of Surgical Wound Healing: A Case Study

We arranged a case study in order to examine whether tetrapolar bioimpedance measurement could be applied for evaluating the healing of a surgical wound. We measured the donor site surgical wound of a patient who had undergone a breast reconstruction surgery. The measurements were conducted three times in a nine days period, starting from the first postoperative day. As a reference, the impedance of an unaffected site was also measured. The electrodes were placed at equal distances, four centimetres apart in a parallel formation. The results show that, at low frequencies, the impedance of the wound increases with time. At higher frequencies, the situation is opposite; the impedance of the wound is initially higher than the reference and decreases with time. Both ends seem to approach the reference impedance as the healing proceeds. Our results are in accordance with the normal course of surgical wound healing and more specifically appear to be related to the diminishing swelling around the wound site. We conclude that the obtained results are interesting in a level that calls for further investigation.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Physiological Measurement Systems and Methods Group, Turku Univ Hosp, University of Turku, Åbo Akademi, Tampere University Hospital
Authors: Kekonen, A., Bergelin, M., Eriksson, J., Kaartinen, I., Viik, J.
Keywords: (Bioimpedance, Tetrapolar, Surgical, Wound, Monitoring, Healing, Assessment, Method)
Number of pages: 4
Pages: 446-449
Publication date: 13 Jun 2017

Host publication information
Title of host publication: EMBEC & NBC 2017 : Joint Conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC), Tampere, Finland, June 2017
Place of publication: Singapore
Publisher: Springer
Editors: Eskola, H., Väisänen, O., Viik, J., Hyttinen, J.
ISBN (Print): 978-981-10-5121-0
ISBN (Electronic): 978-981-10-5122-7
ASJC Scopus subject areas: Medicine(all), Health Professions(all), Surgery, Dermatology

Publication series
Name: IFBME Proceedings
Volume: 65
ISSN (Print): 1680-0737
ISSN (Electronic): 1433-9277
DOIs:
10.1007/978-981-10-5122-7_112

Bibliographical note
jufoid=58152
Research output: Scientific - peer-review › Conference contribution

Geometry-based Computational Modeling of Calcium Signaling in an Astrocyte
In the last two decades, astrocytes have gained more interest due to the realization that they are involved not only in information processing and memory formation but are also linked with several neurodegenerative disorders and brain diseases. Communicating indirectly with synapses via released gliotransmitters such as glutamate, astrocytes take part in the neuronal activity by propagating intracellular and intercellular waves of calcium (Ca2+). However, it is not clear what effect does the astrocyte geometry have on these Ca2+ wave dynamics. In this study, we present a geometry-based computational model of an astrocyte that is used to simulate the stimulation and propagation of intracellular astrocytic Ca2+ waves. To our best knowledge, this is the first computational model to study the effect of the single astrocyte geometry on the Ca2+ wave propagation, while taking into account the intricate biological pathways that regulate internal Ca2+ dynamics. By simulating theoretical astrocyte geometries with a fixed glutamate stimulus, we found that narrower astrocyte processes lead to stronger Ca2+ wave dynamics, in comparison to wider processes. From this study, we concluded that the geometry does have a visible effect on the overall intracellular Ca2+ dynamics.
Sensitivity Distribution of Electrical Impedance Epithelial Measurement Systems

Epithelia are essential tissues that separate body compartments from each other and are affected by a plethora of diseases and conditions. Electrical properties are a convenient method to study the state of these tissues. There are various measurement setups for studying these properties. However, there has been no studies on how the setup of the electrodes affects the sensitivity distribution of the measurement system. We created a computational model of 4-electrode electrical impedance measurement system to study how the placement of the electrode as well as defects in the epithelium affect the sensitivity distribution. Our results show that the sensitivity is highly dependent on the frequency as well as on the distance between the electrodes and the epithelium. The sensitivity become more concentrated to areas between the electrodes when they were moved closer to the epithelium. The sensitivity should be taken into account when developing measurement systems to study localized phenomena with the electrodes placed close to the epithelium.
Some bacterial strains such as Komagataeibacter xylinus are able to produce cellulose as an extracellular matrix. In comparison to wood-based cellulose, bacterial cellulose (BC) holds interesting properties such as biodegradability, high purity, water-holding capacity, and superior mechanical and structural properties. Aiming toward improvement in BC production titer and tailored alterations to the BC film, we engineered K. xylinus to overexpress partial and complete bacterial cellulose synthase operon that encodes activities for BC production. The changes in cell growth, end metabolite, and BC production titers from the engineered strains were compared with the wild-type K. xylinus. Although there were no significant differences between the growth of wild-type and engineered strains, the engineered K. xylinus strains demonstrated faster BC production, generating 2–4-fold higher production titer (the highest observed titer was obtained with K. xylinus-bcsABCD strain producing 4.3 ± 0.46 g/L BC in 4 days). The mechanical and structural characteristics of cellulose produced from the wild-type and engineered K. xylinus strains were analyzed with a stylus profilometer, in-house built tensile strength measurement system, a scanning electron microscope, and an X-ray diffractometer. Results from the profilometer indicated that the engineered K. xylinus strains produced thicker BC films (wild type, 5.1 μm, and engineered K. xylinus strains, 6.2–10.2 μm). Scanning electron microscope revealed no principal differences in the structure of the different type BC films. The crystallinity index of all films was high (from 88.6 to 97.5%). All BC films showed significant piezoelectric response (5.0–20 pC/N), indicating BC as a promising sensor material.
Collagen-immobilized polyimide membranes for retinal pigment epithelial cell adherence and proliferation

Degenerative retinal diseases are a leading cause of visual loss and irreversible blindness, particularly in the developed world. Retinal pigment cell (RPE) transplantation is nowadays considered the most promising therapeutic approach for certain retinal diseases, and the presence of a supportive scaffold has been considered essential to ensure the success of the implant. In this work, collagen IV was covalently immobilized to the surface of polyimide membranes, with the purpose of developing scaffold materials for RPE cell culture. The covalent modification method involved four steps: argon-plasma treatment, acrylic acid graft polymerization, surface activation, and finally immobilization of collagen type IV. Collagen-modified membranes did not become more rough but became significantly more hydrophilic than the unmodified and dip-coated controls. ARPE-19 cell morphology and attachment were studied by immunofluorescence staining and confocal microscopy. Covalently modified surfaces showed cell attachment and cell properties comparable to the uncoated and dip-coated controls. This work demonstrated the potential of collagen IV-immobilized polyimide membranes as substrates for the growth of ARPE-19 cells.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Biomaterials and Tissue Engineering Group, University of Tampere, BioMediTech
Authors: Teymouri, S., Calejo, M. T., Hiltunen, M., Sorkio, A. E., Juuti-Uusitalo, K., Skottman, H., Kellomäki, M.
Keywords: (Polyimide, Retinal pigment epithelial cell, SURFACE MODIFICATION, tissue engineering)
Publication date: 6 Mar 2017
Peer-reviewed: Yes

Investigation of the structural anisotropy in a self-assembling glycinate layer on Cu(100) by scanning tunneling microscopy and density functional theory calculations

Self-assembling organic molecule-metal interfaces exhibiting free-electron like (FEL) states offers an attractive bottom-up approach to fabricating materials for molecular electronics. Accomplishing this, however, requires detailed understanding of the fundamental driving mechanisms behind the self-assembly process. For instance, it is still unresolved as to why the adsorption of glycine ([NH2(CH2)COOH]) on isotropic Cu(100) single crystal surface leads, via deprotonation and self-assembly, to a glycinate ([NH2(CH2)COO−]) layer that exhibits anisotropic FEL behavior. Here, we report on bias-dependent scanning tunneling microscopy (STM) experiments and density functional theory (DFT) calculations for glycine adsorption on Cu(100) single crystal surface. We find that after physical vapor deposition (PVD) of glycine on Cu(100), glycinate self-assembles into an overlayer exhibiting c(2x4) and p(2x4) symmetries with non-identical adsorption sites. Our findings underscore the intricacy of electrical conductivity in nanomolecular organic overlayers and the critical role the structural anisotropy at molecule-metal interface plays in the fabrication of materials for molecular electronics.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Photonics, Research group: Surface Science, Department of Physics and Astronomy, Russian Acad Sci, Ioffe Physical Technical Institute, Russian Academy of Sciences, Ioffe Phys Tech Inst
Authors: Kuzmin, M., Lahtonen, K., Vuori, L., Sánchez-de-Armas, R., Hirsimäki, M., Valden, M.
Keywords: (Cu(100), STM, Glycine, Glycinate, DFT, Self-assembly, Nanoscience)
Number of pages: 6
Pages: 111-116
Publication date: 4 Mar 2017
Peer-reviewed: Yes
Age-related macular degeneration (AMD) is the leading cause of vision loss in senior citizens in the developed world. The disease is characterised by the degeneration of a specific cell layer at the back of the eye – the retinal pigment epithelium (RPE), which is essential in retinal function. The most promising therapeutic option to restore the lost vision is considered to be RPE cell transplantation. This work focuses on the development of biodegradable biomaterials with similar properties to the native Bruch’s membrane as carriers for RPE cells. In particular, the breath figure (BF) method was used to create semi-permeable microporous films, which were thereafter used as the substrate for the consecutive Langmuir-Schaefer (LS) deposition of highly organised layers of collagen type I and collagen type IV. The newly developed biomaterials were further characterised in terms of surface porosity, roughness, hydrophilicity, collagen distribution, diffusion properties and hydrolytic stability. Human embryonic stem cell-derived RPE cells (hESC-RPE) cultured on the biomaterials showed good adhesion, spreading and morphology, as well as the expression of specific protein markers. Cell function was additionally confirmed by the assessment of the phagocytic capacity of hESC-RPE. Throughout the study, microporous films consistently showed better results as cell culture materials for hESC-RPE than dip-coated controls. This work demonstrates the potential of the BF-LS combined technologies to create biomimetic prosthetic Bruch’s membranes for hESC-RPE transplantation.
Multi-wavelength mid-IR light source for gas sensing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Publication date: 20 Feb 2017

Host publication information
Title of host publication: Proc. SPIE 10110 : Photonic Instrumentation Engineering IV
Volume: 10110
Publisher: SPIE
Article number: 101100P
ISBN (Print): 9781510606616
ISBN (Electronic): 9781510606623

Publication series
Name: Proceedings of SPIE
Combining finger and toe photoplethysmograms for the detection of atherosclerosis

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Physiological Measurement
Volume: 38
Issue number: 2
Article number: 139
ISSN (Print): 0967-3334
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.696 1.09
Publication Forum (2016): 1
Scopus rating (2015): 0.815 1.371
Web of Science (2015): 1.576 1.774 7.4 0.57 0.00562 0.493
Publication Forum (2015): 1
Scopus rating (2014): 0.59 1.388
Web of Science (2014): 1.808 1.895 7.2 0.438 0.00584 0.53
Publication Forum (2014): 1
Scopus rating (2013): 0.751 1.678
Publication Forum (2013): 1
Scopus rating (2012): 0.576 1.285
Publication Forum (2012): 1
Scopus rating (2011): 0.654 1.252
Scopus rating (2010): 0.619 1.544
Scopus rating (2009): 0.622 1.445
Scopus rating (2008): 0.675 1.342
Scopus rating (2007): 0.892 1.402
Scopus rating (2006): 0.797 1.3
Scopus rating (2005): 0.59 1.13
Scopus rating (2004): 0.501 1.047
Scopus rating (2003): 0.591 0.958
Scopus rating (2002): 0.592 0.975
Scopus rating (2001): 0.36 1.016
Scopus rating (2000): 0.355 0.882
Scopus rating (1999): 0.428 0.901
Original language: English
DOI:
10.1088/1361-6579/aa4eb0
Links:
Research output: Scientific - peer-review » Article
Comparison of Simple Algorithms for Estimating Respiration Rate from Electrical Impedance Pneumography Signals in Wearable Devices

Respiration rate (RR) is considered as a useful parameter in characterizing the health condition of a person. Among the methods used for respiration measurement, Electrical Impedance Pneumography (EIP) can be easily obtained in wearable applications due to the possibility of using the electrocardiography (ECG) electrodes for the EIP measurement. In the fast growing field of wearable devices, having clinically valuable and reliable information along with providing the convenience of the user, is probably the most important and challenging issue. To address the need of small sized devices for ECG (and EIP) measurements, EASI electrode configuration is an acceptable solution. The signals from EASI system not only provide useful information by themselves when directly used for cardiological analyses, but can also be converted to the standard 12-lead ECG information. With aforementioned advantages of EASI system, the question then arises how suitable the electrode locations of the system are for EIP measurements and what algorithms perform better for respiration rate derivation. In this work, we evaluated eight methods for deriving respiration rate from EIP signals measured from 15 subjects (10 males +5 females) in three conditions: standing, walking slowly, and walking fast. The algorithms were autoregressive (AR) modeling (three different approaches), Fast Fourier Transform (FFT), autocorrelation, peak detection and two counting algorithms. Our results show that advanced counting method is the most promising approach among the ones studied in this work. For this algorithm, the concordance correlation coefficients of the respiration rate estimates between EIP and the reference measurement were 0.96, 0.90 and 0.97 for standing, walking with 3 km/h speed, and walking with 6 km/h speed, respectively.

The Impact of Galileo Open Service on Location Based Services Markets

Many Location Based Services (LBS), such as navigation and tracking services, are using Global Satellite-based Navigation Systems (GNSS). GNSS is the most widely used positioning solution for LBS outdoors, therefore any improvement in the quality of GNSS positioning services will directly improve the quality of LBS and therefore it will generate more revenue and attract more users. One of the upcoming satellite navigation systems is Galileo, which is being deployed by the European Union (EU). Beside all political motivations behind Galileo, the
availability of more satellites in view and a more accurate, reliable and continuous positioning service are some of the technological motivations of having yet another of GNSS on sky. Such improvement in positioning service and, as a result, in LBS applications will develop the market and attract more users. However, due to long delays, current powerful competitors which are making the GNSS market increasingly crowded, and also the cost of Galileo being covered by EU taxpayers only, there is a question if another of GNSS is really required and it is able to return all its cost in near future. This chapter assesses the financial aspects of Galileo at the time of writing the book, including increasing costs and impact of losing some parts of market and also its potential revenue and the economic impact of positioning and timing service improvement by Galileo, and finally the impact of Galileo on future markets of LBS is estimated.

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning
Authors: Basiri, A., Lohan, E., Moore, T.
Pages: 269-281
Publication date: 2017

Host publication information
Title of host publication: Multi-Technology Positioning
Publisher: Springer
Editors: Nurmi, J., Lohan, E. S., Wymeersch, H., Seco-Granados, G., Nykänen, O.
ISBN (Print): 978-3-319-50426-1
ISBN (Electronic): 978-3-319-50427-8
DOI: 10.1007/978-3-319-50427-8_13
Research output: Scientific - peer-review › Chapter

Biomaterials for Electronics
Challenges of climate change, ecological scarcity and depletion of natural resources form a global push towards a bioeconomy, which means shifting from fossil to renewable raw materials. Wood biomass will likely get a significant role in the Finnish bioeconomy. Finnish economy has conventionally focused on bulk products, while the challenge in the future is to bring high added value to the fibre based components and products. Cellulose based nanomaterials are low-cost, strong, porous, lightweight, solution processable, biocompatible, biodegradable and piezoelectric biomaterials, which have obvious applications for example in biomedical and electronic applications.

Piezoelectric sensors are widely applicable for various healthcare and well-being applications. We have recently studied flexible piezoelectric sensors made from commercial PVDF films and printable PVDF-TrFE ink, as well as biodegradable films from wood-based cellulose nanofibrils (CNF) [1] and bacterial cellulose (BC).

The high porosity of CNF makes it also a promising material for supercapacitors, also known as electrochemical double-layer capacitors (EDLC). We have recently demonstrated the fabrication of supercapacitor electrodes from a mixture of CNF and dandelion using high temperature pyrolysis.

References:
Direction as a vibration loading parameter in bone tissue engineering

General information
State: Published
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group
Authors: Halonen, H., Kylönen, L., Ihalainen, T. O., Miettinen, S., Hyttinen, J.
Keywords: (HMHF vibration loading, Adipose stem cells, Osteogenic differentiation)
Publication date: 25 Nov 2016
Peer-reviewed: Unknown
ASJC Scopus subject areas: Biotechnology, Cell Biology, Biomedical Engineering
Links:
Research output: Scientific › Paper, poster or abstract

Suppressing Functional Electrical Stimulation Artifact from Facial Surface EMG Measurements
Methods for suppressing the electrical artifact that functional electrical stimulation introduces to surface electromyography (EMG) measurements are demonstrated. The methods are targeted for facial pacing for people who suffer from unilateral facial paralysis. The pacing includes the measurement of EMG signals from the healthy side of the face as a control signal to simultaneously activate the paralysed side with functional electrical stimulation.

Facial EMG signals typically have amplitudes up to a few hundreds of microvolts. The activation of facial muscles with functional electrical stimulation may require stimulation voltages that are more than 10^6 times larger. When electrical stimulation is fed to the paralysed one side of the face, the introduced voltage will also couple to the EMG measurements on the healthy side. This coupling is called the stimulation artifact. In the worst case, the EMG measurement inputs will saturate leaving it impossible to correctly detect facial muscle activations and their activation intensities. Additionally, the stimulation artifact may be erroneously detected as a muscle activation.

The presented methods for suppressing the stimulation artifact from EMG measurements include filtering implemented in the hardware and software, manipulating the stimulation waveform to help removing it with filtering, and sample-and-hold functionality implemented in the hardware of the EMG signal measurement chain to prevent amplifier saturation and to allow faster recovery from the artifacts. The methods are demonstrated with experimental results.

Fabrication of Ion-Shaped Anisotropic Nanoparticles and their Orientational Imaging by Second-Harmonic Generation Microscopy
Ion beam shaping is a novel and powerful tool to engineer nanocomposites with effective threedimensional (3D) architectures. In particular, this technique offers the possibility to precisely control the size, shape and 3D orientation of metallic nanoparticles at the nanometer scale while keeping the particle volume constant. Here, we use swift heavy ions of xenon for irradiation in order to successfully fabricate nanocomposites consisting of anisotropic gold nanoparticle that are oriented in 3D and embedded in silica matrix. Furthermore, we investigate individual nanorods using a nonlinear optical microscope based on second-harmonic generation (SHG). A tightly focused linearly or radially-polarized laser beam is used to excite nanorods with different orientations. We demonstrate high sensitivity of the SHG response for these polarizations to the orientation of the nanorods. The SHG measurements are in excellent agreement with the results of numerical modeling based on the boundary element method.
Wireless Optogenetic Neural Dust for Deep Brain Stimulation

In recent years, numerous research efforts have been dedicated towards developing efficient implantable devices for Deep Brain Stimulation (DBS). However, there are limitations and challenges with the current technologies. Firstly, the stimulation of neurons currently is only possible through implantable electrodes which target a population of neurons. This results in challenges in the event that stimulation at the single neuron level is required. Secondly, a major hurdle still lies in developing miniature devices that can last for a lifetime in the patient's brain. Recently, the concept of neural dust has been introduced as a way to achieve single neuron monitoring and potentially actuation. In parallel to this, the field of optogenetics has emerged where the aim is to stimulate neurons using light, usually by means of optical fibers inserted through the skull. Obviously, this introduces many challenges in terms of user friendliness and biocompatibility. We address this shortcoming by proposing the wireless optogenetic neural dust (wi-opt neural dust). The wi-opt neural dust is equipped with a miniature LED that is able to stimulate the genetically engineered neurons, and at the same time harvest energy from ultrasonic vibrations. The simulation results presented in the paper investigates the behaviour of the light propagation in the brain tissue, as well as the performance of designed circuitry for the energy harvesting process. The results demonstrates the feasibility of utilizing wi-opt neural dust for long term implantation in the brain, and a new direction towards precise stimulation of neurons in the cortex.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno
UPS and DFT investigation of the electronic structure of gas-phase trimesic acid

Benzene-1,3,5-tricarboxylic acid (trimesic acid, TMA) molecules in gas-phase have been investigated by using valence band photoemission. The photoelectron spectrum in the binding energy region from 9 to 22 eV is interpreted based on the density functional theory calculations. The electronic configuration that makes contribution to each transition is demonstrated. Furthermore, electronic structure of TMA is compared with benzene and benzoic acid (BA) in order to demonstrate changes in molecular orbital energies induced by addition of carboxyl groups to benzene ring.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, University of Tartu, MAX IV Laboratory, Lund University
Authors: Reisberg, L., Pärna, R., Kikas, A., Kuusik, I., Kisand, V., Hirsimäki, M., Valden, M., Nõmmiste, E.
Keywords: (trimesic acid, molecules, electronic structure, synchrotron radiation, MAX IV Laboratory, UPS, DFT, organic acids, gas-phase, spectroscopy, photoemission)
Number of pages: 6
Publication date: Nov 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Organic Chemistry, Atomic and Molecular Physics, and Optics
Lipid membranes: Theory and simulations bridged to experiments

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, University of Helsinki, MEMPHY - Centre for Biomembrane Physics, University of Southern Denmark
Authors: Vattulainen, I., Rög, T.
Number of pages: 3
Pages: 2251-2253
Publication date: 1 Oct 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Biophysics, Biochemistry, Cell Biology

Publication information
Journal: Biochimica et Biophysica Acta: Biomembranes
Volume: 1858
Issue number: 10
ISSN (Print): 0005-2736
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.511 1.101
Publication Forum (2016): 1
Scopus rating (2015): 1.782 1.142
Web of Science (2015): 3.687 3.589 7.3 0.907 0.02731 1.163
Publication Forum (2015): 1
Scopus rating (2014): 1.869 1.09
Web of Science (2014): 3.836 3.881 7.0 1.006 0.02991 1.257
Publication Forum (2014): 2
Scopus rating (2013): 1.592 0.975
Publication Forum (2013): 2
Scopus rating (2012): 1.833 1.156
Publication Forum (2012): 2
Scopus rating (2011): 1.644 1.227
Scopus rating (2009): 2.152 1.298
Scopus rating (2008): 2.035 1.123
Scopus rating (2007): 2.021 1.158
Scopus rating (2005): 1.782 1.142
Scopus rating (2004): 1.5 1.147
Scopus rating (2003): 1.401 1.115
SCP-ECG V3.0: An Enhanced Standard Communication Protocol for Computer-assisted Electrocardiography

The main goal of the SCP-ECG standard is to address ECG data and related metadata structuring, semantics and syntax, with the objective of facilitating interoperability and thus supporting and promoting the exchange of the relevant information for unary and serial ECG diagnosis. Starting with version V3.0, the standard now also provides support for the storage of continuous, long-term ECG recordings and affords a repository for selected ECG sequences and the related metadata to accommodate stress tests, drug trials and protocol-based ECG recordings. The global and per-lead measurements sections have been extended and three new sections have been introduced for storing beat-by-beat and/or spike-by-spike measurements and annotations. The used terminology and the provided measurements and annotations have been harmonized with the ISO/IEEE 11073-10102 Annotated ECG standard. Emphasis has also been put on harmonizing the Universal Statement Codes with the CDISC and the categorized AHA statement codes and similarly the drug and implanted devices codes with the ATC and NASPE/BPEG codes.

General information
State: Published
Organisations: Department of Signal Processing, Research group: Sleep and Sensory Signal Analysis Group-SSSAG, SFR Santé Lyon-Est: eTechSanté, Université de Lyon, The University of Cagliari, A.M.P.S. LCC, Institute of Cardiovascular and Medical Sciences, University of Glasgow
Authors: Pani, D., Rubel, P., Fayn, J., Badilini, F., Macfarlane, P., Värri, A.
Number of pages: 4
Pages: 309-312
Publication date: 12 Sep 2016

Host publication information
Title of host publication: Computers in Cardiology Conference
Volume: 43
Place of publication: Vancouver, Canada
Publisher: Computing in Cardiology
Editor: Murray, A.
ISBN (Print): 978-1-5090-0896-4
ISBN (Electronic): 978-1-5090-0895-7
Electronic versions:
SCP_ECG_V3_in_CinC-2016
Links:
Research output: Scientific - peer-review › Conference contribution

The impact of acquisition dose on quantitative breast density estimation with digital mammography: results from ACRIN PA 4006

General information
State: Published
Organisations: University of Pennsylvania
Authors: Chen, L., Ray, S., Keller, B., Pertuz, S., McDonald, E., Conant, E., Kontos, D.
Publication date: Sep 2016
Peer-reviewed: Yes

Publication information
Journal: Radiology
Volume: 280
Issue number: 3
Automatic objective thresholding to detect neuronal action potentials

In this paper, we introduce a fully objective method to set thresholds (THs) for neuronal action potential spike detection from extracellular field potential signals. Although several more sophisticated methods exist, thresholding is still the most used spike detection method. In general, it is employed by setting a TH as per convention or operator decision, and without considering either the undetected or spurious spikes. Here, we demonstrate with both simulations and real microelectrode measurement data that our method can fully automatically and objectively yield THs comparable to those set by an expert operator. A Matlab function implementation of the method is described, and provided freely in Matlab Central File Exchange.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, Department of Pervasive Computing, BioMediTech
Authors: Tanskanen, J. M., Kapucu, F. E., Välkki, I., Hyttinen, J. A.
Keywords: (Neuronal action potential, Thresholding, Spike detection, Microelectrode array, Electric field potential)
Number of pages: 5
Pages: 662-666
Publication date: 29 Aug 2016

Host publication information
Title of host publication: Proceedings of 2016 24th European Signal Processing Conference (EUSIPCO)
ISBN (Print): 978-1-5090-1891-8
ISBN (Electronic): 978-0-9928-6265-7
ASJC Scopus subject areas: Signal Processing, Neuroscience(all)
Electronic versions:
Imaging of the Second-harmonic Response of Spatially-oriented Individual Ion-shaped Nanoparticles

During the last decade, many efforts have been made to develop techniques to integrate nanostructures in functional matrices. This activity, mainly boosted by advances in nanofabrication, has enabled the development of elegant methods for the development of planar nanodevices. However, the design and implementation of embedded three-dimensional (3D) nano-architectures with tunable spatial orientation remains a challenge. To overcome this difficulty, an alternative is offered by the technique of sculpturing nanoparticles using ion beams (ion-beam shaping). Here, we use this method to produce an array of anisotropic and spatially-oriented gold nanoparticles embedded in silica matrix. Their orientation is then imaged by nonlinear optical microscopy based on second-harmonic generation and polarized optical beams.

The arrays of gold nanoparticles were fabricated by first preparing an array of spherical particles in silica matrix. These particles were then illuminated by a beam of xenon ions. Depending on the total ion fluence, the gold particle elongate along the direction of irradiation, while maintaining constant volume, allowing nanorods and even nanowires to be fabricated. The tilt angle of the particles was adjusted by the direction of ion irradiation.

Second-harmonic microscopy of nanorods was based on using linearly and radially polarized beams focused by a high-numerical-aperture objective. This technique allows the transverse and longitudinal field components in the focus to be controlled. This in turn affects the coupling of the incident light to the nanorods with different orientations.

We report the high sensitivity of the second-harmonic response to the orientation of the nanorods for different states of polarization. The experimental results were obtained to be in very good agreement with simulations based on the boundary-element method. Compared with previous reports, our results provide a considerable improvement for understanding the interaction of highly focused beams with anisotropic sub-wavelength structures.

General information
State: Published
Organisations: Department of Physics, Research area: Optics, Research group: Nonlinear Optics, Optoelectronics Research Centre, Ecole Polytechnique
Number of pages: 1
Pages: 3867
Publication date: 10 Aug 2016
Peer-reviewed: Unknown
Electronic versions:
Abstract_PIERS_2016
DOIs:
10.1109/PIERS.2016.7735457
Research output: Scientific › Paper, poster or abstract

A survey on the feasibility of surface EMG in facial pacing

A survey on the feasibility of surface electromyography (EMG) measurements in facial pacing is presented. Pacing for unilateral facial paralysis consists of the measurement of activity from the healthy side of the face and functional electrical stimulation to reanimate the paralyzed one. The goal of this study is to evaluate the feasibility of surface EMG as a measurement method to detect muscle activations and to determine their intensities. Prior work is discussed, and results from experiments where 12 participants carried out a set of facial movements are presented. EMG was registered from zygomaticus major (smile), orbicularis oris (lip pucker), orbicularis oculi (eye blink), corrugator supercilii (frown), and masseter (chew). Most important facial functions that are limited due to the paralysis are blinking, smiling, and puckering. With majority of the participants, crosstalk between the measured EMG channels was found to be acceptably small to be able to pace smiling and puckering based on detecting their contraction intensities from the healthy side. However, pacing blinking based on orbicularis oculi EMG measurement does not seem possible due to crosstalk from other muscles, but the electro-oculographic (EOG) signals that couple to the same measurement channel could help to detect eye blinks and trigger stimuli. Furthermore, masseter greatly disturbs EMG measurement of most facial muscles, which needs to be addressed in the pacing system to avoid falsely interpreting its activity as the activity of another muscle.

General information
State: Published
Combating Unilateral Facial Paralysis With Low-Latency Muscle Reanimation

The Challenge:
Addressing unilateral facial paralysis by creating a measurement and control system for facial pacing, which measures facial movements from the healthy side of the face and uses functional electrical stimulation to simultaneously reanimate the paralysed side.

The Solution:
Using myRIO combined with custom electronics to measure multiple channels of surface EMG, process the acquired signals, and produce stimulation waveforms to activate facial muscles with the low-latency and reliability required for this novel medical system.

Direction as a vibration loading parameter in osteogenic differentiation of adipose stem cells

General information
State: Published
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group
Authors: Halonen, H., Kyllönen, L., Ihalainen, T. O., Miettinen, S., Hyttinen, J.
Keywords: (HMHF vibration loading, Adipose stem cells, Osteogenic differentiation)
Number of pages: 1
Publication date: 10 Jul 2016
Peer-reviewed: Unknown
ASJC Scopus subject areas: Biotechnology, Cell Biology, Biomedical Engineering
Improved antifouling properties and selective biofunctionalization of stainless steel by employing heterobifunctional silane-polyethylene glycol overlayers and avidin-biotin technology

A straightforward solution-based method to modify the biofunctionality of stainless steel (SS) using heterobifunctional silane-polyethylene glycol (silane-PEG) overlayers is reported. Reduced nonspecific biofouling of both proteins and bacteria onto SS and further selective biofunctionalization of the modified surface were achieved. According to photoelectron spectroscopy analyses, the silane-PEGs formed less than 10 Å thick overlayers with close to 90% surface coverage and reproducible chemical compositions. Consequently, the surfaces also became more hydrophilic, and the observed non-specific biofouling of proteins was reduced by approximately 70%. In addition, the attachment of E. coli was reduced by more than 65%. Moreover, the potential of the overlayer to be further modified was demonstrated by successfully coupling biotinylated alkaline phosphatase (bAP) to a silane-PEG-biotin overlayer via avidin-biotin bridges. The activity of the immobilized enzyme was shown to be well preserved without compromising the achieved antifouling properties. Overall, the simple solution-based approach enables the tailoring of SS to enhance its activity for biomedical and biotechnological applications.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, BioMediTech, University of Jyväskylä, Department of Physics, NanoScience Center
Publication date: 6 Jul 2016
Peer-reviewed: Yes

Publication information
Journal: Scientific Reports
Volume: 6
Article number: 29324
ISSN (Print): 2045-2322
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.625 1.401
Publication Forum (2016): 2
Scopus rating (2015): 2.057 1.684
Web of Science (2015): 5.228 5.525 2.1 0.559 0.20942 1.865
Publication Forum (2015): 2
Scopus rating (2014): 2.103 1.544
Web of Science (2014): 5.578 5.597 1.7 0.722 0.11476 2.075
Publication Forum (2014): 1
Scopus rating (2013): 1.886 1.51
Publication Forum (2013): 1
Scopus rating (2012): 1.458 0.896
Publication Forum (2012): 1
Original language: English
Electronic versions:
hynninen et al - Improved antifouling properties and selective biofunctionalization
DOIs: 10.1038/srep29324
Links:
Research output: Scientific › peer-review › Article

Acoustic Modelling
Let us examine the behaviour of sound in a gas or in a liquid medium. From a physical point of view, the sound we hear is created by the pressure change in the medium surrounding us that is sensed by our ears. The equations describing the behaviour of a liquid or a gas are based on well-known equations of fluid mechanics. Therefore in acoustics, they are often referred to as fluids. In the following sections we present a simple wave equation, which is the simplest of (linear) equations used to model acoustical phenomena. Even though the wave equation is quite a simplified model, it has proven to be extremely useful for describing the behaviour of sound in the most common fluid we face every day, namely air.
Titanium Nitride Microelectrodes Deposited by Ion Beam Assisted E-beam Evaporation

An alternative method for fabricating titanium nitride (TiN) microelectrodes is presented. In order to decrease the impedance and noise levels of microelectrodes, one of the most common methods is to coat the electrodes with TiN. Usually that has required the use of a sputtering device, but we have demonstrated that also an e-beam coater can be used for TiN deposition, if equipped with an ion source. Our first 30 µm microelectrodes fabricated by ion beam assisted deposition (IBAD) have impedances around 75 kΩ, which is close to the impedances reported for sputter deposited TiN microelectrodes.

Transatlantic collection of health informatics competencies

The electronic collection, processing and management of information is becoming increasingly important in healthcare. Because of the nature of the healthcare provision and delivery process, where the health, safety and quality of human lives are impacted on a daily basis, it is critical that those who work in the field are competent and able to perform all clinical, administrative, research and technology-impacted facets of their roles.

The United States and the European Union have been working to encourage broader and more effective use of Information and Communications Technology (ICT) within healthcare. The development, use and governance of ICT within healthcare, often called health informatics, requires a number of competences which need to be identified and integrated into relevant skills assessment, education and training. Ultimately, this will help produce a more proficient and a more confident mobile health informatics-empowered workforce.

A structured set of health information technology and eHealth implementation competences was collected in a co-operation project by voluntary experts in USA and European Union. The project took a deliberately broad starting point, seeking and reviewing an extensive range of related competencies. The skills cover the following domains of professions working with health information technology: direct patient care; administrative; engineering/information, communication, and technology (ICT); informatics; and research and biomedicine. The aggregation of over one thousand competencies was classified to a baseline set of skills and four levels of expertise in 33 focus areas according to Bloom’s taxonomy. The data set also contains definitions of 288 ‘typical’ professional roles. The use of the collection of competencies is supported
by an open access web tool through which all the competencies can be searched through a query mechanism.

The limitation of this work is that only the Acute Care segment of roles and competencies impacted by ICT was evaluated within the scope of this project, however, this subset of other care settings such as ambulatory, rehabilitative care, surgery, and others serves as a representative set of roles and competencies within the health care field as well as a being an important proof of concept for future usefulness of the work if extended beyond its current span. This project has made a contribution to the potential improvement of workforce mobility internationally.

Articular cartilage repair with recombinant human type II collagen/poly lactide scaffold in a preliminary porcine study

The purpose of this study was to investigate the potential of a novel recombinant human type II collagen/poly lactide scaffold (rhCo-PLA) in the repair of full-thickness cartilage lesions with autologous chondrocyte implantation technique (ACI). The forming repair tissue was compared to spontaneous healing (spontaneous) and repair with a commercial porcine type I/III collagen membrane (pCo). Domestic pigs (4-month-old, n = 20) were randomized into three study groups and a circular full-thickness chondral lesion with a diameter of 8 mm was created in the right medial femoral condyle. After 3 weeks, the chondral lesions were repaired with either rhCo-PLA or pCo together with autologous chondrocytes, or the lesion was only debrided and left untreated for spontaneous repair. The repair tissue was evaluated 4 months after the second operation. Hyaline cartilage formed most frequently in the rhCo-PLA treatment group. Biomechanically, there was a trend that both treatment groups resulted in better repair tissue than spontaneous healing. Adverse subchondral bone reactions developed less frequently in the spontaneous group (40%) and the rhCo-PLA treated group (50%) than in the pCo control group (100%). However, no statistically significant differences were found between the groups. The novel rhCo-PLA biomaterial showed promising results in this proof-of-concept study, but further studies will be needed in order to determine its effectiveness in articular cartilage repair.
Wearable monitoring of physical functioning and disability changes, circadian rhythms and sleep patterns in nursing home residents

Sleep problems and disrupted circadian rhythms are common among older adults and may be associated with several health issues and physical functioning status. Wearable continuous monitoring of physical activity enables unobtrusive monitoring of circadian activity and sleep patterns. The objective of this retrospective study was to analyze whether physical functioning status (Activities of Daily Living assessment of Resident Assessment Instrument) is associated with diurnal activity rhythm and sleep patterns measured with wearable activity sensor in nursing home residents during their normal daily life. Continuous activity data were collected by the wearable sensor from 16 nursing home residents (average age of 90.7 years, 7 demented subjects, 1 female) in their daily life over several months (12-18 months). The subjects’ physical activity and sleep were quantified by several parameters from the activity data. In the cross-sectional analysis, physical functioning status was associated with the strength (RHO=0.78, P<0.05) and the stability (RHO=0.72, P<0.05) of the activity rhythm when the level of dementia was not controlled. In the longitudinal analysis (12-18 months), at an individual level the activity rhythm indices and activity level had the strongest correlations with changes in physical functioning but the associations were to some extent individual. In these long-term case recordings, decrease in the physical functioning was most strongly associated with decreasing levels of activity, stability and strength of the activity rhythm, and with increasing fragmentation of rhythm and daytime passivity. Daily wearable monitoring of physical activity may hence reveal information about functioning state and health of older adults. However, since the changes in activity patterns implying changes in physical functioning status may not be consistent between the individuals, a multivariate approach is recommended for monitoring of these changes by continuous physical activity measurement.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI
Authors: Merilahti, J., Viramo, P., Korhonen, I.
Pages: 856-864
Publication date: 1 May 2016
Peer-reviewed: Yes
Early online date: 7 Apr 2015

Publication information
Journal: IEEE Journal of Biomedical and Health Informatics
Volume: 20
Issue number: 3
ISSN (Print): 2168-2194
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.852 1.971
Publication Forum (2016): 2
Scopus rating (2015): 0.823 2.297
Web of Science (2015): 2.093 2.1 1.8 0.488 0.00317 0.652
Publication Forum (2015): 2
Scopus rating (2014): 0.692 2.37
Web of Science (2014): 1.44 1.448 1.3 0.351 5.9E-4 0.318
Publication Forum (2014): 2
Scopus rating (2013): 1.049 2.405
Scopus rating (2012): 0.799 2.261
Scopus rating (2011): 0.681 2.042
Scopus rating (2010): 0.632 1.862
Scopus rating (2009): 0.588 1.809
Scopus rating (2008): 0.605 2.01
Scopus rating (2007): 0.716 2.154
Scopus rating (2006): 0.685 2.199
Scopus rating (2005): 0.596 1.843
Flow Cytometry-Based Classification in Cancer Research: A View on Feature Selection

In this paper, we study the problem of feature selection in cancer-related machine learning tasks. In particular, we study the accuracy and stability of different feature selection approaches within simplistic machine learning pipelines. Earlier studies have shown that for certain cases, the accuracy of detection can easily reach 100% given enough training data. Here, however, we concentrate on simplifying the classification models with and seek for feature selection approaches that are reliable even with extremely small sample sizes. We show that as much as 50% of features can be discarded without compromising the prediction accuracy. Moreover, we study the model selection problem among the $\ell_1$ regularization path of logistic regression classifiers. To this aim, we compare a more traditional cross-validation approach with a recently proposed Bayesian error estimator.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Research group: Computational Systems Biology, Pori Department, Research group: Data-analytics and Optimization, Research group: Vision, BioMediTech
Authors: Hassan, S. S., Ruusuvuori, P., Latonen, L., Huttunen, H.
Pages: 75-85
Publication date: 10 Apr 2016
Peer-reviewed: Yes

Publication information

Journal: Cancer Informatics
Volume: 2015
Issue number: Suppl. 5
ISSN (Print): 1176-9351
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.588 0.328
Publication Forum (2016): 1
Scopus rating (2015): 0.546 0.409
Publication Forum (2015): 1
Scopus rating (2014): 0.94 0.748
Publication Forum (2014): 1
Scopus rating (2013): 0.865 0.552
Publication Forum (2013): 1
Scopus rating (2012): 0.391 0.436
Publication Forum (2012): 1
Scopus rating (2011): 0.585 0.478
Scopus rating (2010): 0.56 0.584
Scopus rating (2009): 0.509 0.391
Scopus rating (2008): 0.483 0.246
Scopus rating (2007): 0.454 0.325
Scopus rating (2006): 0.246 0.164
Original language: English
Electronic versions:
Fully-automated quantitative estimation of volumetric breast density from digital breast tomosynthesis images

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Pertuz, S., McDonald, E., Weinstein, S., Conant, E., Kontos, D.
Pages: 65-74
Publication date: Apr 2016
Peer-reviewed: Yes

Publication information
Journal: Radiology
Volume: 279
Issue number: 1
ISSN (Print): 0033-8419
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 3.488 2.797
Publication Forum (2016): 3
Scopus rating (2015): 3.512 2.765
Web of Science (2015): 6.798 7.326 >10.0 1.559 0.07265 2.538
Scopus rating (2014): 3.795 3.046
Web of Science (2014): 6.867 7.259 >10.0 0.935 0.07686 2.548
Publication Forum (2014): 3
Scopus rating (2013): 3.21 2.953
Publication Forum (2013): 3
Scopus rating (2012): 3.279 2.855
Publication Forum (2012): 3
Scopus rating (2011): 3.129 2.696
Scopus rating (2009): 3.121 2.76
Scopus rating (2008): 3.051 2.664
Scopus rating (2007): 3.392 2.729
Scopus rating (2006): 3.078 2.537
Scopus rating (2005): 2.712 2.642
Scopus rating (2004): 2.664 2.595
Scopus rating (2003): 2.522 2.709
Scopus rating (2002): 2.479 2.56
Health figures: an open source JavaScript library for health data visualization

Background
The way we look at data has a great impact on how we can understand it, particularly when the data is related to health and wellness. Due to the increased use of self-tracking devices and the ongoing shift towards preventive medicine, better understanding of our health data is an important part of improving the general welfare of the citizens. Electronic Health Records, self-tracking devices and mobile applications provide a rich variety of data but it often becomes difficult to understand. We implemented the hFigures library inspired on the hGraph visualization with additional improvements. The purpose of the library is to provide a visual representation of the evolution of health measurements in a complete and useful manner.

Results
We researched the usefulness and usability of the library by building an application for health data visualization in a health coaching program. We performed a user evaluation with Heuristic Evaluation, Controlled User Testing and Usability Questionnaires. In the Heuristics Evaluation the average response was 6.3 out of 7 points and the Cognitive Walkthrough done by usability experts indicated no design or mismatch errors. In the CSUQ usability test the system obtained an average score of 6.13 out of 7, and in the ASQ usability test the overall satisfaction score was 6.64 out of 7.

Conclusions
We developed hFigures, an open source library for visualizing a complete, accurate and normalized graphical representation of health data. The idea is based on the concept of the hGraph but it provides additional key features, including a comparison of multiple health measurements over time. We conducted a usability evaluation of the library as a key component of an application for health and wellness monitoring. The results indicate that the data visualization library was helpful in assisting users in understanding health data and its evolution over time.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI
Authors: Ledesma, A., Al-Musawi, M., Nieminen, H.
Keywords: (Data visualization, Health data, Health informatics, Javascript)
Publication date: 22 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: BMC Medical Informatics and Decision Making
Volume: 16
Issue number: 1
Article number: 38
ISSN (Print): 1472-6947
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.021 1.125
Publication Forum (2016): 1
Scopus rating (2015): 1.055 1.391
Web of Science (2015): 2.042 2.209 3.9 0.246 0.00687 0.759
Publication Forum (2015): 1
Scopus rating (2014): 0.89 1.199
Publication Forum (2014): 1
Scopus rating (2013): 0.693 1.236
Publication Forum (2013): 1
Scopus rating (2012): 0.783 1.229
Publication Forum (2012): 1
Scopus rating (2011): 1.053 1.634
Structural and Electrical Characterization of Solution-Processed Electrodes for Piezoelectric Polymer Film Sensors

Solution-processable graphene and carbon nanotube-based electrode materials were used here to provide electrodes on flexible piezoelectric polyvinylidenefluoride sensors. Piezoelectric sensitivity measurements, image-based analysis, adhesion tests, and sheet resistance measurements were applied to these printable sensors to rigorously analyze their performance and structure. The printable sensors showed electrical performance similar to metallized sensors, whereas the adhesion of the solution-processed materials to the substrate is not as high as that of the evaporated metal films. This also affects the measured sensor sensitivity values. The measurements based on optical images were found to be a promising method to capture detailed information about the electrode surface structure.
Prosthetic Pacing Device for Unilateral Facial Paralysis

Facial pacing ultimately aims at improving the quality of life of people suffering from unilateral facial paralysis. A device to study facial pacing is presented. It is able to measure electromyography signals from the healthy side of the face and simultaneously activate the corresponding muscles on the paralyzed side with electrical stimulation. Tests with healthy participants are ongoing and clinical studies are to be started soon. Four measurement and four stimulation channels of the device enable studying different electrode configurations and stimulation patterns for recognizing and reanimating symmetrical facial expressions in the future. Preliminary testing with ten healthy volunteers showed average partial activation threshold of 2.50 mA (± 0.47 mA) and 3.00 mA (± 0.67 mA) for orbicularis oculi and orbicularis oris muscles, respectively, and full eye closure threshold of 4.45 mA (± 0.69 mA).

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Keywords: (electrical stimulation, facial pacing, facial paralysis)
Number of pages: 6
Pages: 647-652
Publication date: 1 Mar 2016

Host publication information
Title of host publication: Proceedings of the XIV Mediterranean Conference on Medical and Biological Engineering and Computing 2016
Volume: 57
Place of publication: Paphos, Cyprus
Publisher: Springer
ISBN (Print): 978-3-319-32701-3
ISBN (Electronic): 978-3-319-32703-7

Publication series
Name: IFMBE Proceedings
ISSN (Print): 1680-0737
Electronic versions:
Prosthetic Pacing Device for Unilateral Facial Paralysis-postprint. Embargo ended: 2/04/17
DOIs: 10.1007/978-3-319-32703-7_126
Real-Time Patient-Specific ECG Classification by 1-D Convolutional Neural Networks

Goal: This paper presents a fast and accurate patient-specific electrocardiogram (ECG) classification and monitoring system. Methods: An adaptive implementation of 1-D convolutional neural networks (CNNs) is inherently used to fuse the two major blocks of the ECG classification into a single learning body: feature extraction and classification. Therefore, for each patient, an individual and simple CNN will be trained by using relatively small common and patient-specific training data, and thus, such patient-specific feature extraction ability can further improve the classification performance. Since this also negates the necessity to extract hand-crafted manual features, once a dedicated CNN is trained for a particular patient, it can solely be used to classify possibly long ECG data stream in a fast and accurate manner or alternatively, such a solution can conveniently be used for real-time ECG monitoring and early alert system on a light-weight wearable device. Results: The results over the MIT-BIH arrhythmia benchmark database demonstrate that the proposed solution achieves a superior classification performance than most of the state-of-the-art methods for the detection of ventricular ectopic beats and supraventricular ectopic beats. Conclusion: Besides the speed and computational efficiency achieved, once a dedicated CNN is trained for an individual patient, it can solely be used to classify his/her long ECG records such as Holter registers in a fast and accurate manner. Significance: Due to its simple and parameter invariant nature, the proposed system is highly generic, and, thus, applicable to any ECG dataset.
Security Vulnerabilities and Countermeasures for Target Localization in Bio-NanoThings Communication Networks

The emergence of molecular communication has provided an avenue for developing biological nanonetworks. Synthetic biology is a platform that enables reprogramming cells, which we refer to as Bio-NanoThings, that can be assembled to create nanonetworks. In this paper, we focus on specific Bio-NanoThings, i.e., bacteria, where engineering their ability to emit or sense molecules can result in functionalities, such as cooperative target localization. Although this opens opportunities, e.g., for novel healthcare applications of the future, this can also lead to new problems, such as a new form of bioterrorism. In this paper, we investigate the disruptions that malicious Bio-NanoThings (M-BNTs) can create for molecular nanonetworks. In particular, we introduce two types of attacks: blackhole and sentry attacks. In blackhole attack M-BNTs emit attractant chemicals to draw-in the legitimate Bio-NanoThings (L-BNTs) from searching for their target, while in the sentry attack, the M-BNTs emit repellents to disperse the L-BNTs from reaching their target. We also present a countermeasure that L-BNTs can take to be resilient to the attacks, where we consider two forms of decision processes that includes Bayes' rule as well as a simple threshold approach. We run a thorough set of simulations to assess theeffectiveness of the proposed attacks as well as the proposed countermeasure. Our results show that the attacks can significantly hinder the regular behavior of Bio-NanoThings, while the countermeasures are effective for protecting against such attacks.
Implementation and User Testing of a System for Visualizing Continuous Health Data and Events

Efficient ways are needed to visualize the health status of a person and how the lifestyle, daily choices and health care actions are affecting it. Current systems lack a comprehensive interface for interaction and exploration of large and complex data and events affecting the data. Based on state-of-the-art data visualization techniques, we implemented and user tested a system that visualizes health data holistically over time. The system focuses on the dynamic changes by using a timeline of events affecting the overall health status. We conducted an extensive user testing process involving surveys, heuristics and observations in order to evaluate our system. The results show that our system has a high level of User Satisfaction while providing an adequate understanding, interaction and navigation of the data.
Pointing and Selecting with Facial Activity

The aim of this paper was to evaluate the use of three facial actions (i.e. frowning, raising the eyebrows, and smiling) in selecting objects on a computer screen when gaze was used for pointing. Dwell time is the most commonly used selection technique in gaze-based interaction, and thus, a dwell time of 400 ms was used as a reference selection technique. A wireless, head-mounted prototype device that carried out eye tracking and contactless, capacitive measurement of facial actions was used for the interaction task. Participants (N=16) performed point-and-select tasks with three pointing distances (i.e. 60, 120 and 240 mm) and three target sizes (i.e. 25, 30 and 40 mm). Task completion times, pointing errors and throughput values based on Fitts' law were used to compare the selection techniques. The participants also rated the techniques with subjective ratings scales. The results showed that the different techniques performed equally well in many respects. However, throughput values varied from 8.38 bits/s (raising the eyebrows) to 15.33 bits/s (smiling) and were comparable to or, in the case of smiling, better than in earlier research with similar interaction techniques. The dwell time was found to be the least accurate selection technique in terms of the magnitudes of point-and-select errors. Smiling technique was rated as more accurate to use than the frowning or the raising techniques. The results give further support for methods that combine facial behavior to eye tracking when interacting with technology.
A 1.5-W frequency doubled semiconductor disk laser tunable over 40 nm at around 745 nm

1.5 W of output power was obtained in the challenging wavelength range between 700 and 800 nm by frequency doubling a wafer-fused 1.49-μm semiconductor disk laser pumped with 980-nm diodes. A bismuth borate crystal was used for doubling the frequency. A total optical-to-optical efficiency of 8.3 % was achieved. The laser was tunable from 720 to 764 nm with an intracavity birefringent plate. The beam quality parameter M2 remained below 1.5 at all power levels. The laser is attractive for biomedical applications such as photodynamic therapy that benefit from the low absorption of light in tissue in this spectral range.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Authors: Saarinen, E. J., Lyytikäinen, J., Ranta, S., Rantamäki, A., Saarela, A., Sirbu, A., Iakovlev, V., Kapon, E., Okhotnikov, O. G.
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of SPIE : Vertical External Cavity Surface Emitting Lasers (VECSELs) VI
Volume: 9734
Publisher: SPIE
Article number: 97340P-8

Publication series
Name: Spie conference proceedings
Publisher: SPIE
ISSN (Electronic): 0277-786X
DOIs:
10.1117/12.2209384

Bibliographical note
INT=orc,"Saarela, Antti"
JUFOID=71479
Research output: Scientific - peer-review › Conference contribution

Cis and Trans Unsaturated Phosphatidylcholine Bilayers: A Molecular Dynamics Simulation Study

Trans unsaturated lipids are uncommon in nature. In the human diet, they occur as natural products of ruminal bacteria or from industrial food processing like hydrogenation of vegetable oils. Consumption of trans unsaturated lipids has been shown to have a negative influence on human health; in particular, the risk of cardiovascular disease is higher when the amount of trans unsaturated lipids in the diet is elevated. In this study, we first performed quantum mechanical calculations to specifically and accurately parameterize cis and trans mono-unsaturated lipids and subsequently validated the newly derived parameter set. Then, we carried out molecular dynamics (MD) simulations of lipid bilayers composed of cis or trans unsaturated lipids with and without cholesterol. Our results show that trans mono-unsaturated chains are more flexible than cis mono-unsaturated chains due to lower barriers for rotation around the single bonds next to the trans double bond than those next to the cis double bond. In effect, interactions between cholesterol and trans unsaturated
chains are stronger than cis unsaturated chains, which results in a higher ordering effect of cholesterol in trans unsaturated bilayers.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics
Authors: Kulig, W., Pasenkiewicz-Gierula, M., Róg, T.
Keywords: (cholesterol, OPLS-AA force field, torsional potential, model validation)
Pages: 12-20
Publication date: 2016
Peer-reviewed: Yes
Early online date: 14 Jul 2015

**Publication information**

Journal: Chemistry and Physics of Lipids
Volume: 195
ISSN (Print): 0009-3084
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.976 0.862
Publication Forum (2016): 1
Scopus rating (2015): 0.957 0.957
Web of Science (2015): 2.901 2.75 >10.0 0.868 0.00491 0.736
Publication Forum (2015): 1
Scopus rating (2014): 0.885 1.039
Web of Science (2014): 2.422 2.697 >10.0 1.233 0.00529 0.788
Publication Forum (2014): 1
Scopus rating (2013): 0.82 1.055
Publication Forum (2013): 1
Scopus rating (2012): 0.803 0.974
Publication Forum (2012): 1
Scopus rating (2011): 0.727 0.984
Scopus rating (2010): 0.874 0.964
Scopus rating (2009): 0.9 0.995
Scopus rating (2008): 1.114 1.057
Scopus rating (2007): 1.083 1.091
Scopus rating (2006): 0.808 0.881
Scopus rating (2005): 1.038 1.035
Scopus rating (2004): 0.69 0.831
Scopus rating (2003): 0.917 0.817
Scopus rating (2002): 1.005 0.813
Scopus rating (2001): 1.097 0.827
Scopus rating (2000): 0.738 0.742
Scopus rating (1999): 0.737 0.705
Original language: English
DOIs: 10.1016/j.chemphyslip.2015.07.002
Source: RIS
Source-ID: urn:317FBB74503176B7E58C8A075FD7C764
Research output: Scientific - peer-review › Article

**Determination of saturation, heart rate, and respiratory rate at forearm using a NellcorTM forehead SpO2-saturation sensor**

**General information**

State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Estimation of kinetic parameters of transcription from temporal single-RNA measurements

Gene expression dynamics in prokaryotes is largely controlled by the multi-step process of transcription initiation whose kinetics is subject to regulation. Since the number and duration of these steps cannot be currently measured in vivo, we propose a novel method for estimating them from time series of RNA numbers in individual cells.

We demonstrate the method's applicability on measurements of fluorescence-tagged RNA molecules in Escherichia coli cells, and compare with a previous method. We show that the results of the two methods agree for equal data. We also show that, when incorporating additional data, the new method produces significantly different estimates, which are in closer agreement with qPCR measurements. Unlike the previous method, the new method requires no preprocessing of the RNA numbers, using maximal information from the RNA time series. In addition, it can use data outside of the observed RNA productions. Overall, the new method characterizes the transcription initiation process with enhanced detail. (C) 2015 Elsevier Inc. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Exercise loading history and femoral neck strength in a sideways fall: A three-dimensional finite element modeling study.

Over 90% of hip fractures are caused by falls. Due to a fall-induced impact on the greater trochanter, the posterior part of the thin superolateral cortex of the femoral neck is known to experience the highest stress, making it a fracture-prone region. Cortical geometry of the proximal femur, in turn, reflects a mechanically appropriate form with respect to habitual exercise loading. In this finite element (FE) modeling study, we investigated whether specific exercise loading history is associated with femoral neck structural strength and estimated fall-induced stresses along the femoral neck. One hundred and eleven three-dimensional (3D) proximal femur FE models for a sideways falling situation were constructed from magnetic resonance (MR) images of 91 female athletes (aged 24.7±6.1years, >8years competitive career) and 20 non-competitive habitually active women (aged 23.7±3.8years) that served as a control group. The athletes were divided into five distinct groups based on the typical loading pattern of their sports: high-impact (H-I: triple-jumpers and high-jumpers), odd-impact (O-I: soccer and squash players), high-magnitude (H-M: power-lifters), repetitive-impact (R-I: endurance runners), and repetitive non-impact (R-NI: swimmers). The von Mises stresses obtained from the FE models were used to estimate mean fall-induced stresses in eight anatomical octants of the cortical bone cross-sections at the proximal, middle, and distal sites along the femoral neck axis. Significantly (p<0.05) lower stresses compared to the control group were observed: the H-I group - in the superoposterior (10%) and posterior (19%) octants at the middle site, and in the superoposterior (13%) and posterior (22%) octants at the distal site; the O-I group - in the superior (16%), superoposterior (16%), and posterior (12%) octants at the middle site, and in the superoposterior (14%) octant at the distal site; the H-M group - in the superior (13%) and superoposterior (15%) octants at the middle site, and a trend (p=0.07, 9%) in the
superoposterior octant at the distal site; the R-I group - in the superior (14%), superoposterior (23%) and posterior (22%) octants at the middle site, and in the superoposterior (19%) and posterior (20%) octants at the distal site. The R-NI group did not differ significantly from the control group. These results suggest that exercise loading history comprising various impacts in particular is associated with a stronger femoral neck in a falling situation and may have potential to reduce hip fragility.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mechanical Engineering and Industrial Systems, Research area: Applied Mechanics, Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, UKK Inst Hlth Promot Res, UKK Institute, University of Jyväskylä
Authors: Abe, S., Narra, N., Nikander, R., Hyttinen, J., Kouhia, R., Sievänen, H.
Keywords: (Bone strength, Finite element analysis, Exercise, Falling, OSTEOPOROSIS, Hip fracture)
Number of pages: 9
Pages: 9-17
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Orthopedics and Sports Medicine, Biochemistry, medical, Physical Therapy, Sports Therapy and Rehabilitation

Publication information
Journal: Bone
Volume: 92
ISSN (Print): 8756-3282
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.612 1.427
Publication Forum (2016): 2
Scopus rating (2015): 1.757 1.527
Web of Science (2015): 3.736 4.146 7.9 0.764 0.0347 1.36
Publication Forum (2015): 2
Scopus rating (2014): 1.794 1.656
Web of Science (2014): 3.973 4.312 7.5 0.774 0.0356 1.333
Publication Forum (2014): 2
Scopus rating (2013): 1.843 1.73
Publication Forum (2013): 2
Scopus rating (2012): 1.644 1.591
Publication Forum (2012): 2
Scopus rating (2011): 1.82 1.628
Scopus rating (2010): 1.785 1.657
Scopus rating (2009): 1.759 1.593
Scopus rating (2008): 1.848 1.515
Scopus rating (2007): 1.841 1.52
Scopus rating (2006): 1.758 1.517
Scopus rating (2005): 1.671 1.646
Scopus rating (2004): 1.329 1.483
Scopus rating (2003): 1.456 1.344
Scopus rating (2002): 1.511 1.551
Scopus rating (2001): 1.479 1.666
Scopus rating (2000): 1.411 1.438
Scopus rating (1999): 1.323 1.58
Original language: English
DOIs:
10.1016/j.bone.2016.07.021
Links:
Research output: Scientific - peer-review › Article
Increased cytoplasm viscosity hampers aggregate polar segregation in Escherichia coli
In Escherichia coli, under optimal conditions, protein aggregates associated with cellular aging are excluded from midcell by the nucleoid. We study the functionality of this process under sub-optimal temperatures from population and time lapse images of individual cells and aggregates and nucleoids within. We show that, as temperature decreases, aggregates become homogeneously distributed and uncorrelated with nucleoid size and location. We present evidence that this is due to increased cytoplasm viscosity, which weakens the anisotropy in aggregate displacements at the nucleoid borders that is responsible for their preference for polar localisation. Next, we show that in plasmolysed cells, which have increased cytoplasm viscosity, aggregates are also not preferentially located at the poles. Finally, we show that the inability of cells with increased viscosity to exclude aggregates from midcell results in enhanced aggregate concentration in between the nucleoids in cells close to dividing. This weakens the asymmetries in aggregate numbers between sister cells of subsequent generations required for rejuvenating cell lineages. We conclude that the process of exclusion of protein aggregates from midcell is not immune to stress conditions affecting the cytoplasm viscosity. The findings contribute to our understanding of E. coli's internal organisation and functioning, and its fragility to stressful conditions.
Interdigitation of long-chain sphingomyelin induces coupling of membrane leaflets in a cholesterol dependent manner

It has been a long-standing question how the two leaflets in a lipid bilayer modulate each others' physical properties. In this paper, we discuss how this interaction may take place through interdigitation. We use atomistic molecular dynamics simulations to consider asymmetric lipid membrane models whose compositions are based on the lipidomics data determined for exosomes released by PC-3 prostate cancer cells. The simulations show interdigitation to be exceptionally strong for long-chain sphingomyelin (SM) molecules. In asymmetric membranes the amide-linked chain of SM is observed to extend deep into the opposing membrane leaflet. Interestingly, we find that the conformational order of the amide-linked SM chain increases the deeper it penetrates to the opposing leaflet. Analysis of this finding reveals that the amide-linked SM chain interacts favorably with the lipid chains in the opposite leaflet, and that cholesterol modulates the effect of SM interdigitation by influencing the conformational order of lipid hydrocarbon chains in the opposing (cytosolic) leaflet.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter, University of Limerick
Authors: Rog, T., Orlowski, A., Llorente, A., Skotland, T., Sylvänne, T., Kauhanen, D., Ekroos, K., Sandvig, K., Vattulainen, I.
Pages: 281-288
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Biochimica et Biophysica Acta: Biomembranes
Volume: 1858
Issue number: 2
ISSN (Print): 0005-2736
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.511 1.101
Publication Forum (2016): 1
Scopus rating (2015): 1.782 1.142
Web of Science (2015): 3.687 3.589 7.3 0.907 0.02731 1.163
In vivo genotoxic effects of uncoated and coated CeO2 NPs administrated to mice by pharyngeal aspiration

General information
State: Published
Organisations: Department of Materials Science, Research group: Materials Characterization, Työterveyslaitos, University of Zaragoza, Leitat Technologic Center
Authors: Catalan, J., Aimonen, K., Hartikainen, M., Vippola, M., Moreno, C., Cabellos, J., Janer, G., Vazquez-Campos, S., Wolff, H., Savolainen, K., Norppa, H.
Number of pages: 1
Publication date: 2016
Peer-reviewed: Unknown
Research output: Scientific - peer-review › Article

Linear Channel Modeling and Error Analysis for Intra/Inter Cellular Ca2+ Molecular Communication
The use of intra/inter-cellular calcium ion (Ca2+) signaling for molecular communication (MC) is investigated in this paper. In particular, the elevation of the intracellular Ca2+ concentration upon the external excitation, i.e., Ca2+ wave generation, and the intercellular propagation of Ca2+ wave over consecutive cells are studied for information transmission. The main objective of this paper is to develop a linear channel model for intra/inter-cellular Ca2+ MC. In this context, the end-to-end Ca2+ MC system is studied under three blocks: the wave generation, the gap junctional (intercellular) propagation, and the intracellular propagation. The wave generation block captures the intracellular Ca2+ signaling pathway including the release of Ca2+ from the organelles and the buffers inside a cell, and the intake from the extracellular space. The gap junctional (intercellular) propagation block captures the Ca2+ transition through the gap junctions between the touching cells. The intracellular propagation block defines the effect of the cytoplasmic diffusion. Using the developed blocks for the different biophysical phenomena, the end-to-end channel gain and delay formulas are derived. Furthermore, the bit error probability is studied to reveal the impact of the detection threshold. This work provides the basis for the modeling, analysis and the design of Ca2+ MC systems.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Georgia Institute of Technology
Printed epidermal electronic system

State: Published
Organisations: Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics
Authors: Mäntysalo, M.,Vuorinen, T., Suikkola, J.
Publication date: 2016
Peer-reviewed: Unknown

Remotely Powered Piezoresistive Pressure Sensor: Toward Wireless Monitoring of Intracranial Pressure

This paper presents the results of pressure measurements taken after the successful activation of an implantable piezoresistive pressure sensor. The sensor was activated using inductive power transmission for an Intracranial Pressure (ICP) monitoring application. This generated sufficient power (4.47 mW) and voltage (1.894 V) at the sensor input to monitor the pressure changes. Although the changes in voltage were monitored through wires, the required electronics for wireless voltage transfer and measurement in a biological environment are planned in the future. The simulated and measured results of the wireless link, along with the measured changes in pressure are presented. The results are the first step towards a wirelessly powered implant for ICP monitoring.
The biophysical properties of ethanolamine plasmalogens revealed by atomistic molecular dynamics simulations

Given the importance of plasmalogens in cellular membranes and neurodegenerative diseases, a better understanding of how plasmalogens affect the lipid membrane properties is needed. Here we carried out molecular dynamics simulations to study a lipid membrane comprised of ethanolamine plasmalogens (PE-plasmalogens). We compared the results to the PE-diacyl counterpart and palmitoyl-oleyl-phosphatidylcholine (POPC) bilayers. Results show that PE-plasmalogens form more compressed, thicker, and rigid lipid bilayers in comparison with the PE-diacyl and POPC membranes. The results also point out that the vinyl-ether linkage increases the ordering of sn-1 chain substantially and the ordering of the sn-2 chain to a minor extent. Further, the vinyl-ether linkage changes the orientation of the lipid head group, but it does not cause changes in the head group and glycerol backbone tilt angles with respect to the bilayer normal. The vinyl-ether linkage also packs the proximal regions of the sn-1 and sn-2 chains more closely together which also decreases the distance between the rest of the sn-1 and sn-2 chains.
The Impact of Social Behavior on the Attenuation and Delay of Bacterial Nanonetworks

Molecular communication (MC) is a new paradigm for developing communication systems that exchanges information through the transmission and reception of molecules. One proposed model for MC is using bacteria to carry information encoded into DNA plasmids, and this is termed bacterial nanonetworks. However, a limiting factor in the models that have been studied so far is the environment considered only in ideal conditions with a single population. This is far from realistic in natural environments, where bacteria co-exist in multiple populations of same and different species, resulting in a very complex social community. This complex community has social interactions that include cooperation, cheating, as well as...
competition. In this paper, the effects of these social interactions on the information delivery in bacterial nanonetworks are studied in terms of delay, attenuation and data rate. The numerical results show that the cooperative behavior of bacteria improves the performance of delay and attenuation leading to a higher data rate, and this performance can be degraded once their behavior switches towards cheating. The competitive social behavior shows that the performance can degrade delay as well as attenuation leading to slower data rates, as the population with the encoded DNA plasmids are prevented from reaching the receiver. The analysis of social interactions between the bacteria will pave the way for efficient design of bacterial nanonetworks enabling applications such as intra-body sensing, drug delivery, and environmental control against pollution and biological hazards.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Georgia Institute of Technology
Authors: Unluturk, B., Balasubramaniam, S., Akyildiz, I. F.
Pages: 959-969
Publication date: 2016
Peer-reviewed: Yes

**Publication information**
Journal: IEEE Transactions on Nanobioscience
Volume: 15
Issue number: 8
ISSN (Print): 1536-1241
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.571 1.177
Publication Forum (2016): 1
Scopus rating (2015): 0.499 1.19
Web of Science (2015): 1.969 2.113 5.1 0.713 0.00169 0.524
Publication Forum (2015): 1
Scopus rating (2014): 0.62 1.246
Web of Science (2014): 2.309 2.078 6.0 0.408 0.0022 0.679
Publication Forum (2014): 1
Scopus rating (2013): 0.384 0.766
Publication Forum (2013): 1
Scopus rating (2012): 0.41 1.307
Publication Forum (2012): 1
Scopus rating (2011): 0.5 0.819
Scopus rating (2010): 0.662 0.861
Scopus rating (2009): 0.555 0.737
Scopus rating (2008): 0.572 0.893
Scopus rating (2007): 0.853 1.228
Scopus rating (2006): 0.718 1.007
Scopus rating (2005): 0.517 0.769
Scopus rating (2004): 0.286 0.515
Scopus rating (2003): 0.101 0.0
Original language: English
DOIs: 10.1109/TNB.2016.2627081
Research output: Scientific - peer-review › Article

**Towards material excellence: Evaluation of Tekes' programmes on materials**

**General information**
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Virebit Oy
Authors: Timonen, J., Antikainen, M., Das, A., Sarlin, E., Vuorinen, J.
Number of pages: 61
Uniform and electrically conductive biopolymer-doped polypyrrole coating for fibrous PLA

Three-dimensional, fibrous scaffolds can be easily fabricated from polylactide (PLA) using melt spinning and textile techniques. However, the surface properties of PLA scaffolds are not ideal for tissue engineering purposes. Furthermore, electrically conducting scaffolds are required to deliver electrical stimulation to cells. In this study, uniform, electrically conducting polypyrrole (PPy) coatings were fabricated on biodegradable PLA fibers. Biopolymer dopants-hyaluronic acid (HA) and chondroitin sulfate (CS)-were compared, and a PPy/CS composition was analyzed further. The effect of the oxidative polymerization conditions on the PLA fibers and CS counterion was studied. Furthermore, the initial molecular weight of CS and its degree of polymerization were determined. Our experiments showed that the molecular weight of CS decreases under oxidizing conditions but that the decay is not significant with the short polymerization process we used. The coating process was transferred to nonwoven PLA fabrics, and the stability of PPy/CS coating was studied during in vitro incubation in phosphate buffer solution at physiological temperature. The conductivity and surface roughness of the coating decayed during the 20-day incubation. The mechanical strength, however, remained at the initial level. Thus, the fabricated structures are suitable for short-term electrical stimulation adequate to promote cell functions in specific cases.
Urinary thrombomodulin levels were significantly higher following occupational exposure to chemicals, in the presence of dipstick protein, but not in the presence of dipstick blood

Currently, there are no biomarkers which can identify patients with an increased risk of developing urothelial cancer as a result of occupational chemical exposure. The aim of this study was to evaluate the relationships between final diagnosis and 22 biomarkers measured in urine, serum and plasma collected from 156 hematuric patients. Fourteen of the 80 patients (17.5%) with urothelial cancer and 13/76 (17.1%) of the controls were deemed to have a history of chemical exposure. We applied Fisher's exact tests to explore associations between chemical exposure and final diagnosis, and tumor stage and grade, where applicable; ANOVA and t-test to compare age across patients with and without chemical exposure; and Zelen's exact test to evaluate relationships across final diagnosis, chemical exposure and smoking. Following pre-selection of biomarkers using Lasso, we identified biomarkers with differential levels across patients with and without chemical exposure using Welch's t-test. Using a one-sided t-test and considering multiple testing using FDR, we observed that TM levels in urine were significantly higher in samples from patients with a history of chemical exposure regardless of their diagnosis as control or urothelial cancer (one-sided t-test, \( p_{\text{UC}} = 0.014 \) and \( p_{\text{CTL}} = 0.043 \)); in the presence of dipstick protein and when urinary pH levels \( \leq 6 \) (\( p = 0.003 \)), but not in the presence of dipstick blood (\( p = 0.115 \)). Urothelial cancer patients with a history of chemical exposure were significantly younger (64.1 years) than those without chemical exposure (70.2 years) (one-sided t-test \( p\)-value = 0.012); and their tumors were higher grade (Fisher's exact test; \( p = 0.008 \)). There was a strong association between a history of chemical exposure and smoking in urothelial cancer patients (Zelen's exact test; \( p = 0.025 \)). Elevated urinary thrombomodulin levels could have the potential to identify chemical exposure in hematuric patients at high risk of developing urothelial cancer.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Randox Laboratories Ltd, Queen's University, Belfast, Northern Ireland, Belfast City Hospital, South Eastern Health and Social Care Trust, Centre for Cancer Research and Cell Biology
Authors: Ruddock, M. W., De Matos Simoes, R., O'Rourke, D., Duggan, B., Stevenson, M., O'Kane, H. F., Curry, D., Abogunrin, F., Emmert-Streib, F., Reid, C. N., Maxwell, P., Arthur, K., Mallon, M., Carson, G., Kennedy, G., Williamson, K. E.
Keywords: (Bladder cancer, Chemical exposure, Occupation, Smoking, Thrombomodulin, Urine)
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Biochemistry, Genetics and Molecular Biology(all)
Using Competing Bacterial Communication to Disassemble Biofilms

In recent years, bacterial infections have become a major public health concern due to their ability to cooperate between single and multiple species resisting to various forms of treatments (e.g., antibiotics). One form of protection is through biofilms, where the bacteria produce a protective medium known as the Extracellular Polymeric Substances (EPS). Researchers are pursuing new multi-disciplinary approaches to treating and curb the evolving process of these infections through the biofilms, to lower the humans' antibiotic dependence that can result in the so-called “super-bugs”. Although various solutions have been proposed to break biofilms, they are based on applying drugs or using nanoparticles. In this paper, we propose an alternative approach, where bacteria will cooperate and surround the biofilms to consume the nutrients. By hijacking the nutrients in the environment and blocking the flow from reaching the biofilms, this will lead to starvation, forcing them to break their structure. Preliminary simulations show that a small action radius of quorum sensing molecules is needed to maximise bacteria attraction to a particular location and create the protective wall. Therefore, this formation is capable of speeds up biofilm dispersal process by two hours.

General information

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Waterford Institute of Technology
Authors: Martins, D., Barros, M., Balasubramaniam, S.
Publication date: 2016

Host publication information

Title of host publication: 3rd ACM International Conference on Nanoscale Computing and Communication (ACM NanoCom 2016)
Publisher: ACM
Article number: 18
ISBN (Electronic): 978-1-4503-4061-8
DOIs: 10.1145/2967446.2967463
Research output: Scientific - peer-review » Conference contribution

What can we learn about cholesterol's transmembrane distribution based on cholesterol-induced changes in membrane potential?

Cholesterol is abundant in the plasma membranes of animal cells and is known to regulate a variety of membrane properties. Despite decades of research, the transmembrane distribution of cholesterol is still a matter of debate. Here we consider this outstanding issue through atomistic simulations of asymmetric lipid membranes, whose composition is largely consistent with eukaryotic plasma membranes. We show that the membrane dipole potential changes in a cholesterol-dependent manner. Remarkably, moving cholesterol from the extracellular to the cytosolic leaflet increases the dipole potential on the cytosolic side, and vice versa. Biologically this implies that by altering the dipole potential, cholesterol can provide a driving force for cholesterol molecules to favor the cytosolic leaflet, in order to compensate for the intramembrane field that arises from the resting potential.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Institute of Macromolecular Compounds, Russian Academy of Sciences, St. Petersburg, Institute of Organic Chemistry and Biochemistry, Czech Academy of Sciences, Flemingovo náměstí 542/2, 166 10 Praha 6, Czech Republic, Belozersky Institute of Physico-Chemical Biology, Lomonosov Moscow State University, Leninskie Gory, 1/40, 119991 Moscow, Russia
Authors: Falkovich, S. G., Martinez-Seara, H., Nesterenko, A. M., Vattulainen, I., Gurtovenko, A. A.
Number of pages: 6
Pages: 4585-4590
Publication date: 2016
Peer-reviewed: Yes

Publication information

Journal: Journal of Physical Chemistry Letters
Volume: 7
Issue number: 22
ISSN (Print): 1948-7185
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 4.583 1.68
Publication Forum (2016): 3
Using multi-step proposal distribution for improved MCMC convergence in Bayesian network structure learning

Bayesian networks have become popular for modeling probabilistic relationships between entities. As their structure can also be given a causal interpretation about the studied system, they can be used to learn, for example, regulatory relationships of genes or proteins in biological networks and pathways. Inference of the Bayesian network structure is complicated by the size of the model structure space, necessitating the use of optimization methods or sampling techniques, such Markov Chain Monte Carlo (MCMC) methods. However, convergence of MCMC chains is in many cases slow and can become even a harder issue as the dataset size grows. We show here how to improve convergence in the Bayesian network structure space by using an adjustable proposal distribution with the possibility to propose a wide range of steps in the structure space, and demonstrate improved network structure inference by analyzing phosphoprotein data from the human primary T cell signaling network.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Aalto University
Authors: Larjo, A., Lähdesmäki, H.
Keywords: (Bayesian network, MCMC, Proposal distribution, Structure learning)
Publication date: 27 Dec 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Medicine(all), Computer Science(all), Signal Processing, Statistics and Probability, General

Publication information
Journal: Eurasip Journal on Bioinformatics and Systems Biology
Volume: 2015
Issue number: 1
Article number: 6
ISSN (Print): 1687-4145
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.475 0.324
Publication Forum (2016): 1
Scopus rating (2015): 0.329 0.392
Publication Forum (2015): 1
Scopus rating (2014): 0.377 0.439
Publication Forum (2014): 1
Scopus rating (2013): 0.242 0.752
Publication Forum (2013): 1
Scopus rating (2012): 0.445 0.455
Publication Forum (2012): 1
Scopus rating (2011): 0.396 0.414
Scopus rating (2010): 0.593 0.656
Scopus rating (2009): 0.604 0.98
Scopus rating (2008): 0.311 0.231
Which wavelength is the best for arterial pulse waveform extraction using laser speckle imaging?

A multi-wavelengths analysis for pulse waveform extraction using laser speckle is conducted. The proposed system consists of three coherent light sources (532 nm, 635 nm, 850 nm). A bench-test composed of a moving skin-like phantom (silicone membrane) is used to compare the results obtained from different wavelengths. The system is able to identify a skin-like phantom vibration frequency, within physiological values, with a minimum error of 0.5 mHz for the 635 nm and 850 nm wavelengths and a minimum error of 1.3 mHz for the 532 nm light wavelength using a FFT-based algorithm. The phantom velocity profile is estimated with an error ranging from 27% to 9% using a bidimensional correlation coefficient-based algorithm. An in vivo trial is also conducted, using the 532 nm and 635 nm laser sources. The 850 nm light source has not been able to extract the pulse waveform. The heart rate is identified with a minimum error of 0.48 beats per minute for the 532 nm light source and a minimal error of 1.15 beats per minute for the 635 nm light source. Our work reveals that a laser speckle-based system with a 532 nm wavelength is able to give arterial pulse waveform with better results than those given with a 635 nm laser.

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, LARIS-Laboratoire Angevin de Recherche en Ingénierie des Systèmes, Center for Mathematics Probability and Statistics
Authors: Vaz, P., Pereira, T., Figueiras, E., Correia, C., Humeau-Heurtier, A., Cardoso, J.
Keywords: (Arterial pulse waveform, Correlation, Fast Fourier transform, Laser speckle, Multi-spectral)
Number of pages: 8
Pages: 188-195
Publication date: 22 Dec 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Health Informatics, Signal Processing

Publication information
Journal: Biomedical Signal Processing and Control
Volume: 25
ISSN (Print): 1746-8094
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.659 1.574
Publication Forum (2016): 1
Scopus rating (2015): 0.631 1.559
Web of Science (2015): 1.521 1.588 3.4 0.348 0.00242 0.39
Publication Forum (2015): 1
Scopus rating (2014): 0.43 1.44
Web of Science (2014): 1.419 1.376 3.9 0.231 0.00146 0.285
Publication Forum (2014): 1
Scopus rating (2013): 0.566 1.8
Publication Forum (2013): 1
Scopus rating (2012): 0.378 1.277
Publication Forum (2012): 1
Scopus rating (2011): 0.407 1.087
Scopus rating (2010): 0.37 0.926
Scopus rating (2009): 0.31 1.083
Scopus rating (2008): 0.251 0.813
Scopus rating (2007): 0.141 0.284
Original language: English
DOIs:
Topologies, structures and parameter files for lipid simulations in GROMACS with the OPLS-aa force field: DPPC, POPC, DOPC, PEPC, and cholesterol

In this data article we provide topologies and force field parameter files for molecular dynamics simulations of lipids in the OPLS-aa force field using the GROMACS package. This is the first systematic parameterization of lipid molecules in this force field. Topologies are provided for four phosphatidylcholines: saturated DPPC, mono-cis unsaturated POPC and DOPC, and mono-trans unsaturated PEPC. Parameterization of the phosphatidylcholines was achieved in two steps: first, we supplemented the OPLS force field parameters for DPPC with new parameters for torsion angles and van der Waals parameters for the carbon and hydrogen atoms in the acyl chains, as well as new partial atomic charges and parameters for torsion angles in the phosphatidylcholine and glycerol moieties [1]. Next, we derived parameters for the cis and trans double bonds and the neighboring them single bonds [2]. Additionally, we provide GROMACS input files with parameters describing simulation conditions (md.mdp), which are strongly recommended to be used with these lipids models. The data are associated with the research article "Cis and trans unsaturated phosphatidylcholine bilayers: a molecular dynamics simulation study" [2] and provided as supporting materials.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Computational Science X (CompX)
Authors: Kulig, W., Pasenkiewicz-Gierula, M., Róg, T.
Number of pages: 4
Pages: 333-336
Publication date: 5 Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Data in Brief
Volume: 5
ISSN (Print): 2352-3409
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 0.216 0.201
Publication Forum (2016): 0
Scopus rating (2015): 0.186 0.065
Original language: English
DOIs:
10.1016/j.dib.2015.09.013
Research output: Scientific - peer-review › Article

Device for Studying Reanimation of Unilateral Facial Paralysis
A device for studying facial pacing for people who suffer from unilateral facial paralysis is presented. The device is able to measure electromyographic (EMG) signals from the healthy side of the face and simultaneously activate the paralysed side with electrical stimulation.

Electronics designed for the device are integrated to a single tabletop unit together with a myRIO embedded hardware device by National Instruments (NI). The presented device is designed to fulfill the safety requirements of the Council Directive 93/42/EEC of the European Union concerning medical devices and IEC 60601 standards. The device is powered by a commercial medical grade power source. The custom electronics include isolated measurement and stimulation amplifiers that feed the signals to and from the myRIO. Complex real-time processing can be carried out in the myRIO’s FPGA circuit for detecting muscle activations and producing appropriate stimulation signals. The functionality is programmed with NI LabVIEW. The device is controlled wirelessly via a computer interface, and the measured data is logged to the computer.

Clinical study with the device is about to be started at the Tampere University Hospital. First trials will determine and compare the required stimulation signal waveform parameters for transcutaneous activation of facial muscles of healthy participants and patients suffering from unilateral facial paralysis. Four measurement and four stimulation channels of the device enable studying different electrode configurations and stimulation patterns for recognizing and reanimating symmetrical facial expressions in the future.
**General information**

State: Published
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control, University of Tampere, Department of Clinical Neurophysiology
Keywords: (electromyography, facial pacing, functional electrical stimulation, prosthetic technology, unilateral facial paralysis)
Publication date: 4 Dec 2015
Peer-reviewed: Unknown
ASJC Scopus subject areas: Biomedical Engineering
Electronic versions:
Links:
Research output: Scientific › Paper, poster or abstract

**How Well Does BODIPY-Cholesteryl Ester Mimic Unlabeled Cholesteryl Esters in High Density Lipoprotein Particles?**

We compare the behavior of unlabeled and BODIPY-labeled cholesteryl ester (CE) in high density lipoprotein by atomistic molecular dynamics simulations. We find through replica exchange umbrella sampling and unbiased molecular dynamics simulations that BODIPY labeling has no significant effect on the partitioning of CE between HDL and the water phase. However, BODIPY-CE was observed to diffuse more slowly and locate itself closer to the HDL-water interface than CE due to the BODIPY probe that is constrained to the surface region, and because the CE body in BODIPY-CE prefers to align itself away from the HDL surface. The implications as to the suitability of BODIPY to explore lipoprotein properties are discussed.

**General information**

State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX)
Authors: Karilainen, T., Vuorela, T., Vattulainen, I.
Number of pages: 9
Pages: 15848-15856
Publication date: 4 Dec 2015
Peer-reviewed: Yes

**Publication information**

Journal: Journal of Physical Chemistry Part B
Volume: 119
Issue number: 52
ISSN (Print): 1520-6106
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.348 1.02
Publication Forum (2016): 1
Scopus rating (2015): 1.367 1.096
Web of Science (2015): 3.187 3.265 9.8 0.808 0.11793 0.91
Publication Forum (2015): 1
Scopus rating (2014): 1.44 1.14
Web of Science (2014): 3.302 3.528 9.0 0.754 0.14274 0.989
Publication Forum (2014): 3
Scopus rating (2013): 1.494 1.2
Publication Forum (2013): 3
Scopus rating (2012): 1.92 1.251
Publication Forum (2012): 3
Scopus rating (2011): 1.78 1.226
Scopus rating (2010): 1.849 1.214
Variance-corrected Michaelis-Menten equation predicts transient rates of single-enzyme reactions and response times in bacterial gene-regulation

Many chemical reactions in biological cells occur at very low concentrations of constituent molecules. Thus, transcriptional gene-regulation is often controlled by poorly expressed transcription-factors, such as E.coli lac repressor with few tens of copies. Here we study the effects of inherent concentration fluctuations of substrate-molecules on the seminal Michaelis-Menten scheme of biochemical reactions. We present a universal correction to the Michaelis-Menten equation for the reaction-rates. The relevance and validity of this correction for enzymatic reactions and intracellular gene-regulation is demonstrated. Our analytical theory and simulation results confirm that the proposed variance-corrected Michaelis-Menten equation predicts the rate of reactions with remarkable accuracy even in the presence of large non-equilibrium concentration fluctuations. The major advantage of our approach is that it involves only the mean and variance of the substrate-molecule concentration. Our theory is therefore accessible to experiments and not specific to the exact source of the concentration fluctuations.
A new algorithm to improve assessment of cortical bone geometry in pQCT

High-resolution peripheral quantitative computed tomography (HR-pQCT) is now considered the leading imaging modality in bone research. However, access to HR-pQCT is limited and image acquisition is mainly constrained only for the distal third of appendicular bones. Hence, the conventional pQCT is still commonly used despite inaccurate threshold-based segmentation of cortical bone that can compromise the assessment of whole bone strength. Therefore, this study addressed whether the use of an advanced image processing algorithm, called OBS, can enhance the cortical bone analysis in pQCT images and provide similar information to HR-pQCT when the same volumes of interest are analyzed.

Using pQCT images of European Forearm Phantom (EFP), and pQCT and HR-pQCT images of the distal tibia from 15 cadavers, we compared the results from the OBS algorithm with those obtained from common pQCT analyses, HR-pQCT manual analysis (considered as a gold standard) and common HR-pQCT analysis dual threshold technique. We found that the use of OBS segmentation method for pQCT image analysis of EFP data did not result in any improvement but reached similar performance in cortical bone delineation as did HR-pQCT image analyses. The assessments of cortical cross-sectional bone area and thickness by OBS algorithm were overestimated by less than 4% while area moments of inertia were overestimated by ~5-10%, depending on reference HR-pQCT analysis method. In conclusion, this study showed that the OBS algorithm performed reasonably well and it offers a promising practical tool to enhance the assessment of cortical bone geometry in pQCT.
Assessment of respiratory effort during sleep with noninvasive techniques

General information
State: Published
Ministry of Education publication type: B1 Article in a scientific magazine
Organisations: Department of Electronics and Communications Engineering, BioMediTech, Department of Clinical Neurophysiology, Department of Medical Physics, Tampere University Hospital, Pirkanmaa Hospital District, University of Tampere
Authors: Tenhunen, M., Hasan, J., Himanen, S. L.
Number of pages: 2
Pages: 103-104
Publication date: 1 Dec 2015
Peer-reviewed: No
ASJC Scopus subject areas: Clinical Neurology, Physiology (medical), Pulmonary and Respiratory Medicine, Neurology

Publication information
Journal: Sleep Medicine Reviews
Volume: 24
ISSN (Print): 1087-0792
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.534 2.705
Publication Forum (2016): 2
Web of Science (2015): 7.341 9.636 6.6 2.375 0.01038 3.463
Publication Forum (2015): 2
Web of Science (2014): 8.513 9.258 6.6 2.062 0.00959 3.247
Publication Forum (2014): 3
Scopus rating (2013): 3.381 3.951
Publication Forum (2013): 3
Publication Forum (2012): 3
Scopus rating (2011): 2.207 2.76
Scopus rating (2010): 2.06 2.559
Scopus rating (2009): 2.191 2.544
Scopus rating (2008): 2.517 2.294
Scopus rating (2007): 1.978 2.314
Scopus rating (2006): 1.806 2.346
Scopus rating (2005): 1.519 2.053
Scopus rating (2004): 1.107 1.774
Scopus rating (2003): 0.698 1.072
Modeling carbon dioxide transport in PDMS-based microfluidic cell culture devices

Maintaining a proper pH level is crucial for successful cell culturing. Mammalian cells are commonly cultured in incubators, where the cell culture medium is saturated with a mixture of air and 5% carbon dioxide (CO$_2$). Therefore, to keep cell culture medium pH in an acceptable level outside these incubators, a suitable CO$_2$ concentration must be dissolved in the medium. However, it can be very difficult to control and measure precisely local concentration levels. Furthermore, possible undesired concentration gradients generated during long-term cell culturing are almost impossible to detect. Therefore, we have developed a computational model to estimate CO$_2$ transport in silicone-based microfluidic devices. An extensive set of experiments was used to validate the finite element model. The model parameters were obtained using suitable measurement set-ups and the model was validated using a fully functional cell cultivation device. The predictions obtained by the simulations show very good responses to experiments. It is shown in this paper how the model helps to understand the dynamics of CO$_2$ transport in silicone-based cell culturing devices possessing different geometries, thus providing cost-effective means for studying different device designs under a variety of experimental conditions without the need of actual testing. Finally, based on the results from the computational model, an alternative strategy for feeding CO$_2$ is proposed to accelerate the system performance such that a faster and more uniform CO$_2$ concentration response is achieved in the area of interest.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Department of Materials Science, Research group: Paper Converting and Packaging, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), BioMediTech
Authors: Mäki, A. J., Peltokangas, M., Kreutzer, J., Auvinen, S., Kallio, P.
Keywords: (Carbon dioxide, Finite element method, Mass transport, Microfluidics cell culturing, Numerical simulation, pH)
Number of pages: 10
Pages: 515-524
Publication date: 1 Dec 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Chemical Engineering(all), Chemistry(all), Applied Mathematics, Industrial and Manufacturing Engineering

Publication information
Journal: Chemical Engineering Science
Volume: 137
ISSN (Print): 0009-2509
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.037 1.442
Publication Forum (2016): 2
Scopus rating (2015): 1.038 1.606
Web of Science (2015): 2.75 2.948 10.0 0.777 0.0354 0.772
Publication Forum (2015): 2
Scopus rating (2014): 1.115 1.642
Web of Science (2014): 2.337 2.674 9.7 0.47 0.03532 0.719
Publication Forum (2014): 3
Scopus rating (2013): 1.157 1.866
Publication Forum (2013): 3
Scopus rating (2012): 1.189 1.847
Publication Forum (2012): 3
Scopus rating (2011): 1.205 1.685
Behavioral Informatics and Computational Modeling in Support of Proactive Health Management and Care

Health-related behaviors are among the most significant determinants of health and quality of life. Improving health behavior is an effective way to enhance health outcomes and mitigate the escalating challenges arising from an increasingly aging population and the proliferation of chronic diseases. Although it has been difficult to obtain lasting improvements in health behaviors on a wide scale, advances at the intersection of technology and behavioral science may provide the tools to address this challenge. In this paper, we describe a vision and an approach to improve health behavior interventions using the tools of behavioral informatics, an emerging transdisciplinary research domain based on system-theoretic principles in combination with behavioral science and information technology. The field of behavioral informatics has the potential to optimize interventions through monitoring, assessing, and modeling behavior in support of providing tailored and timely interventions. We describe the components of a closed-loop system for health interventions. These components range from fine grain sensor characterizations to individual-based models of behavior change. We provide an example of a research health coaching platform that incorporates a closed-loop intervention based on these multiscale models. Using this early prototype, we illustrate how the optimized and personalized methodology and technology can support self-management and remote care. We note that despite the existing examples of research projects and our platform, significant future research is required to convert this vision to full-scale implementations.
Comparative End-to-End Analysis of Ca2+-Signaling-Based Molecular Communication in Biological Tissues

Calcium (Ca2+)-signaling-based molecular communication is a short-range communication process that diffuses and propagates ions between the cells of a tissue. The communication process is initiated via stimulation and amplification of the production of Ca2+ ions within a cell; these ions then diffuse through a physical connection between cells called a gap junction. Ca2+ signaling can be found in different classes of cell. In excitable cells, initiation of the Ca2+-signaling process is accompanied by an electrical component; for nonexcitable cell types, the electrical component is absent; while hybrid cells exhibit both behaviors. This paper provides a comparison and analysis of the communication behavior in tissues comprised three specific cell types that utilize Ca2+ signaling: epithelium cells (nonexcitable), smooth muscle cells (excitable), and astrocytes (hybrid). The analysis focuses on spatiotemporal Ca2+ concentration dynamics and how they are influenced by the intracellular signaling process, the molecular diffusion delay, the gain and capacity of the communication channel, as well as intracellular signaling interference. This analysis of the communication behavior in the context of tissues provides insights useful for, inter alia, the design of nanomachines that are situated within tissues and that use analysis of the communication channel to infer tissue health.
Current technologies to monitor neuronal cultures in vitro are based on 2-dimensional (2D) multi-electrode arrays and cell cultures. The complexity of actual high-level neurobiological systems requires 3-dimensional (3D) cultures and 3D electrode arrays to improve our understanding of such systems. The realization calls for smart multilayer and packaging technology. Our approach uses low-temperature cofired ceramics (LTCC) for the design of a 3-dimensional multi-electrode array for 3D in vitro cell cultures.
array (3D MEA). An LTCC multilayer board with gold electrodes forms the basis of the system. The layout of the 3D MEA is designed to fit into widely used measurement adapters for 2D signal recordings, enabling data processing identical to that of established chips. Design and manufacturing of the new 3D device as a basic tool for the investigation of 3D cell cultures are described. Features of thick-film gold electrodes are characterized by means of microscopic and spectroscopic tools complemented with complex impedance measurements. Possible biological applications for in vitro electrophysiological measurements were evaluated based on cell cultures of primary neurons, seeded directly to the chip surface. It was shown that activity can be measured over six months.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Bartsch, H., Himmerlich, M., Fischer, M., Demko, L., Hyttinen, J., Schober, A.
Keywords: (Low-temperature cofired ceramics (LTCC), three-dimensional hybrid multi-electrode array (3D MEA), in vitro cell culture, thick-film gold electrode, primary neuron culture, GROWTH)
Number of pages: 10
Pages: 315-324
Publication date: Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Ceramic Science and Technology
Volume: 6
Issue number: 4
ISSN (Print): 2190-9385
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 0.378 0.715
Publication Forum (2016): 0
Scopus rating (2015): 0.243 0.441
Web of Science (2015): 0.544 0.451 Not Available 0.071 2.3E-4 0.116
Publication Forum (2015): 0
Scopus rating (2014): 0.212 0.516
Web of Science (2014): 0.538 0.462 Not Available 0.025 1.6E-4 0.106
Scopus rating (2013): 0.282 0.686
Scopus rating (2012): 0.507 1.354
Scopus rating (2011): 0.157 0.423
Original language: English
DOIs:
10.4416/JCST2015-00056
Source: WOS
Source-ID: 000367422100010
Research output: Scientific - peer-review » Article

Human-based approaches to pharmacology and cardiology: An interdisciplinary and intersectorial workshop
General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Computational Biophysics and Imaging Group, Department of Electronics and Communications Engineering, BioMediTech
Publication date: 29 Nov 2015
Peer-reviewed: Yes

Publication information
Journal: Europace
Effects of Intracellular and Partitioning Asymmetries in Escherichia coli

Cell divisions in Escherichia coli are, in general, morphologically symmetric. However, in a few cases, significant asymmetries between sister cells exist. These asymmetries between sister cells result in functional differences between them. For example, cells inheriting the older pole, over generations, accumulate more unwanted protein aggregates than their sister and, consequently, have a reduced growth rate. The reduced ability of these cells to reproduce shows that even these unicellular organisms are susceptible to the effects of aging. To understand senescence in these organisms, it is critical to investigate the sources as well as the functional consequences of asymmetries in division.

In this thesis, we characterize mechanisms responsible for functional and morphological asymmetries in division in E. coli cells, using live, single-cell, single-molecule imaging techniques and detailed stochastic models. First, to understand the functional asymmetries due to the heterogeneous spatial distribution of large, inert protein complexes, we study the kinetics of segregation and retention of such complexes by observing these events, one event at a time. For that, we track individual MS2-GFP tagged RNA complexes, as they move in the cell cytoplasm, and characterize the mechanisms responsible for their long-term spatial distribution and resulting partitioning. Next, to understand the morphological asymmetries, we study the difference in cell sizes between sister cells at division under different environmental conditions. Finally, we present the models and simulators developed to characterize and mimic these processes, as well as to explore their functional consequences.

Our results suggest that functional and morphological asymmetries in division, in the growth conditions studied, appear to be mostly driven by the nucleoid. In particular, we find that the fluorescent complexes are retained at the poles due to nucleoid occlusion. Further, the positioning of the point of division is also regulated by the degree of proximity between the two replicated nucleoids in the cell at the moment preceding division. Finally, based on simulation results of the models in extreme conditions, we suggest that asymmetries in these processes in division can enhance the mean vitality of E. coli cell populations. Overall, the results suggest that nucleoid occlusion contributes, in different ways, to heterogeneities in E. coli cells that ultimately generate phenotypic differences between sister cells.

General information
Polypyrrole coating on poly-(lactide/glycolide)-β-tricalcium phosphate screws enhances new bone formation in rabbits

Polypyrrole (PPy) has gained interest as an implant material due to its multifunctional properties and its high compatibility with several cell and tissue types. For the first time, the biocompatibility and osteointegration of PPy coating, incorporated with chondroitin sulfate (CS), were studied in vivo by implanting PPy-coated bioabsorbable bone fixation composite screws of poly-(lactide/glycolide) copolymer (PLGA) and β-tricalcium phosphate (TCP) into New Zealand white rabbits. Uncoated bioabsorbable polymer composite screws and commercially available stainless steel cortical screws were used as reference implants. The rabbits were euthanized 12 and 26 weeks after the implantation. The systemic effects were evaluated from food and water consumption, body weight, body temperature, clinical signs, blood samples, internal organ weights, and histological examination. Local effects were studied from bone tissue and surrounding soft tissue histology. New bone formation was evaluated by micro-computed tomography, tetracycline labeling and torsion tests. Torsion tests were performed in order to capture the peak value of the torsion force during the course of the screw's loosening. The coated screws induced significantly more bone formation than the uncoated screws. In addition, none of the implants induced any systemic or local toxicity. The results suggest that PPy is biocompatible with bone tissue and is a potential coating for enhancing osteointegration in orthopedic implants.
Signatures of chaotic and stochastic dynamics uncovered with epsilon-recurrence networks

An old and important problem in the field of nonlinear time-series analysis entails the distinction between chaotic and stochastic dynamics. Recently, e-recurrence networks have been proposed as a tool to analyse the structural properties of a time series. In this paper, we propose the applicability of local and global e-recurrence network measures to distinguish between chaotic and stochastic dynamics using paradigmatic model systems such as the Lorenz system, and the chaotic and hyper-chaotic Rossler system. We also demonstrate the effect of increasing levels of noise on these network measures and provide a real-world application of analysing electroencephalographic data comprising epileptic seizures. Our results show that both local and global e-recurrence network measures are sensitive to the presence of unstable periodic orbits and other structural features associated with chaotic dynamics that are otherwise absent in stochastic dynamics. These network measures are still robust at high noise levels and short data lengths. Furthermore, e-recurrence network analysis of the real-world epileptic data revealed the capability of these network measures in capturing dynamical transitions using short window sizes. e-recurrence network analysis is a powerful method in uncovering the signatures of chaotic and stochastic dynamics based on the geometrical properties of time series.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Stockholm Univ, Stockholm University, Planetary Boundary Res Lab, BioMediTech
Authors: Subramaniyam, N., Donges, J. F., Hyttinen, J.
Keywords: (time-series analysis, complex networks, chaotic dynamics, stochastic dynamics, TIME-SERIES ANALYSIS, COMPLEX NETWORK, SYSTEMS, NOISE, INFORMATION, TRANSITIONS, CENTRALITY, NONLINEARITY, DETERMINISM, QUANTIFIERS)
Publication date: 8 Nov 2015
Towards washable electro-textile UHF RFID tags: reliability study of epoxy-coated copper fabric antennas

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Identification and Sensing Systems Research Group, Sensing Systems for Wireless Medicine (MediSense), City University of Hong Kong
Authors: Wang, S., Chong, N. L., Virkki, J., Björninen, T., Sydänheimo, L., Ukkonen, L.
Publication date: 8 Nov 2015
Peer-reviewed: Yes

Publication information
Journal: Proceedings of the Royal Society A: Mathematical Physical and Engineering Sciences
Volume: 471
Issue number: 2183
Article number: 20150349
ISSN (Print): 1364-5021
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.754 1.081
Publication Forum (2016): 2
Scopus rating (2015): 0.866 1.279
Web of Science (2015): 1.935 2.45 >10.0 0.36 0.01857 1.207
Publication Forum (2015): 2
Scopus rating (2014): 0.949 1.437
Web of Science (2014): 2.192 2.372 >10.0 0.405 0.01866 1.215
Publication Forum (2014): 2
Scopus rating (2013): 1.003 1.589
Publication Forum (2013): 2
Scopus rating (2012): 0.969 1.521
Publication Forum (2012): 2
Scopus rating (2011): 0.867 1.464
Scopus rating (2010): 0.938 1.507
Scopus rating (2009): 1.001 1.571
Scopus rating (2008): 1.071 1.415
Scopus rating (2007): 1.139 1.532
Scopus rating (2005): 1.14 1.419
Scopus rating (2004): 1.068 1.339
Scopus rating (2003): 1.146 1.438
Scopus rating (2002): 1.119 1.414
Scopus rating (2001): 1.126 1.329
Scopus rating (2000): 0.881 1.399
Scopus rating (1999): 0.91 1.28
Original language: English
DOIs:
10.1098/rspa.2015.0349
Source: WOS
Source-ID: 000363982600007
Research output: Scientific - peer-review » Article
Biotelemetric wireless intracranial pressure monitoring: an in vitro study

Assessment of intracranial pressure (ICP) is of great importance in management of traumatic brain injuries (TBIs). The existing clinically established ICP measurement methods require catheter insertion in the cranial cavity. This increases the risk of infection and hemorrhage. Thus, noninvasive but accurate techniques are attractive. In this paper, we present two wireless, battery-less and minimally invasive implantable sensors for continuous ICP monitoring. The implants comprise ultra-thin (50 µm) flexible spiral coils connected in parallel to a capacitive microelectromechanical systems (MEMS) pressure sensor. The implantable sensors are inductively coupled to an external on-body reader antenna. The ICP variation can be detected wirelessly through measuring the reader antenna’s input impedance. This paper also proposes a novel implant placement to improve the efficiency of the inductive link. In this study, the performance of the proposed telemetry system was evaluated in a hydrostatic pressure measurement setup. The impact of the human tissues on the inductive link was simulated using a 5-mm layer of pig skin. The results from the in vitro measurement proved the capability of our developed sensors to detect ICP variations ranging from 0 to 70 mmHg at 2.5-mmHg intervals.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Behfar, M., Björninen, T., Moradi, E., Sydänheimo, L., Ukkonen, L.
Number of pages: 10
Publication date: 5 Nov 2015
Peer-reviewed: Yes

Publication information
Journal: International Journal of Antennas and Propagation
Article number: 918698
ISSN (Print): 1687-5869
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.276 0.576
Publication Forum (2016): 1
Scopus rating (2015): 0.35 0.753
Web of Science (2015): 0.75 0.751 2.7 0.125 0.00391 0.282
Publication Forum (2015): 1
Scopus rating (2014): 0.36 0.695
Web of Science (2014): 0.66 0.664 2.4 0.098 0.00264 0.282
Publication Forum (2014): 1
Scopus rating (2013): 0.337 0.677
Publication Forum (2013): 1
Original language: English
DOIs:
10.1155/2015/424150
Links:
http://www.hindawi.com/journals/ijap/2015/424150/ (This article is openly available in the publisher's website.)
Research output: Scientific - peer-review › Article
Comparison Study for Whitney (Raviart-Thomas) Type Source Models in Finite Element Method Based EEG Forward Modeling

This study concentrates on finite element method (FEM) based electroencephalography (EEG) forward simulation in which the electric potential evoked by neural activity in the brain is to be calculated at the surface of the head. The main advantage of the FEM is that it allows realistic modeling of tissue conductivity inhomogeneity. However, it is not straightforward to apply the classical model of a dipolar source with the FEM, due to its strong singularity and the resulting irregularity. The focus of this study is on comparing different methods to cope with this problem. In particular, we evaluate the accuracy of Whitney (Raviart-Thomas) type dipole-like source currents compared to two reference dipole modeling methods: the St. Venant and partial integration approach. Common to all these methods is that they enable direct approximation of the potential field utilizing linear basis functions. In the present context, Whitney elements are particularly interesting, as they provide a simple means to model a divergence-conforming primary current vector field satisfying the square integrability condition. Our results show that a Whitney type source model can provide simulation accuracy comparable to the present reference methods. It can lead to superior accuracy under optimized conditions with respect to both source location and orientation in a tetrahedral mesh. For random source orientations, the St. Venant approach turns out to be the method of choice over the interpolated version of the Whitney model. The overall moderate differences obtained suggest that practical aspects, such as the focality, should be prioritized when choosing a source model.
A survey of printable piezoelectric sensors

Availability of solution-processable piezoelectric sensor and electrode materials enable low-cost and high-throughput fabrication of fully printable piezoelectric sensors. Results obtained with piezoelectric polymer (polyvinylidenefluoride, PVDF), cellulose nanofibril (CNF) and cellulose nanocrystal (CNC) films as sensor materials are presented here. These sensor materials can be processed in solution and used in combination with printed electrodes to obtain full printability of the sensors. A commercial PVDF film and in-house fabricated CNF and CNC film are used as sensor materials. In addition, conducting polymer, graphene and carbon nanotube (CNT) based inks are used as solution-processable electrode materials in the sensors, whereas conventional metallic electrodes are used as reference electrode material. The sensor operation of the fabricated sensors is evaluated through piezoelectric sensitivity measurements. The sensor sensitivity measurements revealed mean sensitivities from 2 pC/N to 42 pC/N in transverse direction, depending on set of the sensor and electrode materials used.
and raw or insufficiently cooked seafood. Throughout the food chain, V. parahaemolyticus encounters different temperature conditions that might alter metabolism and pathogenicity of the bacterium. In this study, we performed gene expression profiling of V. parahaemolyticus RIMD 2210633 after exposure to 4, 15, 20, 37 and 42°C to describe the cold and heat shock response. Methods: Gene expression profiles of V. parahaemolyticus RIMD 2210633 after exposure to 4, 15, 20, 37 and 42°C were investigated via microarray. Gene expression values and RT-qPCR experiments were compared by plotting the log2 values. Moreover, volcano plots of microarray data were calculated to visualize the distribution of differentially expressed genes at individual temperatures and to assess hybridization qualities and comparability of data. Finally, enriched terms were searched in annotations as well as functional-related gene categories using the Database for Annotation, Visualization and Integrated Discovery. Results: Analysis of 37°C normalised transcriptomics data resulted in differential expression of 19 genes at 20°C, 193 genes at 4°C, 625 genes at 42°C and 638 genes at 15°C. Thus, the largest number of significantly expressed genes was observed at 15 and 42°C with 13.3 and 13 %, respectively. Genes of many functional categories were highly regulated even at lower temperatures. Virulence associated genes (tdh1, tdh2, toxR, toxS, vopC, T6SS-1, T6SS-2) remained mostly unaffected by heat or cold stress. Conclusion: Along with folding and temperature shock depending systems, an overall temperature-dependent regulation of expression could be shown. Particularly the energy metabolism was affected by changed temperatures. Whole-genome gene expression studies of food related pathogens such as V. parahaemolyticus reveal how these pathogens react to stress impacts to predict its behaviour under conditions like storage and transport.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Department of Signal Processing, Freie Universität Berlin, University of Tampere
Authors: Urmersbach, S., Aho, T., Alter, T., Hassan, S. S., Autio, R., Huehn, S.
Keywords: (Gene expression, Thermal shock, Vibrio parahaemolyticus)
Publication date: 23 Oct 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Microbiology, Microbiology (medical)

Publication information
Journal: BMC Microbiology
Volume: 15
Issue number: 1
Article number: 229
ISSN (Print): 1471-2180
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.23 0.992
Publication Forum (2016): 1
Scopus rating (2015): 1.401 0.998
Web of Science (2015): 2.581 3.177 5.2 0.335 0.02287 0.98
Publication Forum (2015): 1
Scopus rating (2014): 1.472 1.039
Web of Science (2014): 2.729 3.251 4.7 0.319 0.02397 1.005
Publication Forum (2014): 1
Scopus rating (2013): 1.527 1.143
Publication Forum (2013): 1
Scopus rating (2012): 1.454 1.12
Publication Forum (2012): 1
Scopus rating (2011): 1.472 1.116
Scopus rating (2010): 1.405 1.03
Scopus rating (2009): 1.438 0.964
Scopus rating (2008): 1.432 0.99
Scopus rating (2007): 1.354 0.949
Scopus rating (2006): 1.261 0.827
Scopus rating (2005): 0.734 0.548
Scopus rating (2004): 0.668 0.544
Scopus rating (2003): 0.661 0.535
Scopus rating (2002): 0.69 0.511
Original language: English
DOIs:
Exercise apps cure the sitting disease

A sedentary lifestyle is the bane of our modern society and affects both body and mind. But help may be closer than you think – in your pocket. Can a mobile application get us up from our office chairs and start exercising?

Adipose Tissue Dysfunction and Altered Systemic Amino Acid Metabolism Are Associated with Non-Alcoholic Fatty Liver Disease

Background

Fatty liver is a major cause of obesity-related morbidity and mortality. The aim of this study was to identify early metabolic alterations associated with liver fat accumulation in 50- to 55-year-old men (n = 49) and women (n = 52) with and without NAFLD.

Methods

Hepatic fat content was measured using proton magnetic resonance spectroscopy (H-1 MRS). Serum samples were analyzed using a nuclear magnetic resonance (NMR) metabolomics platform. Global gene expression profiles of adipose tissues and skeletal muscle were analyzed using Affymetrix microarrays and quantitative PCR. Muscle protein expression was analyzed by Western blot.

Results

Increased branched-chain amino acid (BCAA), aromatic amino acid (AAA) and orosomucoid were associated with liver fat accumulation already in its early stage, independent of sex, obesity or insulin resistance (p

Conclusions

Liver fat accumulation, already in its early stage, is associated with increased serum branched-chain and aromatic amino acids. The observed associations of decreased BCAA catabolism activity, mitochondrial energy metabolism and serum BCAA concentration with liver fat content suggest that adipose tissue dysfunction may have a key role in the systemic nature of NAFLD pathogenesis.
Mobile Applications to Support Physical Exercise - Motivational Factors and Design Strategies

The growing incidence of health problems attributed to contemporary lifestyles, and the limited resources of healthcare, has led several stakeholders to look for alternative preventive healthcare methods. Physical exercise has many good effects for health, but people often lack motivation towards it. Smartphone applications can act as motivational tools, as they are accessible, mobile, and have suitable technological abilities. During past 10 years, a large number of mobile exercise applications have been launched and, increasingly, wellness technologies have been researched in the field of human-computer interaction (HCI). However, the field lacks a comprehensive overview of the design strategies related to motivational exercise applications. Additionally, research in the field has mostly been conducted in western cultures, and perspectives from the developing world are missing.

This thesis explores the design space of mobile applications that aim to motivate the users to engage in physical exercise. The main foci of the research were to identify the motivational factors towards the use of mobile exercise applications and to formulate a comprehensive overview of design strategies for motivational, mobile exercise applications. The results were gained from a constructive design research process that included user studies, concepting and evaluation of motivational exercise applications, a cross study analysis of motivational factors, and formulating design strategies. The user studies were conducted in Finland and India with working-age participants.

Based on a rich set of empirical studies, this research produces insights for a wide set of motivational factors towards the use of mobile exercise applications. It points out differences in motivational factors between Finnish and Indian participants. For example, the use of surprising elements and certain playful elements as sources of motivation appealed to Indian participants more than Finns, who, in general, had a more pragmatic perspective towards the exercise applications. Finns were motivated by viewing their goals and progress by numbers and graphs, while Indians did not adopt the numerical approaches. The second outcome of the research is a comprehensive, structured and focused model of design strategies for motivational, mobile exercise applications. The model includes 34 design strategies divided into six dimensions. Nine of the strategies are India specific. The design strategies can be utilised in the design work of future exercise applications.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Pervasive Computing, Research area: User experience
Authors: Ahtinen, A.
750 nm 1.5 W frequency-doubled semiconductor disk laser with a 44 nm tuning range

We demonstrate 1.5 W of output power at the wavelength of 750 nm by intracavity frequency doubling a wafer-fused semiconductor disk laser diode-pumped at 980 nm. An optical-to-optical efficiency of 8.3% was achieved using a bismuth borate crystal. The wavelength of the doubled emission could be tuned from 720 to 764 nm with an intracavity birefringent plate. The beam quality parameter M2 of the laser output was measured to be below 1.5 at all pump powers. The laser is a promising tool for biomedical applications that can take advantage of the large penetration depth of light in tissue in the 700–800 nm spectral range.
Erbium-doped borosilicate glasses containing various amounts of P2O5 and Al2O3: Influence of the silica content on the structure and thermal, physical, optical and luminescence properties

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Biomaterials and Tissue Engineering Group, Department of Electronics and Communications Engineering, BioMediTech, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE), Politecnico di Torino, DISAT, Istituto di Ingegneria e Fisica dei Materiali, Corso Duca degli Abruzzi 24, I-10129 Torino, Italy, BioMediTech, Åbo Akademi University, Process Chemistry Centre, nLIGHT Corporation, SorrRonrinne 9, FI-08500 Lohja, Finland, CNRS, Université de Bordeaux, ISM, 351Cours de la Libération, F-33405 Talence, France, CNRS, Université de Bordeaux, ICMCB, 87 Avenue du Dr Schweitzer, F-33608 Pessac, France
Keywords: (Glasses, Infrared spectroscopy, Luminescence, Luminescence and optical properties, Photoelectron spectroscopy)
Number of pages: 8
Pages: 47-54
Publication date: 1 Oct 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Materials Science(all), Condensed Matter Physics, Mechanical Engineering, Mechanics of Materials

Publication information
Journal: Materials Research Bulletin
Volume: 70
ISSN (Print): 0025-5408
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.71 0.855
Publication Forum (2016): 1
Scopus rating (2015): 0.733 0.976
Web of Science (2015): 2.435 2.38 6.7 0.611 0.0211 0.441
Publication Forum (2015): 1
Scopus rating (2014): 0.774 1.051
Noncontact Respiration Monitoring during Sleep with Microwave Doppler Radar

This paper demonstrates the measurement of respiration waveform during sleep with a noncontact radar sensor. Instead of measuring only the respiration rate, the methods that allow monitoring the absolute respiration displacement were studied. Absolute respiration displacement can in theory be measured with a quadrature microwave Doppler radar sensor and using the nonlinear demodulation as the channel combining method. However, in this paper, relative respiration displacement measures were used as a reference. This is the first time that longer data sets have been analyzed successfully with the nonlinear demodulation method. This paper consists of whole-night recordings of three patients in an uncontrolled environment. The reference respiration data were obtained from a full polysomnography recorded simultaneously. The feasibility of the nonlinear demodulation in a real-life setting has been unclear. However, this paper shows that it is successful most of the time. The coverage of successfully demodulated radar data was ~ 58 %-78%. The use of the nonlinear demodulation is not possible in the following cases: 1) if the chest wall displacement is too small compared with the wavelength of the radar; 2) if the radar data do not form an arc-like shape in the $IQ$-plot; or 3) if there are large movement artifacts present in the data. Both in academic literature and in commercial radar devices, the data are processed based on the presumption that it forms either an arc or a line in the IQ-plot. Our measurements show that the presumption is not always valid.

General information

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Authors: Zakrzewski, M., Vehkaoja, A., Joutsen, A. S., Palovuori, K. T., Vanhala, J. J.

Keywords: (breathing patterns, Doppler radar, non-contact respiration measurement, radar measurements)

Number of pages: 11
Pages: 5683-5693
Publication date: 1 Oct 2015
Peer-reviewed: Yes

ASJC Scopus subject areas: Electrical and Electronic Engineering, Instrumentation

Publication information

Journal: IEEE Sensors Journal
Volume: 15
Issue number: 10
Transcriptome sequencing reveals PCAT5 as a Novel ERG-Regulated long Noncoding RNA in prostate cancer

Castration-resistant prostate cancers (CRPC) that arise after the failure of androgen-blocking therapies cause most of the deaths from prostate cancer, intensifying the need to fully understand CRPC pathophysiology. In this study, we characterized the transcriptomic differences between untreated prostate cancer and locally recurrent CRPC. Here, we report the identification of 145 previously unannotated intergenic long noncoding RNA transcripts (lncRNA) or isoforms that are associated with prostate cancer or CRPC. Of the one third of these transcripts that were specific for CRPC, we defined a novel lncRNA termed PCAT5 as a regulatory target for the transcription factor ERG, which is activated in approximately 50% of human prostate cancer. Genome-wide expression analysis of a PCAT5-positive prostate cancer after PCAT5 silencing highlighted alterations in cell proliferation pathways. Strikingly, an in vitro validation of these alterations revealed a complex integrated phenotype affecting cell growth, migration, invasion, colony-forming potential, and apoptosis. Our findings reveal a key molecular determinant of differences between prostate cancer and CRPC at the level of the transcriptome. Furthermore, they establish PCAT5 as a novel oncogenic lncRNA in ERG-positive prostate cancers, with implications for defining CRPC biomarkers and new therapeutic interventions.
Strontium- and calcium-containing, titanium-stabilised phosphate-based glasses with prolonged degradation for orthopaedic tissue engineering
Building new computational models to support health behavior change and maintenance: new opportunities in behavioral research

Adverse and suboptimal health behaviors and habits are responsible for approximately 40% of preventable deaths, in addition to their unfavorable effects on quality of life and economics. Our current understanding of human behavior is largely based on static “snapshots” of human behavior, rather than ongoing, dynamic feedback loops of behavior in response to ever-changing biological, social, personal, and environmental states. This paper first discusses how new technologies (i.e., mobile sensors, smartphones, ubiquitous computing, and cloud-enabled processing/computing) and emerging systems modeling techniques enable the development of new, dynamic, and empirical models of human behavior that could facilitate just-in-time adaptive, scalable interventions. The paper then describes concrete steps to the creation of robust dynamic mathematical models of behavior including: (1) establishing “gold standard” measures, (2) the creation of a behavioral ontology for shared language and understanding tools that both enable dynamic theorizing across disciplines, (3) the development of data sharing resources, and (4) facilitating improved sharing of mathematical models.
and tools to support rapid aggregation of the models. We conclude with the discussion of what might be incorporated into a “knowledge commons,” which could help to bring together these disparate activities into a unified system and structure for organizing knowledge about behavior.

General information

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D), University of Southern California, Arizona State University, Northeastern University, National Institutes of Health, Bethesda, Northwestern University, Wharton School, University of Pennsylvania, Scientific Institute Hospital San Raffaele, Valencia Polytechnical University, Columbia University in the City of New York, VTT Technical Research Centre of Finland


Keywords: (Computational models of behavior, Connected health, Health-related behavior, Just-in-time adaptive interventions, mHealth, Mobile health, Real-time interventions)

Number of pages: 12

Pages: 335-346

Publication date: 17 Sep 2015

Peer-reviewed: Yes

ASJC Scopus subject areas: Behavioral Neuroscience, Applied Psychology

Synthetic Genetic Circuits: Plasticity and Robustness

Living organisms have evolved to survive in a multitude of environmental conditions. This plasticity, and the robustness to environmental fluctuations, is achieved by altering gene expression levels in response to perturbations while maintaining the basic processes essential for survival. Genetic circuits, which are networks of interacting genes, are responsible for carrying out both the basic processes to sustain life, such as counting time, as well as the specific processes that provide them with adaptability to various environmental conditions while maintaining homeostasis.

Gene expression and its regulation are dynamic, stochastic processes. Namely, although gene expression was previously considered to be identical in cells arising from common ancestors, the observation of multiple, single cells expressing fluorescent proteins has shown that gene expression is noisy, which allows genetically identical cells in a homogeneous environment to behave differently, a phenomenon known as cell-to-cell phenotypic variability. Noise in gene expression arises from the fact that most of the underlying biochemical reactions involve small molecular numbers, which leads to infrequent, to some extent random in time, interactions and processes. While initially noise in gene expression was considered to be disadvantageous to the organisms, a number of recent studies suggest significant functional roles for noise in intracellular processes.

The complexity and size of natural genetic circuits hampers their detailed study at present. One approach to overcome this problem is based on design of small, and thus more tractable, artificial circuits. Aside from its small size, in such circuits, all components are known and there is less chance that they interact with unknown cellular components. This strategy offers additional advantages, such as testability of whether a certain architecture is able to generate a desired trait or function without affecting natural cellular processes e.g., by inducing other downstream effectors that affect cell
functioning. Moreover, it provides an opportunity to compare different circuit designs and determine which circuit architecture is preferable. Finally, due to detailed knowledge of their structure, the behavior of these circuits can be computationally simulated to assist, e.g., the study of their long-term behaviors, among other. Previous studies based on synthetic circuits have already provided key insights into the design principles and architecture of genetic circuits, such as how these organize genes so as to gain the ability to make decisions or track time. These circuits are also expected to become of great use in therapeutic and industrial applications.

In this thesis, we focused on the study of the phenotypic plasticity and robustness of synthetic genetic clocks. We focused on the effects of temperature, copy number and the role of components; proteins and promoters, of the circuit. For this, we made use of the well-known genetic Repressilator, a synthetic genetic clock that is also one of the simplest genetic circuits known to be functional in a living system. To assist the studies, aside from techniques from cell and molecular biology, we made use of state of the art techniques in microscopy and image analysis. From the data, we characterized, first, the phenotypic plasticity of individual genes in Escherichia coli, as these are the main components of the Repressilator. Next, we performed a study of the effects of temperature on the dynamics of the genetic Repressilator. Subsequently, we studied the degree of synchrony between sister cells, each containing the Repressilator, in order to evaluate the extent to which cell division affects the dynamics of this circuit. Finally, we inserted the Repressilator genetic code into a single-copy vector so as to, by comparison with the original construct, study the effects of copy numbers on the dynamics of the circuit.

Redox-induced activation of the proton pump in the respiratory complex I
Complex I functions as a redox-linked proton pump in the respiratory chains of mitochondria and bacteria, driven by the reduction of quinone (Q) by NADH. Remarkably, the distance between the Q reduction site and the most distant proton channels extends nearly 200 Å. To elucidate the molecular origin of this long-range coupling, we apply a combination of large-scale molecular simulations and a site-directed mutagenesis experiment of a key residue. In hybrid quantum mechanics/molecular mechanics simulations, we observe that reduction of Q is coupled to its local protonation by the His-38/Asp-139 ion pair and Tyr-87 of subunit Nqo4. Atomistic classical molecular dynamics simulations further suggest that formation of quinol (QH2) triggers rapid dissociation of the anionic Asp-139 toward the membrane domain that couples to conformational changes in a network of conserved charged residues. Site-directed mutagenesis data confirm the importance of Asp-139; upon mutation to asparagine the Q reductase activity is inhibited by 75%. The current results, together with earlier biochemical data, suggest that the proton pumping in complex I is activated by a unique combination of electrostatic and conformational transitions.
Response patterns in finger and central body skin temperatures under mild whole body cooling in an elderly and in a young male - a pre-study

General information
State: Published
Organisations: Department of Electronics and Communications Engineering, Research group: Physiological Measurement Systems and Methods Group
Methods for Doppler Radar Monitoring of Physiological Signals

Unobtrusive health monitoring includes advantages such as long-term monitoring of rarely occurring conditions or of slow changes in health, at reasonable costs. In addition, the preparation of electrodes or other sensors is not needed. Currently, the main limitation of remote patient monitoring is not in the existing communication infrastructure but the lack of reliable, easy-to-use, and well-studied sensors.

The aim of this thesis was to develop methods for monitoring cardiac and respiratory activity with microwave continuous wave (CW) Doppler radar. When considering cardiac and respiration monitoring, the heart and respiration rates are often the first monitored parameters. The motivation of this thesis, however, is to measure not only rate-related parameters but also the cardiac and respiratory waveforms, including the chest wall displacement information.

This dissertation thoroughly explores the signal processing methods for accurate chest wall displacement measurement with a radar sensor. The sensor prototype and measurement setup choices are reported. The contributions of this dissertation encompass an I/Q imbalance estimation method and a nonlinear demodulation method for a quadrature radar sensor. Unlike the previous imbalance estimation methods, the proposed method does not require the use of laboratory equipment. The proposed nonlinear demodulation method, on the other hand, is shown to be more accurate than other methods in low-noise cases. In addition, the separation of the cardiac and respiratory components with independent component analysis (ICA) is discussed. The developed methods were validated with simulations and with simplified measurement setups in an office environment. The performance of the nonlinear demodulation method was also studied with three patients for sleep-time respiration monitoring. This is the first time that whole-night measurements have been analyzed with the method in an uncontrolled environment. Data synchronization between the radar sensor and a commercial polysomnographic (PSG) device was assured with a developed infrared (IR) link, which is reported as a side result.

The developed methods enable the extraction of more useful information from a radar sensor and extend its application. This brings Doppler radar sensors one step closer to large-scale commercial use for a wide range of applications, including home health monitoring, sleep-time respiration monitoring, and measuring gating signals for medical imaging.

General information

State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Electronics and Communications Engineering, Research group: Personal Electronics Group
Authors: Zakrzewski, M.
Number of pages: 92
Publication date: 11 Sep 2015

Publication information

Place of publication: Tampere
Publisher: Tampere University of Technology
Effects of subsampling on characteristics of RNA-seq data from triple-negative breast cancer patients

Background: Data from RNA-seq experiments provide a wealth of information about the transcriptome of an organism. However, the analysis of such data is very demanding. In this study, we aimed to establish robust analysis procedures that can be used in clinical practice. Methods: We studied RNA-seq data from triple-negative breast cancer patients. Specifically, we investigated the subsampling of RNA-seq data. Results: The main results of our investigations are as follows: (1) the subsampling of RNA-seq data gave biologically realistic simulations of sequencing experiments with smaller sequencing depth but not direct scaling of count matrices; (2) the saturation of results required an average sequencing depth larger than 32 million reads and an individual sequencing depth larger than 46 million reads; and (3) for an abrogated feature selection, higher moments of the distribution of all expressed genes had a higher sensitivity for signal detection than the corresponding mean values. Conclusions: Our results reveal important characteristics of RNA-seq data that must be understood before one can apply such an approach to translational medicine.
by Eσ70 or Eσ38, the researchers make use of in silico data from a stochastic model of transcription dynamics of that promoter, to show that the method estimates consistently and effectively the kinetics rates of closed and open complex formation by Eσ70 and Eσ38. In the end, the necessary measurement procedures for acquiring the data needed to apply this new methodology are described.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: Laboratory of Biosystem Dynamics-LBD
Authors: Tran, H., Ribeiro, A. S.
Number of pages: 7
Pages: 151-157
Publication date: 6 Sep 2015
Peer-reviewed: Yes

**Publication information**

Journal: International Journal of Pharma Medicine and Biological Sciences
Volume: 4
Issue number: 3
ISSN (Print): 2278-5221

**Detected and Assessment of Sleep-Disordered Breathing with Special Interest of Prolonged Partial Obstruction**

Sleep-disordered breathing (SDB) has become more common and puts more strain on public health services than ever before. Obstructive sleep apnea (OSA) and its health consequences such as different cardiovascular diseases are nowadays well recognized. In addition to OSA, attention has recently been paid to another SDB; prolonged partial obstruction. However, it is often undiagnosed and easily left untreated because of the low number of respiratory events during polysomnography recording. This patient group has found to present with more atypical subjective symptoms than OSA patients.

Polysomnography (PSG) is considered to be the gold standard in reference methods in SDB diagnostics. PSG is a demanding and laborious multichannel recording method and often requires subjects to spend one night in a sleep laboratory. There is long tradition in Finland to use mattress sensors in SDB diagnostics. Recently, smaller electromechanical film transducer (Emfit) mattresses have replaced the old Static Charge-Sensitive Bed (SCSB) mattresses. However, a proper clinical validation of Emfit mattresses in SDB diagnostics has not been carried out.

In this work, the use of Emfit recording in the detection of sleep apneas, hypopneas, and prolonged partial obstruction with increased respiratory effort was evaluated. The general aim of the thesis is to develop and improve the diagnostic methods for sleep-related breathing disorders.

Comparisons with both PSG with nasal pressure recording and transesophageal pressure were made. Special attention was paid to the existence of the spiking phenomenon in the Emfit mattress in relation to changes in negative intrathoracic pressure in estimating increased respiratory effort. This entails monitoring the esophageal pressure as a part of nocturnal polysomnography. The recording method is demanding and uncomfortable and is usually not used with ordinary sleep laboratory patients. Thus, reliable and easy indirect quantification methods for respiratory effort are needed in clinical work. According to the results presented in this work, the Emfit signal reveals increased respiratory effort as well as apneas/hypopneas.

To find out the prevalence and consequences of prolonged partial obstruction among sleep laboratory patients was another aim of this thesis. This was done by retrospective analyses of sleep laboratory patients from one year. The prevalence of patients with prolonged partial obstruction was 11%. They were as sleepy as OSA patients, but their life quality was worse, as assessed by a survey. These results, along with the findings of the heart rate variation evaluation carried out in this thesis, suggest that prolonged partial obstruction and OSA should be considered as different entities of SDB.
With the Emfit mattress sensor, the SDB types can be differentiated, which is expected to enhance the accuracy of diagnostics. However, there is increasing need for easy and cheap screening methods to evaluate nocturnal breathing. In this respect, the usability of compressed tracheal sound signal scoring in SDB screening was estimated. The method reveals apneas and hypopneas but, according to the present findings, it can also be used in the detection of prolonged partial obstruction. The findings encourage the use of compressed tracheal sound analysis in screening different SDB.

The analysis of sleep recordings is still based on a doctor's subjective and visual estimation. To date, no generally accepted and sufficiently reliable automatic analysis method exists. Robust, automatic quantification methods with easier techniques for non-invasive sleep recording would enable the analysis methods to be also used for screening purposes. In this technology-orientated world, people could take much more responsibility and take care of themselves better by following their own biosignals and by changing their health habits earlier. The need for good sleep as a necessity for good life and health is widely recognized.

**General information**
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Electronics and Communications Engineering
Authors: Tenhunen, M.
Number of pages: 77
Publication date: 4 Sep 2015

**Publication information**
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

**Publication series**
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1304
ISSN (Print): 1459-2045
Electronic versions: tenhunen_1304
Links:

**Bibliographical note**
Awarding institution: Tampere University of Technology
Versio ok 16.12.2015
Research output: Collection of articles › Doctoral Thesis

A single aspiration of rod-like carbon nanotubes induces asbestos-like pulmonary inflammation mediated in part by the IL-1 receptor
Carbon nanotubes (CNT) have been eagerly studied because of their multiple applications in product development and potential risks on health. We investigated the difference of two different CNT and asbestos in inducing proinflammatory reactions in C57BL/6 mice after single pharyngeal aspiration exposure. We used long tangled and long rod-like CNT, as well as crocidolite asbestos at a dose of 10 or 40 μg/mouse. The mice were sacrificed 4 and 16h or 7, 14, and 28 days after the exposure. To find out the importance of a major inflammatory marker IL-1β in CNT-induced pulmonary inflammation, we used etanercept and anakinra as antagonists as well as Interleukin 1 (IL-1) receptor (IL-1R-/-) mice. The results showed that rod-like CNT, and asbestos in lesser extent, induced strong pulmonary neutrophilia accompanied by the proinflammatory cytokines and chemokines 16h after the exposure. Seven days after the exposure, neutrophilia had essentially disappeared but strong pulmonary eosinophilia peaked in rod-like CNT and asbestos-exposed groups. After 28 days, pulmonary granulomas, goblet cell hyperplasia, and Charcot-Leyden-like crystals containing acidophilic macrophages were observed especially in rod-like CNT-exposed mice. IL-1R-/- mice and antagonists-treated mice exhibited a significant decrease in neutrophilia and messenger ribonucleic acid (mRNA) levels of proinflammatory cytokines at 16 h. However, rodlike CNT-induced Th2-type inflammation evidenced by the expression of IL-13 and mucus production was unaffected in IL-1R-/- mice at 28 days. This study provides knowledge about the pulmonary effects induced by a single exposure to the CNT and contributes to hazard assessment of carbon nanomaterials on airway exposure.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Distinct electrophysiological and mechanical beating phenotypes of long QT syndrome type 1-specific cardiomyocytes carrying different mutations

Background: Long QT syndrome (LQTS) is associated with increased risk of ventricular arrhythmias and cardiac arrest. LQTS type 1 (LQT1), the most prevalent subtype of LQTS, is caused by defects of slow delayed rectifier potassium current (I_{Ks}) that lead to abnormal cardiac repolarization. Here we used pluripotent stem cell (iPSC)-technology to investigate both the electrophysiological and also for the first time the mechanical beating behavior of genetically defined, LQT1 specific cardiomyocytes (CMs) carrying different mutations.

Methods: We established in vitro models for LQT1 caused by two mutations (G589D or ivs7-2A>G). LQT1 specific CMs were derived from patient specific iPSCs and
characterized for their electrophysiology using a current clamp and Ca\textsuperscript{2+}-imaging. Their mechanical beating characteristics were analyzed with video-image analysis method. Results and conclusions: Both LQT1-CM-types showed prolonged repolarization, but only those with G589D presented early after-depolarizations at baseline. Increased amounts of abnormal Ca\textsuperscript{2+} transients were detected in both types of LQT1-CMs. Surprisingly, also the mechanical beating behavior demonstrated clear abnormalities and additionally the abnormalities were different with the two mutations: prolonged contraction was seen in G589D-CMs while impaired relaxation was observed in ivs7-2A>G-CMs. The CMs carrying two different LQT1 specific mutations (G589D or ivs7-2A>G) presented clear differences in their electrical properties as well as in their mechanical beating behavior. Results from different methods correlated well with each other suggesting that simply mechanical beating behavior of CMs could be used for screening of diseased CMs and possibly for diagnostic purposes in the future.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Tampere University Hospital, BioMediTech, Heart and Lung Center, University of Helsinki, Helsinki University Central Hospital
Keywords: (Arrhythmia, Calcium imaging, Digital image correlation, Induced pluripotent stem cell, Long QT syndrome, Patch clamp)
Number of pages: 13
Pages: 19-31
Publication date: 1 Sep 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Cardiology and Cardiovascular Medicine

Publication information
Journal: IJC Heart and Vasculature
Volume: 8
ISSN (Print): 2352-9067
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.26 0.519
Publication Forum (2016): 1
Scopus rating (2015): 0.195 0.127
Original language: English
DOIs:
10.1016/j.jcha.2015.04.008
Source: Scopus
Source-ID: 84934929449
Research output: Scientific - peer-review › Article

Er\textsuperscript{3+}-Al\textsubscript{2}O\textsubscript{3} nanoparticles doping of borosilicate glass
Novel borosilicate glasses were developed by adding in the glass batch Er\textsuperscript{3+}-Al\textsubscript{2}O\textsubscript{3} nanoparticles synthetized by using a soft chemical method. A similar nanoparticle doping with modified chemical vapour deposition (MCVD) process was developed to increase the efficiency of the amplifying silica fibre in comparison to using MCVD and solution doping. It was shown that with the melt quench technique, a Er\textsuperscript{3+}-Al\textsubscript{2}O\textsubscript{3} nanoparticle doping neither leads to an increase in the Er\textsuperscript{3+} luminescence properties nor allows one to control the rare-earth chemical environment in a borosilicate glass. The site of Er\textsuperscript{3+} in the Er\textsuperscript{3+}-Al\textsubscript{2}O\textsubscript{3} nanoparticle containing glass seems to be similar as in glasses with the same composition prepared using standard raw materials. We suspect the Er\textsuperscript{3+} ions to diffuse from the nanoparticles into the glass matrix. There was no clear evidence of the presence of Al\textsubscript{2}O\textsubscript{3} nanoparticles in the glasses after melting.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE), Light Corporation, CNRS, Université de Bordeaux, ICMCB, Johan Gadolin Process Chemistry Centre, Abo Akademi University
Authors: Massera, J., Petit, L., Koponen, J., Glorieux, B., Hupa, L., Hupa, M.
Keywords: (Glass, optical fibre, IR photoluminescence, nanoparticles, doping, LUMINESCENCE, IONS)
Number of pages: 4
Pages: 1407-1410
Publication date: Sep 2015
Peer-reviewed: Yes
Sleep stage classification using sparse rational decomposition of single channel EEG records

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Video, Research group: Filterbanks, Research Community on Data-to-Decision (D2D), Eötvös Loránd University
Authors: Samiee, K., Kovacs, P., Kiranyaz, S., Gabbouj, M., Saramäki, T.
Number of pages: 5
Pages: 1905-1909
Publication date: 31 Aug 2015

Host publication information
Title of host publication: 2015 23rd European Signal Processing Conference (EUSIPCO)
Publisher: IEEE
ISBN (Print): 978-0-9928626-3-3
Links:
Examples of electromagnetic field (50–100 kHz) emissions from smart meters in Finland

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen, Tampereen Sähköverkko Oy
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 3
Pages: 225 - 227
Publication date: 28 Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Radioprotection
Volume: 50
Issue number: 3
ISSN (Print): 0033-8451
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.238 0.454
Publication Forum (2016): 1
Scopus rating (2015): 0.246 0.385
Web of Science (2015): 0.508 0.51 6.2 0.242 3.2E-4 0.139
Publication Forum (2015): 1
Scopus rating (2014): 0.226 0.33
Web of Science (2014): 0.54 0.883 5.6 0.176 7.4E-4 0.32
Publication Forum (2014): 1
Scopus rating (2013): 0.262 0.326
Publication Forum (2013): 1
Scopus rating (2012): 0.238 0.234
Publication Forum (2012): 1
Scopus rating (2011): 0.258 0.597
Scopus rating (2010): 0.237 0.383
Scopus rating (2009): 0.18 0.351
Scopus rating (2008): 0.228 0.471
Scopus rating (2007): 0.253 0.705
Scopus rating (2006): 0.152 0.264
Scopus rating (2005): 0.197 0.47
Scopus rating (2004): 0.184 0.497
Scopus rating (2003): 0.148 0.331
Scopus rating (2002): 0.146 0.171
Scopus rating (2001): 0.162 0.253
Scopus rating (2000): 0.225 0.507
Scopus rating (1999): 0.846 0.652
Original language: English
DOIs:
10.1051/radiopro/2015004
Research output: Scientific - peer-review › Article

Examples of extremely low-frequency magnetic fields in a Finnish metro station

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Estimation of induced currents in the human body exposed to non-uniform ELF electric fields

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, National Institute of technology, Anan Collage, University of Miyazaki, National Institute of Technology, Kagawa College, Japan, University of Tokushima
Authors: Tarao, H., Miyamoto, H., Hayashi, N., Matsumoto, T., Korpinen, L., Isaka, K.
Number of pages: 4
Publication date: 23 Aug 2015
Occupational exposure to magnetic fields while working around a reactor at a 400 kV substation in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI Rauno Pääkkönen, University of Modena and Reggio Emilia
Authors: Pääkkönen, R., Korpinen, L., Gobba, F.
Number of pages: 3
Publication date: 23 Aug 2015

Possibility of decreasing 50 Hz electric field exposure with different coveralls under 400 kV power lines

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Department of Electrical and Computer Engineering Kagawa National College of Technology, TMI Rauno Pääkkönen, University of Modena and Reggio Emilia
Authors: Korpinen, L., Tarao, H., Pääkkönen, R., Gobba, F.
Number of pages: 3
Publication date: 23 Aug 2015

Building synthetic sterols computationally: unlocking the secrets of evolution?
Cholesterol is vital in regulating the physical properties of animal cell membranes. While it remains unclear what renders cholesterol so unique, it is known that other sterols are less capable in modulating membrane properties, and there are membrane proteins whose function is dependent on cholesterol. Practical applications of cholesterol include its use in liposomes in drug delivery and cosmetics, cholesterol-based detergents in membrane protein crystallography, its fluorescent analogs in studies of cholesterol transport in cells and tissues, etc. Clearly, in spite of their difficult synthesis, producing the synthetic analogs of cholesterol is of great commercial and scientific interest. In this article, we discuss how synthetic sterols non-existent in nature can be used to elucidate the roles of cholesterol’s structural elements. To this end,
we discuss recent atomistic molecular dynamics simulation studies that have predicted new synthetic sterols with properties comparable to those of cholesterol. We also discuss more recent experimental studies that have vindicated these predictions. The paper highlights the strength of computational simulations in making predictions for synthetic biology, thereby guiding experiments.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter
Authors: Rög, T., Pöyry, S., Vattulainen, I.
Publication date: 21 Aug 2015
Peer-reviewed: Yes

Construction of therapeutically relevant human prostate epithelial fate map by utilising miRNA and mRNA microarray expression data
Background: Objective identification of key miRNAs from transcriptomic data is difficult owing to the inherent inconsistencies within miRNA target-prediction algorithms and the promiscuous nature of miRNA-mRNA target relationship. Methods: An integrated database of miRNAs and their 'relevant' mRNA targets was generated from validated miRNA and mRNA microarray data sets generated from patient-derived prostate epithelial normal and cancer stem-like cells (SCs) and committed basal (CB) cells. The effect of miR-542-5p inhibition was studied to provide proof-of-principle for database utility. Results: Integration of miRNA-mRNA databases showed that signalling pathways and processes can be regulated by a single or relatively few miRNAs, for example, DNA repair/Notch pathway by miR-542-5p, P=0.008. Inhibition of miR-542-5p in CB cells (thereby achieving miR-542-5p expression levels similar to SCs) promoted efficient DNA repair and activated expression of Notch reporters, HES1 and Survivin, without inducing dedifferentiation into SCs. Conclusions: Our novel framework impartially identifies therapeutically relevant miRNA candidates from transcriptomic data sets.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, BioMediTech, Prostate cancer research center (PCRC), BioMediTech - Institute of Biosciences and Medical Technology, Hull York Medical School, Department of Urology, University of York, King's College London, University of Hull, Castle Hill Hospital
Authors: Rane, J. K., Ylipää, A., Adamson, R., Mann, V. M., Simms, M. S., Collins, A. T., Visakorpi, T., Nykter, M., Maitland, N. J.
Keywords: (cancer stem cell, DNA repair, epithelial hierarchy, miRNA-mRNA integration, Notch pathway, prostate cancer)
Number of pages: 5
Pages: 611-615
Publication date: 11 Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Cancer Research, Oncology

Publication information
Journal: British Journal of Cancer
Volume: 113
Dynamics of Genetic Circuits with Molecule Partitioning Errors in Cell Division and RNA-RNA Interactions

Many signaling and regulatory molecules within cells exist in very few copies per cell. Any process affecting even limited numbers of these molecules therefore has the potential to affect the dynamics of the biochemical networks of which they are a part. This sensitivity to small copy-number changes is what allows stochasticity in gene expression to introduce a degree of randomness in what cells do. While this randomness can be suppressed, it does not appear to be so in many biological systems, at least not to the maximum degree possible. This suggests that this randomness is not necessarily detrimental to cell populations, as it can produce qualitatively new behaviours in genetic networks which may be utilized by cells.

In this thesis, two other mechanisms are investigated which, through their interaction with low copy-number molecules, are able to produce qualitatively different dynamics in genetic networks: the stochastic partitioning of molecules in cell division, and the direct interaction of two low copy-number molecules. For this, a novel simulator of chemical kinetics is first presented, designed to simulate the dynamics of genetic circuits inside growing populations of cells. It is then used to study a genetic switch where one repressive link is formed by direct interaction between RNA molecules. This arrangement was found to decouple the stability of the two noisy attractors of the network and the speeds of the state transitions. In other words, it allows the network to have two equally-stable noisy attractors, but differing state transition speeds.

Next, the cell-to-cell diversity in RNA numbers (as quantified by the normalized variance) of a single gene over time in a growing model cell population was studied as a function of the division synchrony. In the model, synchronous cell divisions introduce transient increases in the cell-to-cell diversity in RNA numbers of the population, a prediction which was verified using single-molecule measurements of RNA numbers. Finally, the effects of the stochastic partitioning of regulatory
molecules in cell division on the dynamics of two genetic circuits, a switch and a clock, were studied. Of these two circuits, the switch has the most dramatic changes in its dynamics, brought on by the inevitable negative correlation in molecule numbers that sister cells inherit. This negative correlation can allow a cell population to partition the phenotypes of the individual cells with less variance than a binomial distribution.

These results advance our understanding of the different behaviours that can be produced in genetic circuits due to these two mechanisms. Since they produce unique behaviours, these mechanisms, and combinations thereof, are expected to be used for specialized purposes in natural genetic circuits. Further, since the downstream effects of these mechanisms may be more predictable than, e.g., modifying promoter sequences, they may also be useful in the design and implementation of future synthetic genetic circuits with specific behaviours.

Effect of Phosphatidic Acid on Biomembrane: Experimental and Molecular Dynamics Simulations Study
We consider the impact of phosphatidic acid (namely, 1,2-dioleoyl-sn-glycero-3-phosphate, DOPA) on the properties of a zwitterionic (1,2-dipalmitoyl-sn-glycero-3-phosphocholine, DPPC) bilayer used as a model system for protein-free cell membranes. For this purpose, experimental measurements were performed using differential scanning calorimetry and the Langmuir monolayer technique at physiological pH. Moreover, atomistic-scale molecular dynamics (MD) simulations were performed to gain information on the mixed bilayer's molecular organization. The results of the monolayer studies clearly showed that the DPPC/DOPA mixtures are nonideal and the interactions between lipid species change from attractive, at low contents of DOPA, to repulsive, at higher contents of that component. In accordance with these results, the MD simulations demonstrated that both monoanionic and dianionic forms of DOPA have an ordering and condensing effect on the mixed bilayer at low concentrations. For the DOPA monoanions, this is the result of both (i) strong electrostatic interactions between the negatively charged oxygen of DOPA and the positively charged choline groups of DPPC and (ii) conformational changes of the lipid acyl chains, leading to their tight packing according to the so-called umbrella model, in which large headgroups of DPPC shield the hydrophobic part of DOPA (the conical shape lipid) from contact with water. In the case of the DOPA dianions, cation-mediated clustering was observed. Our results provide a detailed molecular-level description of the lipid organization inside the mixed zwitterionic/PA membranes, which is fully supported by the experimental data.
Comparison of Bispectral Index and Entropy values with electroencephalogram during surgical anaesthesia with sevoflurane

Background Concomitantly recorded Bispectral Index® (BIS) and Entropy™ values sometimes show discordant trends during general anaesthesia. Previously, no attempt had been made to discover which EEG characteristics cause discrepancies between BIS and Entropy. We compared BIS and Entropy values, and analysed the changes in the raw EEG signal during surgical anaesthesia with sevoflurane. Methods In this prospective, open-label study, 65 patients receiving general anaesthesia with sevoflurane were enrolled. BIS, Entropy and multichannel digital EEG were recorded. Concurrent BIS and State Entropy (SE) values were selected. Whenever BIS and SE values showed ≥10-unit disagreement for ≥60 s, the raw EEG signal was analysed both in time and frequency domain. Results A ≥10-unit disagreement ≥60 s was detected 428 times in 51 patients. These 428 episodes accounted for 5158 (11%) out of 45 918 analysed index pairs. During EEG burst suppression, SE was higher than BIS in 35 out of 49 episodes. During delta-theta dominance, BIS was higher than SE in 141 out of 157 episodes. During alpha or beta activity, SE was higher than BIS in all 49 episodes. During electrocautery, both BIS and SE changed, sometimes in the opposite direction, but returned to baseline values after electrocautery. Electromyography caused index disagreement four times (BIS > SE). Conclusions Certain specific EEG patterns, and artifacts, are associated with discrepancies between BIS and SE. Time and frequency domain analyses of the original EEG improve the interpretation of studies involving BIS, Entropy and other EEG-based
Convolutional Neural Networks for patient-specific ECG classification

We propose a fast and accurate patient-specific electrocardiogram (ECG) classification and monitoring system using an adaptive implementation of 1D Convolutional Neural Networks (CNNs) that can fuse feature extraction and classification into a unified learner. In this way, a dedicated CNN will be trained for each patient by using relatively small common and patient-specific training data and thus it can also be used to classify long ECG records such as Holter registers in a fast and accurate manner. Alternatively, such a solution can conveniently be used for real-time ECG monitoring and early alert system on a light-weight wearable device. The experimental results demonstrate that the proposed system achieves a superior classification performance for the detection of ventricular ectopic beats (VEB) and supraventricular ectopic beats (SVEB).

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D), Qatar University, Izmir University of Economics
Authors: Kiranyaz, S., Ince, T., Hamila, R., Gabbouj, M.
Keywords: (electrocardiography, feature extraction, medical signal processing, neural nets, signal classification, 1D convolutional neural network, ECG monitoring, ECG record classification, light-weight wearable device, patient-specific ECG classification, patient-specific electrocardiogram classification, supraventricular ectopic beat detection, Convolution, Databases, Electrocardiography, Feature extraction, Neural networks, Neurons, Training)
Number of pages: 4
Pages: 2608-2611
Publication date: 1 Aug 2015

Evaluation of the different sleep-disordered breathing patterns of the compressed tracheal sound

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, BioMediTech, Tampere University Hospital, Medical Imaging Centre, Department of Clinical Neurophysiology, Medical Imaging Centre and Hospital Pharmacy
Authors: Tenhunen, M., Huupponen, E., Hasan, J., Heino, O., Himanen, S. L.
Keywords: (Flow limitation, Oesophageal pressure, Sleep, Sleep-disordered breathing, Tracheal sound)
Number of pages: 7
Pages: 1557-1563
Publication date: 1 Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Clinical Neurology, Neurology, Physiology (medical), Sensory Systems

Publication information
Journal: Clinical Neurophysiology
Volume: 126
Issue number: 8
ISSN (Print): 1388-2457
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.379 1.394
Publication Forum (2016): 1
Web of Science (2015): 3.426 3.477 8.6 1.143 0.02173 1.056
Publication Forum (2015): 1
Scopus rating (2014): 1.405 1.363
X-ray microtomographic confirmation of the reliability of CBCT in identifying the scalar location of cochlear implant electrode after round window insertion

Cone-beam computed tomography (CBCT) plays a key role in cochlear implantation in both planning implantation before surgery and quality control during surgery due to the high spatial resolution and convenience of application in the operation theater. We recently designed a novel, high-resolution cone-beam acquisition system that has been tested in temporal bones with cochlear implantation to identify the scalar localization of the electrode arrays. The current study aimed to verify the reliability of the experimental CBCT set-up using high-resolution invitro X-ray microtomography (μCT) imaging as a reference. Nine human temporal bones were studied by inserting a straight electrode of a cochlear implant using the round window approach followed by sequential imaging using experimental CBCT and μCT with and without 1% iodine as the contrast agent. In the CBCT images, the electrodes were located in the scala tympani and near the lateral wall in all temporal bones. In the μCT images, the cochlear fine structures, including Reissner's membrane, stria vascularis, spiral ligament, basilar membrane, spiral limbus, osseous spiral lamina, and Rosenthal's canal that hosts the spiral ganglion cells, were clearly delineated; the electrode array avoided the lateral wall of the scala tympani in the hook region and then ran along the lateral wall of the scala tympani without any exception, a feature that was also detected in a temporal bone with ruptures in the basilar and Reissner's membranes. In conclusion, the current invitro μCT imaging system produced high-quality images that could demonstrate the fine cochlear structures faithfully and verify the reliability of a novel experimental CBCT set-up aimed for clinical application in identifying the scalar localization of the electrode array. The straight electrode is safe for cochlear structures with low risk of translocation and is suitable for atraumatic implantation, although a large gap between the contacts and the modiolus exists.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Tampere University Hospital, BioMediTech - Institute of Biosciences and Medical Technology, Medical Imaging Centre, University of Tampere, Changhai Hospital, PlanmecaOy
Number of pages: 7
Pages: 59-65
Publication date: 1 Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Sensory Systems
Cardiac pacemakers in magnetic fields of a shunt reactor at a 400 kV substation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Fingrid Oyj, The Heart Center, Tampere University Hospital
Authors: Korpinen, L., Kuisti, H., Tarao, H., Elovaara, J., Virtanen, V.
Number of pages: 4
Pages: 229-232
Publication date: Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: International Journal of Occupational Safety and Ergonomics
Volume: 21
Issue number: 2
ISSN (Print): 1080-3548
Ratings:
Publication Forum (2017): 1
Self-reported depression and anxiety symptoms and usage of computers and mobile phones among working-age Finns

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 8
Pages: 221-228
Publication date: Aug 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: International Journal of Occupational Safety and Ergonomics
Volume: 21
Issue number: 2
ISSN (Print): 1080-3548
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.259 0.673
Publication Forum (2016): 1
Scopus rating (2015): 0.284 0.729
Web of Science (2015): 0.381 0.711 7.0 0.043 7.4E-4 0.193
Publication Forum (2015): 1
Scopus rating (2014): 0.23 0.62
Web of Science (2014): 0.312 0.615 6.8 0.069 6.3E-4 0.169
Publication Forum (2014): 1
Scopus rating (2013): 0.232 0.853
Publication Forum (2013): 1
Scopus rating (2012): 0.344 0.732
Publication Forum (2012): 1
Scopus rating (2011): 0.286 0.578
Scopus rating (2010): 0.221 0.341
Scopus rating (2009): 0.272 0.673
Scopus rating (2008): 0.369 0.488
Scopus rating (2007): 0.431 0.618
Scopus rating (2006): 0.205 0.427
Scopus rating (2005): 0.216 0.257
Scopus rating (2004): 0.224 0.45
Scopus rating (2003): 0.19 0.344
Scopus rating (2002): 0.205 0.403
Scopus rating (2001): 0.141 0.333
Scopus rating (2000): 0.136 0.264
Scopus rating (1999): 0.197 0.372
Original language: English
DOIs: 10.1080/10803548.2015.1029286
Research output: Scientific - peer-review » Article
Nonlinear Optical Properties of Fluorescent Dyes Allow for Accurate Determination of Their Molecular Orientations in Phospholipid Membranes

Several methods based on single- and two-photon fluorescence detected linear dichroism have recently been used to determine the orientational distributions of fluorescent dyes in lipid membranes. However, these determinations relied on simplified descriptions of nonlinear anisotropic properties of the dye molecules, using a transition dipole-moment-like vector instead of an absorptivity tensor. To investigate the validity of the vector approximation, we have now carried out a combination of computer simulations and polarization microscopy experiments on two representative fluorescent dyes (DiI and F2N12S) embedded in aqueous phosphatidylcholine bilayers. Our results indicate that a simplified vector-like treatment of the two-photon transition tensor is applicable for molecular geometries sampled in the membrane at ambient conditions. Furthermore, our results allow evaluation of several distinct polarization microscopy techniques. In combination, our results point to a robust and accurate experimental and computational treatment of orientational distributions of DiI, F2N12S, and related dyes (including Cy3, Cy5, and others), with implications to monitoring physiologically relevant processes in cellular membranes in a novel way.
615 nm GaInNAs VECSEL with output power above 10 W
A high-power optically-pumped vertical-external-cavity surface-emitting laser (VECSEL) generating 10.5 W of cw output power at 615 nm is reported. The gain mirror incorporated 10 GaInNAs quantum wells and was designed to have an emission peak in the 1230 nm range. The fundamental emission was frequency doubled to the red spectral range by using an intra-cavity nonlinear LBO crystal. The maximum optical-to-optical conversion efficiency was 17.5%. The VECSEL was also operated in pulsed mode by directly modulating the pump laser to produce light pulses with duration of ~1.5 µs. The maximum peak power for pulsed operation (pump limited) was 13.8 W. This corresponded to an optical-to-optical conversion efficiency of 20.4%.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics
Authors: Kantola, E., Leinonen, T., Penttinen, J., Korpijärvi, V., Guina, M.
Number of pages: 8
Pages: 20280–20287
Publication date: 27 Jul 2015
Peer-reviewed: Yes

Publication information
Journal: Optics Express
Improved dimensional stability with bioactive glass fibre skeleton in poly(lactide-co-glycolide) porous scaffolds for tissue engineering

Abstract Bone tissue engineering requires highly porous three-dimensional (3D) scaffolds with preferable osteoconductive properties, controlled degradation, and good dimensional stability. In this study, highly porous 3D poly(d,l-lactide-co-glycolide) (PLGA) - bioactive glass (BG) composites (PLGA/BG) were manufactured by combining highly porous 3D fibrous BG mesh skeleton with porous PLGA in a freeze-drying process. The 3D structure of the scaffolds was investigated as well as in vitro hydrolytic degradation for 10 weeks. The effect of BG on the dimensional stability, scaffold composition, pore structure, and degradation behaviour of the scaffolds was evaluated. The composites showed superior pore structure as the BG fibres inhibited shrinkage of the scaffolds. The BG was also shown to buffer the acidic degradation products of PLGA. These results demonstrate the potential of these PLGA/BG composites for bone tissue engineering, but the ability of this kind of PLGA/BG composites to promote bone regeneration will be studied in forthcoming in vivo studies.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), BioMediTech - Institute of Biosciences and Medical Technology, Abo Akademi University, BioMediTech, Laboratory of Polymer Technology, Centre of Excellence in Functional Materials at Biological Interfaces, Åbo Akademi University
Authors: Haaparanta, A., Uppstu, P., Hannula, M., Ellä, V., Rosling, A., Kellomäki, M.
Keywords: (Bioactive glass, Bone, Composite, Freeze-drying, Poly(d,l-lactide-co-glycolide), Tissue engineering)
Number of pages: 10
Pages: 457-466
Kinetics of the cellular intake of a gene expression inducer at high concentrations

From in vivo single-event measurements of the transient and steady-state transcription activity of a single-copy lac-ara-1 promoter in Escherichia coli, we characterize the intake kinetics of its inducer (IPTG) from the media. We show that the empirical data are well-fit by a model of intake assuming a bilayer membrane, with the passage through the second layer being rate-limiting, coupled to a stochastic, sub-Poissonian, multi-step transcription process. Using this model, we show that for a wide range of extracellular inducer levels (up to 1.25 mM) the intake process is diffusive-like, suggesting unsaturated membrane permeability. Inducer molecules travel from the periplasm to the cytoplasm in, on average, 31.7 minutes, strongly affecting cells' response time. The novel methodology followed here should aid the study of cellular intake mechanisms at the single-event level.
Fast and accurate measurements of the kinetics and deformation of the heart during cardiac surgery can be useful for assessing the best strategies for the protection of the myocardium. While measurements based on ultrasonic technology such as the transesophageal echocardiography are rapidly developing in this direction, also other analysis methods based on optical imaging have been developed within the recent decade. The improved quality of digital cameras and increased computational power of personal computers have led to the development of deformation analysis method known as Digital Image Correlation (DIC). This paper presents preliminary results on the application of the DIC technique on analysing of the movement and deformation of the myocardial movement during a cardiopulmonary bypass surgery. The results show that the natural pattern of the heart should be sufficient for DIC, but better and more accurate results could be obtained with improved contrast conditions. DIC has a potential to be used as a sensitive tool for the surgeon to monitor the cardiac function.

In-vivo deformation measurements of the human heart by 3D Digital Image Correlation

Fast and accurate measurements of the kinetics and deformation of the heart during cardiac surgery can be useful for assessing the best strategies for the protection of the myocardium. While measurements based on ultrasonic technology such as the transesophageal echocardiography are rapidly developing in this direction, also other analysis methods based on optical imaging have been developed within the recent decade. The improved quality of digital cameras and increased computational power of personal computers have led to the development of deformation analysis method known as Digital Image Correlation (DIC). This paper presents preliminary results on the application of the DIC technique on analysing of the movement and deformation of the myocardial movement during a cardiopulmonary bypass surgery. The results show that the natural pattern of the heart should be sufficient for DIC, but better and more accurate results could be obtained with improved contrast conditions. DIC has a potential to be used as a sensitive tool for the surgeon to monitor the cardiac function.
Bioactive glass ions as strong enhancers of osteogenic differentiation in human adipose stem cells

Bioactive glasses are known for their ability to induce osteogenic differentiation of stem cells. To elucidate the mechanism of the osteoinductivity in more detail, we studied whether ionic extracts prepared from a commercial glass S53P4 and from three experimental glasses (2-06, 1-06 and 3-06) are alone sufficient to induce osteogenic differentiation of human adipose stem cells. Cells were cultured using basic medium or osteogenic medium as extract basis. Our results indicate that cells stay viable in all the glass extracts for the whole culturing period, 14 days. At 14 days the mineralization in osteogenic medium extracts was excessive compared to the control. Parallel to the increased mineralization we observed a decrease in the cell amount. Raman and Laser Induced Breakdown Spectroscopy analyses confirmed that the mineral consisted of calcium phosphates. Consistently, the osteogenic medium extracts also increased osteocalcin production and collagen Type-I accumulation in the extracellular matrix at 13 days. Of the four osteogenic medium extracts, 2-06 and 3-06 induced the best responses of osteogenesis. However, regardless of the enhanced mineral formation, alkaline phosphatase activity was not promoted by the extracts. The osteogenic medium extracts could potentially provide a fast and effective way to differentiate human adipose stem cells in vitro.

General information
Application of Biopolymer Doped Polypyrroles in Biomedical Implants and Electrical Stimulation Devices

Organic conductive polymers are emerging new materials for biomedical engineering. They offer surface properties which are attractive for many biomedical applications, such as surface coatings on metallic or biodegradable polymeric implants, tissue engineering scaffolds, implantable electronic tissue stimulation devices and microelectromechanical systems for the manipulation of single living cells in vitro, for example. Owing to the proven compatibility with tissues and cells, conductive polypyrrole (PPy) has been intensively investigated for bone and neural stimulation applications. A salient feature of PPy is its easy modification with bioactive molecules and macromolecules, such as the extracellular matrix (ECM) components of animal tissues. This work assessed the ECM components hyaluronic acid (HA) and chondroitin sulfate (CS) as dopants, which we incorporated into the PPy during the syntheses by electrochemical and oxidative chemical polymerization.

Biopolymer doped PPy have been earlier reported to be good substrates for cell cultures. Furthermore, preceding
implantation studies have shown promising results. However, considering clinical application and registration of PPy as a biomaterial in commercial cell culturing or tissue engineering products, there are still many practical aspects requiring more attention, such as the establishment of feasible synthetic routes, sterilizability, preservation of the electronic properties during storage and during the incubation in physiological conditions, possible biodegradation mechanisms, stability and biological elimination of the degradation products in vivo, for example. Mass spectroscopy of the hydrolysis products of polylactide (PLA) fibers coated with layer of PPy, suggested that the PPy was biostable in water at neutral pH. Electrical conductivity measurements and Raman spectroscopy showed that the PPy chain was prone to de-doping, and hence the lost its conductivity under biological conditions, but these effects were partly reversible by acid doping and positively biased electrochemical potential. The electrochemical redox activity and electromechanical actuation property of the biopolymer doped PPys was thoroughly studied. It was shown that the biopolymer doped PPy had significant and reversible redox activity, which could be potentially utilized in microelectromechanical stimulation of cells and implantable microscopic actuators.

Practical and reproducible polymerization protocols were developed during this work. We took novel approaches and suggested a relatively simple "one-pot" chemical polymerization scheme, avoiding the complications of biological functionalization using potentially toxic click-chemistry. The developed methods were successfully applied to the deposition of electrically conductive, biopolymer doped PPy coatings on polylactide (PLA) nonwoven tissue engineering scaffolds and commercial poly(lactide-co-glycolide)-β-tricalcium phosphate (PLGA-β-TCP) bone fixation screws.

The physical properties and cell response of HA and CS doped PPys (PPyHA and PPyCS) electrode coatings were investigated by atomic force microscopy (AFM) and electrochemical methods. Drastically different behaviour of adipose stem cells (hASC) was found on the different electrode coatings, highlighting the sensitivity of the hASCs on the nanoscopic and microscopic surface properties of the PPy substrate, such as surface roughness, elasticity and surface potential distribution, factors which could be engineered during the synthesis and affected by external stimuli during incubation in cell culture medium.

In conclusion, the results of this thesis supported the use of PPy coatings in bone tissue engineering. The electropolymerized films and also the chemically polymerized PPyHA and PPyCS coatings on bioabsorbable polymer were highly compatible with hASCs, supported cell adhesion and could be utilized in delivering direct electrical stimulation in vitro. There is also future potential in designing permanently implantable scaffolds and microstimulation devices, but still further insight into the biodegradation mechanism and biological elimination of PPy in vivo is needed.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Electronics and Communications Engineering
Authors: Pelto, J.
Number of pages: 85
Publication date: 9 Jul 2015

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1307
ISSN (Electronic): 1459-2045
Electronic versions:
pelto_1307
Links:

Bibliographical note
Awarding institution: Tampere University of Technology
Versio ok 16.12.2015
Research output: Collection of articles › Doctoral Thesis

Real sequence effects on the search dynamics of transcription factors on DNA
Recent experiments show that transcription factors (TFs) indeed use the facilitated diffusion mechanism to locate their target sequences on DNA in living bacteria cells: TFs alternate between sliding motion along DNA and relocation events through the cytoplasm. From simulations and theoretical analysis we study the TF-sliding motion for a large section of the
DNA-sequence of a common E. coli strain, based on the two-state TF-model with a fast-sliding search state and a recognition state enabling target detection. For the probability to detect the target before dissociating from DNA the TF-search times self-consistently depend heavily on whether or not an auxiliary operator (an accessible sequence similar to the main operator) is present in the genome section. Importantly, within our model the extent to which the interconversion rates between search and recognition states depend on the underlying nucleotide sequence is varied. A moderate dependence maximises the capability to distinguish between the main operator and similar sequences. Moreover, these auxiliary operators serve as starting points for DNA looping with the main operator, yielding a spectrum of target detection times spanning several orders of magnitude. Auxiliary operators are shown to act as funnels facilitating target detection by TFs.

Emission of Smart Meter Electric Fields (50 -100 kHz) in Finland
Examples of Electromagnetic Field Sources in an Indoor Distribution Substation
The paper presents example measurements of electromagnetic fields in an indoor distribution substation. We measured at different places: At Place A (near the fuse panel), using (1) frequency bandwidth (FB) 40kHz-100kHz, fields varied 0.011-0.039 μT and using (2) FB 5Hz-100kHz, fields varied 67-74 μT; at Place B (the surface of the collector meter), the fields varied from 0.022 to 0.083 μT (40kHz-100kHz); at Place C (near the antenna of the collector meter), the maximum radio frequency field was 1.0 W/m², and at Place D (the surface of the antenna), it was 1.8 W/m². The measured values were below ICNIRP guidelines.

Examples of Variation in Measured ELF Electric Fields under 400 kV Power Lines
General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication

Host publication information
Title of host publication: Progress In Electromagnetics Research Symposium, July 6-9, 2015, Prague, Czech Republic Publisher: Electromagnetics Academy ISBN (Electronic): 978-1-934142-30-1 ASJC Scopus subject areas: Engineering(all), Electrical and Electronic Engineering

Publication series

Examples of Variation in Measured ELF Electric Fields under 400 kV Power Lines
General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Sensing Systems for Wireless Medicine (MediSense), TMI Rauno Pääkkönen, Department of Electrical and Computer Engineering Kagawa National College of Technology, Department of Electrical Energy National Technical University, Kharkiv Polytechnic Institute Authors: Korpinen, L., Pääkkönen, R., Tarao, H., Okun, O., Sydänheimo, L. Number of pages: 3 Pages: 1104 - 1106 Publication date: 6 Jul 2015

Host publication information
Title of host publication: Progress In Electromagnetics Research Symposium, July 6-9, 2015, Prague, Czech Republic Publisher: Electromagnetics Academy ISBN (Electronic): 978-1-934142-30-1 ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication series
Name: Progress in electromagnetics research symposium ISSN (Electronic): 1559-9450 Links:
Influences of High Relative Humidity on Extremely Low Frequency Electric Field Measurements

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Sensing Systems for Wireless Medicine (MediSense), Department of Electrical and Computer Engineering Kagawa National College of Technology, TMI Rauno Pääkkönen, Department of Electrical Energy National Technical University, Kharkiv Polytechnic Institute
Authors: Korpinen, L., Tarao, H., Pääkkönen, R., Okun, O., Sydänheimo, L.
Number of pages: 4
Pages: 1100 - 1103
Publication date: 6 Jul 2015

Host publication information
Title of host publication: Progress In Electromagnetics Research Symposium, July 6-9, 2015, Prague, Czech Republic
Publisher: Electromagnetics Academy
ISBN (Electronic): 978-1-934142-30-1
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication series
Name: Progress in electromagnetics research symposium
ISSN (Electronic): 1559-9450
Links:
Research output: Scientific - peer-review › Conference contribution

Numerical Estimation of Muscle Conductivity in Terms of Human Body Internal Resistance

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, National Institute of Technology, Kagawa College, Japan, National Technical University
Authors: Tarao, H., Aga, K., Okun, O., Korpinen, L.
Number of pages: 3
Pages: 439 - 441
Publication date: 6 Jul 2015

Host publication information
Title of host publication: Progress In Electromagnetics Research Symposium, July 6-9, 2015, Prague, Czech Republic
Publisher: Electromagnetics Academy
ISBN (Electronic): 978-1-934142-30-1
ASJC Scopus subject areas: Engineering(all)

Publication series
Name: Progress in electromagnetics research symposium
ISSN (Electronic): 1559-9450
Links:
Research output: Scientific - peer-review › Conference contribution

Possible Methods for Limiting Exposure to the Electric Fields of High Voltage Power Lines on Active Implantable Medical Devices in the Human Body

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Sensing Systems for Wireless Medicine (MediSense), Department of Electrical Energy National Technical University, Kharkiv Polytechnic Institute
Signal focusing through active transport

The accuracy of molecular signaling in biological cells and novel diagnostic devices is ultimately limited by the counting noise floor imposed by the thermal diffusion. Motivated by the fact that messenger RNA and vesicle-engulfed signaling molecules transiently bind to molecular motors and are actively transported in biological cells, we show here that the random active delivery of signaling particles to within a typical diffusion distance to the receptor generically reduces the correlation time of the counting noise. Considering a variety of signaling particle sizes from mRNA to vesicles and cell sizes from prokaryotic to eukaryotic cells, we show that the conditions for active focusing - faster and more precise signaling - are indeed compatible with observations in living cells. Our results improve the understanding of molecular cellular signaling and novel diagnostic devices.
μCT based assessment of mechanical deformation of designed PTMC scaffolds

BACKGROUND: Advances in rapid-prototyping and 3D printing technologies have enhanced the possibilities in preparing designed architectures for tissue engineering applications. A major advantage in custom designing is the ability to create structures with desired mechanical properties. While the behaviour of a designed scaffold can be simulated using bulk material properties, it is important to verify the behaviour of a printed scaffold at the microstructure level. OBJECTIVE: In this study we present an effective method in validating the mechanical behaviour of designed scaffolds using a CT with an in-situ mechanical deformation device. METHODS: The scaffolds were prepared from biodegradable poly(trimethylene carbonate) (PTMC) by stereolithography and images obtained using a high-resolution CT with 12.25 m isometric voxels. The data was processed (filtering, segmentation) and analysed (surface generation, registration) to extract relevant deformation features. RESULTS: The computed local deformation fields, calculated at sub-pore resolutions, displayed expected linear behaviour within the scaffold along the compression axis. On planes perpendicular to this axis, the deformations varied by 150-200 m. CONCLUSIONS: μCT based imaging with in-situ deformation provides a vital tool in validating the design parameters of printed scaffolds. Deformation fields obtained from micro-tomographic image volumes can serve to corroborate the simulated ideal design with the realized product.
Cholesterol under oxidative stress: How lipid membranes sense oxidation as cholesterol is being replaced by oxysterols

The behavior of oxysterols in phospholipid membranes and their effects on membrane properties were investigated by means of dynamic light scattering, fluorescence spectroscopy, NMR, and extensive atomistic simulations. Two families of oxysterols were scrutinized - tail-oxidized sterols, which are mostly produced by enzymatic processes, and ring-oxidized sterols, formed mostly via reactions with free radicals. The former family of sterols was found to behave similar to cholesterol in terms of molecular orientation, roughly parallel to the bilayer normal, leading to increasing membrane stiffness and suppression of its membrane permeability. In contrast, ring-oxidized sterols behave quantitatively differently from cholesterol. They acquire tilted orientations and therefore disrupt the bilayer structure with potential implications for signaling and other biochemical processes in the membranes.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX), University of Oulu, Tallinn Technical University, Institute of Chemistry, University of Southern Denmark, J. Heyrovský Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, Department of Physics and Chemistry, Weill Cornell Medical College, Fritz Haber Research Center, Hebrew University of Jerusalem
Authors: Kulig, W., Olzyńska, A., Jurkiewicz, P., Kantola, A. M., Komulainen, S., Manna, M., Pourmousa, M., Vazdar, M., Cwiklik, L., Rog, T., Khelashvili, G., Harries, D., Telkki, V. V., Hof, M., Vattulainen, I., Jungwirth, P.
Keywords: (Phospholipid bilayers, Oxysterols, Molecular dynamics simulations, DPH anisotropy, NMR measurements, Laurdan fluorescence, Liposomes, Tilt modulus, FLUORESCENCE SOLVENT RELAXATION, MOLECULAR-DYNAMICS METHOD, MODEL MEMBRANES, FOURIER TRANSFORMATION, POTENTIAL FUNCTIONS, SOLVATION DYNAMICS, BENDING RIGIDITY, ORDER PARAMETERS, BILAYERS, PROTEINS)
Number of pages: 12
Pages: 30-41
Publication date: 1 Jul 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biochemistry, Physiology (medical)

Publication information
Journal: Free Radical Biology and Medicine
Volume: 84
ISSN (Print): 0891-5849
Ratings:
Molecular Communication Modeling of Antibody-Mediated Drug Delivery Systems

Antibody-mediated Drug Delivery Systems (ADDS) are emerging as one of the most encouraging therapeutic solutions for treating several diseases such as human cancers. ADDS use small molecules (antibodies) that propagate in the body and bind selectively to their corresponding receptors (antigens) expressed at the surface of the diseased cells. In this paper, the Molecular Communication (MC) paradigm, where information is conveyed through the concentration of molecules, is advocated for the engineering of ADDS and modeling their complex behavior, to provide a realistic model without the over-complexification of system biology models, and the limitations of experimental approaches. The peculiarities of antibodies, including their anisotropic transport and complex electrochemical structure, are taken into account to develop an analytical model of the ADDS transport and antigen-binding kinetics. The end-to-end response of ADDS, from the drug injection to the drug absorption, is mathematically derived based on the geometry of the antibody molecule, the electrochemical structure of the antibody-antigen complex, and the physiology of the patient. The accuracy of the MC model is validated by finite-element (COMSOL) simulations. The implications of the complex interplay between the transport and kinetics parameters on the performance of ADDS are effectively captured by the proposed MC model. The MC model of ADDS will enable the discovery and optimization of drugs in a versatile, cost-efficient, and reliable manner.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Wireless Communications and Positioning (WICO), Georgia Institute of Technology
Authors: Chahibi, Y., Akyildiz, I. F., Balasubramaniam, S., Koucheryavy, Y.
Keywords: (molecular communication, pharmacokinetics, protein-protein interactions, Targeted drug delivery systems)
Number of pages: 13
Pages: 1683-1695
MRI Texture Analysis and Diffusion Tensor Imaging in Chronic Right Hemisphere Ischemic Stroke

BACKGROUND AND PURPOSE: Diffusion tensor imaging (DTI) is shown to reveal changes caused by cerebral infarction. The aim of this study is to reveal those changes also in the conventional magnetic resonance (MR) images using a quantitative image analysis method, texture analysis (TA).

METHODS: Thirty patients who had suffered their first ever infarction located on the right hemisphere underwent DTI and conventional MRI studies in the chronic phase. DTI parameters fractional anisotropy and mean diffusivity, as well as four second-order texture parameters were calculated. Interhemispheric differences and correlations between DTI and TA parameters were evaluated. RESULTS: Our DTI findings supported earlier studies as fractional anisotropy values were lowered and mean diffusivity values elevated in the lesion site, and ipsilateral cerebral peduncle, thalamus, and centrum semiovale compared to the unaffected side. Textural homogeneity parameters showed lower and complexity parameters higher values in the lesion site and ipsilateral centrum semiovale compared to the contralateral hemisphere. Correlation between the two methods was found in ipsilateral mesencephalon. CONCLUSIONS: In addition to DTI method, TA could assist in revealing the changes caused by infarction, also outside the lesion site. Damaged areas were found more heterogeneous and random in texture compared to unaffected sites.

General information
On the threshold based neuronal spike detection, and an objective criterion for setting the threshold

In this paper, we investigate the workings of threshold (TH) based spike detection for neuronal extracellular field potential spikes. Thresholding is the most used spike detection method. In general, it is employed by setting the TH as per convention and without considering either the undetected or spurious spikes. In this paper, we provide insight into the workings of thresholding, and proposed a new objective way to set the TH based on spike count histogram analysis. We
Recurrence network analysis of wide band oscillations of local field potentials from the primary motor cortex reveals rich dynamics.

Aggregate signals that reflect activities of a large number of neurons in the cerebral cortex, local field potentials (LFPs) have been observed to mediate gross functional activities of a relatively small volume of the brain tissues. There are several bands of the oscillations frequencies in LFPs that have been observed across multiple brain areas. The signature oscillation band of the LFPs in the primary motor cortex (MI) is over β range and it has been consistently observed both in human and non-human primates around the time of visual cues and movement onsets. However, its dynamical behavior has not been well characterized. Furthermore, dynamics of β oscillations has been documented based on the phase locking of β oscillations, but not in terms of the inherent dynamics of the oscillations themselves. Here, we used the complexity measure derived from cluster coefficients of a recurrence network and analyzed a pair of wide-band signals, one including β band of the LFPs and the other ranging the low γ band in MI recorded from a non-human primate. We show rather unique temporal profiles of the evoked responses using complexity of the dynamical behavior in both bands of the oscillation, either of which is not simply resembling either the power of the oscillation or the phase locking of β oscillations. Therefore, the current method can reveal a new type of dynamics of the underlying network complexity during the task simply based on event evoked potentials of wide-band oscillatory signals.
Hemispheric asymmetry measured by texture analysis and diffusion tensor imaging in two multiple sclerosis subtypes

Background: This paper addresses two subtypes of multiple sclerosis (MS), primary progressive multiple sclerosis (PPMS) and relapsing-remitting multiple sclerosis (RRMS). The separation of PPMS and RRMS is challenging in certain cases.

Purpose: To quantitatively determine MS subtypes using texture analysis (TA) and diffusion tensor imaging (DTI).

Material and Methods: T1-weighted (T1W) magnetic resonance imaging (MRI) and DTI of the left and right brain hemispheres of 17 patients with PPMS and 19 patients with RRMS were studied. Areas of the caudate nucleus and thalamus were investigated as normal appearing gray matter (NAGM), and areas of the cerebral peduncle and centrum semiovale were investigated as normal appearing white matter (NAWM). The described locations were symmetrical and were accurately marked. TA was performed on the T1W images, and the fractional anisotropy and apparent diffusion coefficient were determined from the DTI data.

Results: Hemispherical differences were found with both TA and DTI. Several texture and diffusion tensor parameter values calculated for the left and right hemispheres of the patients showed statistically significant differences. The patients with RRMS had greater significant differences (P

Conclusion: TA can be helpful when distinguishing between PPMS and RRMS, while DTI appears to reveal the hemispherical asymmetry of RRMS patients.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 8
Pages: 844-851
Publication date: Jul 2015
Peer-reviewed: Yes

Publication information
Journal: Acta Radiologica
Volume: 56
Issue number: 7
ISSN (Print): 0284-1851
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.693 0.909
Publication Forum (2016): 1
Scopus rating (2015): 0.741 0.953
Web of Science (2015): 2.009 1.758 7.7 0.442 0.00702 0.545
Publication Forum (2015): 1
Scopus rating (2014): 0.761 0.993
Web of Science (2014): 1.603 1.645 8.1 0.357 0.00752 0.556
Publication Forum (2014): 1
Scopus rating (2013): 0.694 0.91
Publication Forum (2013): 1
Scopus rating (2012): 0.659 0.879
Publication Forum (2012): 1
Scopus rating (2011): 0.703 0.795
Scopus rating (2010): 0.76 0.887
Scopus rating (2009): 0.642 0.839
Scopus rating (2008): 0.585 0.771
Scopus rating (2007): 0.584 0.814
Scopus rating (2006): 0.531 0.747
Scopus rating (2005): 0.523 0.826
Scopus rating (2004): 0.65 0.984
Scopus rating (2003): 0.578 0.883
Scopus rating (2002): 0.552 0.745
How To Minimize Artifacts in Atomistic Simulations of Membrane Proteins, Whose Crystal Structure Is Heavily Engineered: beta(2)-Adrenergic Receptor in the Spotlight

Atomistic molecular dynamics (MD) simulations are used extensively to elucidate membrane protein properties. These simulations are based on three-dimensional protein structures that in turn are often based on crystallography. The protein structures resolved in crystallographic studies typically do not correspond to pristine proteins, however. Instead the crystallized proteins are commonly engineered, including structural modifications (mutations, replacement of protein sequences by antibodies, bound ligands, etc.) whose impact on protein structure and dynamics is largely unknown. Here we explore this issue through atomistic MD simulations (5 its in total), focusing on the beta(2)-adrenergic receptor (beta(2)AR) that is one of the most studied members of the G-protein coupled receptor superfamily. Starting from an inactive-state crystal structure beta(2)AR, we remove the many modifications in beta(2)AR systematically one at a time, in six consecutive steps. After each step, we equilibrate the system and simulate it quite extensively. The results of this step-by-step approach highlight that the structural modifications used in crystallization can affect ligand and G-protein binding sites, packing at the transmembrane-helix interface region, and the dynamics of connecting loops in beta(2)AR. When the results of the systematic step-by-step approach are compared to an all-at-once technique where all modifications done on beta(2)AR are removed instantaneously at the same time, it turns out that the step-by-step method provides results that are superior in terms of maintaining protein structural stability. The results provide compelling evidence that for membrane proteins whose 3D structure is based on structural engineering, the preparation of protein structure for atomistic MD simulations is a delicate and sensitive process. The results show that most valid results are found when the structural modifications are reverted slowly, one at a time.
Membrane targeting of the yeast exocyst complex
The exocytosis is a process of fusion of secretory vesicles with plasma membrane, which plays a prominent role in many crucial cellular processes, e.g. secretion of neurotransmitters, cytokinesis or yeast budding. Prior to the SNARE-mediated fusion, the initial contact of secretory vesicle with the target membrane is mediated by an evolutionary conserved vesicle tethering protein complex, the exocyst. In all eukaryotic cells, the exocyst is composed of eight subunits - Sec5, Sec6, Sec8, Sec10, Sec15, Exo84 and two membrane-targeting landmark subunits Sec3 and Exo70, which have been described to directly interact with phosphatidylinositol (4,5)-bisphosphate (PIP2) of the plasma membrane. In this work, we utilized coarse-grained molecular dynamics simulations to elucidate structural details of the interaction of yeast Sec3p and Exo70p with lipid bilayers containing PIP2. We found that PIP2 is coordinated by the positively charged pocket of N-terminal part of Sec3p, which folds into unique Pleckstrin homology domain. Conversely, Exo70p interacts with the lipid bilayer by several binding sites distributed along the structure of this exocyst subunit. Moreover, we observed that the interaction of Exo70p with the membrane causes clustering of PIP2 in the adjacent leaflet. We further revealed that PIP2 is required for the correct positioning of small GTPase Rho1p, a direct Sec3p interactor, prior to the formation of the functional Rho1p-exocyst-membrane assembly. Our results show the critical importance of the plasma membrane pool of PIP2 for the exocyst function and suggest that specific interaction with acidic phospholipids represents an ancestral mechanism for the exocyst regulation. (C) 2015 Elsevier B.V. All rights reserved.
Self-reported ache, pain, or numbness in hip and lower back and use of computers and cell phones amongst Finns aged 18–65

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI Rauno Pääkkönen, Department of Public Health Sciences, University of Modena and Reggio Emili
Authors: Korpinen, L., Pääkkönen, R., Gobba, F.
Number of pages: 7
Pages: 70-76
Publication date: Jul 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: International Journal of Industrial Ergonomics
Volume: 48
ISSN (Print): 0169-8141
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.564 1.51
Publication Forum (2016): 1
Scopus rating (2015): 0.631 1.32
Web of Science (2015): 1.0 1.451 9.8 0.206 0.0022 0.372
Publication Forum (2015): 1
Scopus rating (2014): 0.648 2.057
Superdiffusion dominates intracellular particle motion in the supercrowded cytoplasm of pathogenic Acanthamoeba castellanii

Acanthamoebae are free-living protists and human pathogens, whose cellular functions and pathogenicity strongly depend on the transport of intracellular vesicles and granules through the cytosol. Using high-speed live cell imaging in combination with single-particle tracking analysis, we show here that the motion of endogenous intracellular particles in the size range from a few hundred nanometers to several micrometers in Acanthamoeba castellanii is strongly superdiffusive and influenced by cell locomotion, cytoskeletal elements, and myosin II. We demonstrate that cell locomotion significantly contributes to intracellular particle motion, but is clearly not the only origin of superdiffusivity. By analyzing the contribution of microtubules, actin, and myosin II motors we show that myosin II is a major driving force of intracellular motion in A. castellanii. The cytoplasm of A. castellanii is supercrowded with intracellular vesicles and granules, such that significant intracellular motion can only be achieved by actively driven motion, while purely thermally driven diffusion is negligible.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Institute for Physics and Astronomy, University of Potsdam, Institute for Materials Science, Biocompatible Nanomaterials, Christian-Albrechts-Universität zu Kiel, Zoological Institute, Comparative Immunobiology, Korea Institute for Advanced Study
Authors: Reverey, J. F., Jeon, J., Bao, H., Leippe, M., Metzler, R., Selhuber-Unkel, C.
Publication date: 30 Jun 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: General

Publication information
Journal: Scientific Reports
Volume: 5
Article number: 11690
ISSN (Print): 2045-2322
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.625 1.401
Publication Forum (2016): 2
Scopus rating (2015): 2.057 1.684
Web of Science (2015): 5.228 5.525 2.1 0.559 0.20942 1.865
The influence of SrO and CaO in silicate and phosphate bioactive glasses on human gingival fibroblasts

In this paper, we investigate the effect of substituting SrO for CaO in silicate and phosphate bioactive glasses on the human gingival fibroblast activity. In both materials the presence of SrO led to the formation of a CaP layer with partial Sr substitution for Ca. The layer at the surface of the silicate glass consisted of HAP whereas at the phosphate glasses it was close to the DCPD composition. In silicate glasses, SrO gave a faster initial dissolution and a thinner reaction layer probably allowing for a continuous ion release into the solution. In phosphate glasses, SrO decreased the dissolution process and gave a more strongly bonded reaction layer. Overall, the SrO-containing silicate glass led to a slight enhancement in the activity of the gingival fibroblasts cells when compared to the SrO-free reference glass, S53P4. The cell activity decreased up to 3 days of culturing for all phosphate glasses containing SrO. Whereas culturing together with the SrO-free phosphate glass led to complete cell death at 7 days. The glasses containing SrO showed rapid cell proliferation and growth between 7 and 14 days, reaching similar activity than glass S53P4. The addition of SrO in both silicate and phosphate glasses was assumed beneficial for proliferation and growth of human gingival fibroblasts due to Sr incorporation in the reaction layer at the glass surface and released in the cell culture medium.
High power GaInNAs VECSEL emitting at 1230/615 nm
We report a frequency-doubled VECSEL operating at 1230/615 nm. The gain chip was grown by plasma-assisted MBE and comprised 10 GaInNAs quantum wells. Preliminary experiments show an output power of >8 W at 615 nm.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Penttinen, J., Leinonen, T., Korpijärvi, V., Kantola, E., Guina, M.
Publication date: 22 Jun 2015

Host publication information
Title of host publication: The European Conference on Lasers and Electro-Optics 2015
Publisher: OSA
ISBN (Print): 978-1-4673-7475-0
Links: https://www.osapublishing.org/abstract.cfm?uri=cleo_europe-2015-CB_P_1&origin=search
Research output: Scientific - peer-review › Conference contribution

A Quantitative Method for Monitoring Wound Healing
Assessment and monitoring of chronic wounds is primarily based on visual inspection by medical professionals. The method is subjective and its reliability depends on the assessment criteria of the evaluator. This may cause problems in particular at home care where caretakers are not usually wound care specialists. Wound dressings have to be removed for each assessment which disturbs the wound healing process. Additionally this increases both workload and cost, as the wound dressings are often changed without medical necessity. Our research group has developed a quantitative method for evaluation and monitoring of the wound healing process. The method is based on differences in electrical conductivity of tissue types and is addressed using the bioimpedance measurement. The results indicate that the method is a potential tool for evaluating the status of a wound.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Physiological Measurement Systems and Methods Group
Authors: Kekonen, A., Bergelin, M., Eriksson, J., Ylänen, H., Viik, J.
Emission of smart meter electromagnetic field (50-100 kHz) in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen
Authors: Pääkkönen, R., Korpinen, L.
Number of pages: 5
Pages: 1-4
Publication date: 15 Jun 2015

Host publication information
Title of host publication: 23rd international conference and exhibition on electricity distribution, CIRED, 15-18 June 2015, Lyon, France
Article number: 1484
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication series
Name: International conference and exhibition on electricity distribution
ISSN (Electronic): 2032-9644
Links:
Research output: Scientific - peer-review › Conference contribution

New Directive 2013/35/EU on Occupational Exposure to Magnetic Fields and Electrical Workers Use of Active Implanted Medical Devices (AIMDS)

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen, The Heart Center, Tampere University Hospital
Authors: Korpinen, L., Pääkkönen, R., Virtanen, V.
Number of pages: 5
Pages: 1-5
Publication date: 15 Jun 2015
Dynamics of the peripheral membrane protein P2 from human myelin measured by neutron scattering: A Comparison between wild-type protein and a hinge mutant

Myelin protein P2 is a fatty acid-binding structural component of the myelin sheath in the peripheral nervous system, and its function is related to its membrane binding capacity. Here, the link between P2 protein dynamics and structure and function was studied using elastic incoherent neutron scattering (EINS). The P38G mutation, at the hinge between the β barrel and the α-helical lid, increased the lipid stacking capacity of human P2 in vitro, and the mutated protein was also functional in cultured cells. The P38G mutation did not change the overall structure of the protein. For a deeper insight into P2 structure-function relationships, information on protein dynamics in the 10 ps to 1 ns time scale was obtained using EINS. Values of mean square displacements mainly from protein H atoms were extracted for wild-type P2 and the P38G mutant and compared. Our results show that at physiological temperatures, the P38G mutant is more dynamic than the wild-type P2 protein, especially on a slow 1-ns time scale. Molecular dynamics simulations confirmed the enhanced dynamics of the mutant variant, especially within the portal region in the presence of bound fatty acid. The increased softness of the hinge mutant of human myelin P2 protein is likely related to an enhanced flexibility of the portal region of this fatty acid-binding protein, as well as to its interactions with the lipid bilayer surface requiring conformational adaptations.

General information

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX), University of Oulu, Univ Bergen, University of Bergen, Dept Phys & Technol, Biochemistry and Molecular Medicine and Biocenter Oulu, German Electron Synchrotron (DESY), European Spallation Source (ESS), Max Planck Institute for Experimental Medicine, Institut Laue-Langevin, Department of Biomedicine, CNR-IOM

Authors: Laulumaa, S., Nieminen, T., Lehtimäki, M., Aggarwal, S., Simons, M., Koza, M. M., Vattulainen, I., Kursula, P., Natali, F.

Publication date: 11 Jun 2015

Peer-reviewed: Yes

ASJC Scopus subject areas: Agricultural and Biological Sciences(all), Biochemistry, Genetics and Molecular Biology(all), Medicine(all)
The effects of neuron morphology on graph theoretic measures of network connectivity: The analysis of a two-level statistical model

We developed a two-level statistical model that addresses the question of how properties of neurite morphology shape the large-scale network connectivity. We adopted a low-dimensional statistical description of neurites. From the neurite model description we derived the expected number of synapses, node degree, and the effective radius, the maximal distance between two neurons expected to form at least one synapse. We related these quantities to the network connectivity described using standard measures from graph theory, such as motif counts, clustering coefficient, minimal path length, and small-world coefficient. These measures are used in a neuroscience context to study phenomena from synaptic connectivity in the small neuronal networks to large scale functional connectivity in the cortex. For these measures we provide analytical solutions that clearly relate different model properties. Neurites that sparsely cover space lead to a small effective radius. If the effective radius is small compared to the overall neuron size the obtained networks share similarities with the uniform random networks as each neuron connects to a small number of distant neurons. Large neurites with densely packed branches lead to a large effective radius. If this effective radius is large compared to the neuron size, the obtained networks have many local connections. In between these extremes, the networks maximize the variability of connection repertoires. The presented approach connects the properties of neuron morphology with large scale network properties without requiring heavy simulations with many model parameters. The two-steps procedure provides an easier interpretation of the role of each modeled parameter. The model is flexible and each of its components can be further expanded. We identified a range of model parameters that maximizes variability in network connectivity, the property that might affect network capacity to exhibit different dynamical regimes.
Long-term epileptic EEG classification via 2D mapping and textural features

Interpretation of long-term Electroencephalography (EEG) records is a tiresome task for clinicians. This paper presents an efficient, low cost and novel approach for patient-specific classification of long-term epileptic EEG records. We aim to achieve this with the minimum supervision from the neurologist. To accomplish this objective, first a novel feature extraction method is proposed based on the mapping of EEG signals into two dimensional space, resulting into a texture image. The texture image is constructed by mapping and scaling EEG signals and their associated frequency sub-bands into the gray-level image domain. Image texture analysis using gray level co-occurrence matrix (GLCM) is then applied in order to extract multivariate features which are able to differentiate between seizure and seizure-free events. To evaluate the discriminative power of the proposed feature extraction method, a comparative study is performed, against other dedicated feature extraction methods. The comparative performance evaluations show that the proposed feature extraction method can outperform other state-of-art feature extraction methods with a low computational cost. With a training rate of 25%, the overall sensitivity of 70.19% and specificity of 97.74% are achieved in the classification of over 163 h of EEG records using support vector machine (SVM) classifiers with linear kernels and trained by the stochastic gradient descent (SGD) algorithm.
Fabrication of electrospun poly(D,L lactide-co-glycolide)80/20 scaffolds loaded with diclofenac sodium for tissue engineering Surgery

Background: Adaptation of nanotechnology into materials science has also advanced tissue engineering research. Tissues are basically composed of nanoscale structures hence making nanofibrous materials closely resemble natural fibers. Adding a drug release function to such material may further advance their use in tissue repair. Methods: In the current study, bioabsorbable poly(D,L lactide-co-glycolide)80/20 (PDLGA80/20) was dissolved in a mixture of acetone/dimethylformamide. Twenty percent of diclofenac sodium was added to the solution. Nanofibers were manufactured using electrospinning. The morphology of the obtained scaffolds was analyzed by scanning electron microscopy (SEM). The release of the diclofenac sodium was assessed by UV/Vis spectroscopy. Mouse fibroblasts (MC3T3) were seeded on the scaffolds, and the cell attachment was evaluated with fluorescent microscopy. Results: The thickness of electrospun nanomats was about 1 mm. SEM analysis showed that polymeric nanofibers containing drug particles formed very interconnected porous nanostructures. The average diameter of the nanofibers was 500 nm. Drug release was measured by means of UV/Vis spectroscopy. After a high start peak, the release rate decreased considerably during 11 days and lasted about 60 days. During the evaluation of the release kinetics, a material degradation process was observed. MC3T3 cells attached to the diclofenac sodium-loaded scaffold. Conclusions: The nanofibrous porous structure made of PDLGA polymer loaded with diclofenac sodium is feasible to develop, and it may help to improve biomaterial properties for controlled tissue repair and regeneration.
Sterically stabilized liposomes (SSLs) (PEGylated liposomes) are applied as effective drug delivery vehicles. Understanding the interactions between hydrophobic compounds and PEGylated membranes is therefore important to determine the effectiveness of PEGylated liposomes for delivery of drugs or other bioactive substances. In this study, we have combined fluorescence quenching analysis (FQA) experiments and all-atom molecular dynamics (MD) simulations to study the effect of membrane PEGylation on the location and orientation of 5,10,15,20-tetrakis(4-hydroxyphenyl)porphyrin (p-THPP) that has been used in our study as a model hydrophobic compound. First, we consider the properties of p-THPP in the presence of different fluid phosphatidylcholine bilayers that we use as model systems for protein-free cell membranes. Next, we studied the interaction between PEGylated membranes and p-THPP. Our MD simulation results indicated that the arrangement of p-THPP within zwitterionic membranes is dependent on their free volume, and p-THPP solubilized in PEGylated liposomes is localized in two preferred positions: deep within the membrane (close to the center of the bilayer) and in the outer PEG corona (p-THPP molecules being wrapped with the polymer chains). Fluorescence quenching methods confirmed the results of atomistic MD simulations and showed two populations of p-THPP molecules as in MD simulations. Our results provide both an explanation for the experimental observation that PEGylation improves the drug-loading efficiency of membranes and also a more detailed molecular-level description of the interactions between porphyrins and lipid membranes.

Bibliographical note
ORG=elt,0.5
ORG=mol,0.5
Source: Scopus
Source-ID: 84931269207
Research output: Scientific - peer-review → Article

PEGylated liposomes as carriers of hydrophobic porphyrins
Sterically stabilized liposomes (SSLs) (PEGylated liposomes) are applied as effective drug delivery vehicles. Understanding the interactions between hydrophobic compounds and PEGylated membranes is therefore important to determine the effectiveness of PEGylated liposomes for delivery of drugs or other bioactive substances. In this study, we have combined fluorescence quenching analysis (FQA) experiments and all-atom molecular dynamics (MD) simulations to study the effect of membrane PEGylation on the location and orientation of 5,10,15,20-tetrakis(4-hydroxyphenyl)porphyrin (p-THPP) that has been used in our study as a model hydrophobic compound. First, we consider the properties of p-THPP in the presence of different fluid phosphatidylcholine bilayers that we use as model systems for protein-free cell membranes. Next, we studied the interaction between PEGylated membranes and p-THPP. Our MD simulation results indicated that the arrangement of p-THPP within zwitterionic membranes is dependent on their free volume, and p-THPP solubilized in PEGylated liposomes is localized in two preferred positions: deep within the membrane (close to the center of the bilayer) and in the outer PEG corona (p-THPP molecules being wrapped with the polymer chains). Fluorescence quenching methods confirmed the results of atomistic MD simulations and showed two populations of p-THPP molecules as in MD simulations. Our results provide both an explanation for the experimental observation that PEGylation improves the drug-loading efficiency of membranes and also a more detailed molecular-level description of the interactions between porphyrins and lipid membranes.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX), University of Cambridge, Faculty of Physics and Chemistry, Helsinki University, University of Southern Denmark, Jagiellonian University, Centre for Drug Research, Faculty of Pharmacy
Authors: Dzieciuch, M., Rissanen, S., Szydłowska, N., Bunker, A., Kumorek, M., Jamróz, D., Vattulainen, I., Nowakowska, M., Róg, T., Kepczynski, M.
Optimising polylactide melt spinning using real-time monitoring

Polylactide (PLA) is a synthetic biodegradable polyester and it is usually processed into fibres by two-step melt spinning, which comprises of (i) melting the raw material and pushing the melt through small orifices and (ii) stretching and heat treating the fibre to increase its mechanical properties. However, processing biodegradable polymers is challenging because the polymer degrades thermally which narrows the choice of the processing parameters. Real-time monitoring allows monitoring of the key properties of the material during the production of the fibre.

There were two objectives for this work: (i) upscaling the production of 4-filament PLA fibre with an updated set-up with real-time monitoring and (ii) studying the hydrolytic degradation of PLA fibres manufactured with the conventional set-up. The updated set-up comprised of high-speed spinning plants and a twin-screw extruder equipped with a slit die for later real-time monitoring of parameters related to thermal degradation of the polymer. The processing conditions of polylactide melt spinning were optimised by two sets of trials; initial trials with a packaging grade PLA and a second set of trials with GMP grade poly(L/D)lactide with an L/D ratio of 96/4.
The obtained fibres were characterised by tensile testing and the temperature-induced chain scission was evaluated by inherent viscosity (i.v.) measurements. Goal values were established to enable the post-processing of the fibres. Mechanically adequate fibre was produced in the initial trials regarding the material used and the filament diameters fulfilled the requirements. The packaging grade PLA did not degrade during extrusion but the i.v. of the GMP grade PLA was decreased by one third. The filament diameter and the strain values were at an acceptable level in half of the spools produced in the GMP grade trials. In the initial trials there was a problem with the fluctuation of the filament diameters but it was largely solved by a change of the feeding equipment in the GMP grade trials. There is a need for further optimisation of the mechanical properties. This should be done by increasing the draw ratio. However, the ultimate tensile strength of the fibre was close to the required value.

In addition a 48-week hydrolysis study was conducted on the fibre produced with the conventional set-up. The molecular, rheological, thermal and mechanical properties of gamma irradiated and non-irradiated fibres were measured. The molecular weights and inherent viscosities of both fibres decreased steadily, but the irradiated fibre degraded more prominently. The mechanical performance of the non-irradiated fibre showed no changes but the irradiated fibre could no longer be tested after 28 weeks. In conclusion, the results of the hydrolytic degradation studies were mainly in line with earlier studies. These results can be used as a reference for the future hydrolytic degradation studies for the fibre manufactured with the upgraded set-up.

General information
State: Published
Ministry of Education publication type: G2 Master's thesis, polytechnic Master's thesis
Organisations: Department of Electronics and Communications Engineering
Authors: Lyyra, I.
Keywords: (Polylactide, Melt spinning, Real-time monitoring, Hydrolytic degradation)
Number of pages: 85
Publication date: 3 Jun 2015
Apolipoprotein A-I mimetic peptide 4F blocks sphingomyelinase-induced LDL aggregation

Lipolytic modification of LDL particles by SMase generates LDL aggregates with a strong affinity for human arterial proteoglycans and may so enhance LDL retention in the arterial wall. Here, we evaluated the effects of apoA-I mimetic peptide 4F on structural and functional properties of the SMase-modified LDL particles. LDL particles with and without 4F were incubated with SMase, after which their aggregation, structure, and proteoglycan binding were analyzed. At a molar ratio of L-4F to apoB-100 of 2.5 to 20:1, 4F dose-dependently inhibited SMase-induced LDL aggregation. At a molar ratio of 20:1, SMase-induced aggregation was fully blocked. Binding of 4F to LDL particles inhibited SMase-induced hydrolysis of LDL by 10% and prevented SMase-induced LDL aggregation. In addition, the binding of the SMase-modified LDL particles to human aortic proteoglycans was dose-dependently inhibited by pretreating LDL with 4F. The 4F stabilized apoB-100 conformation and inhibited SMase-induced conformational changes of apoB-100. Molecular dynamic simulations showed that upon binding to protein-free LDL surface, 4F locally alters membrane order and fluidity and induces structural changes to the lipid layer. Collectively, 4F stabilizes LDL particles by preventing the SMase-induced conformational changes in apoB-100 and so blocks SMase-induced LDL aggregation and the resulting increase in LDL retention.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX), Department of Molecular and Cellular Medicine, University of California, Los Angeles, University of Southern Denmark, Wihuri Research Institute, Biomedicum Helsinki, University of Helsinki Institute of Biotechnology, Science Service Center, Kuopio University Hospital, David Geffen School of Medicine at UCLA
Keywords: (Apolipoprotein B-100, Atherosclerosis, Conformation, Interaction, Low density lipoprotein, Proteoglycans, Retention)
Number of pages: 16
Pages: 1206-1221
Publication date: 1 Jun 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biochemistry, Cell Biology, Endocrinology

Publication information
Journal: Journal of Lipid Research
Volume: 56
Issue number: 6
ISSN (Print): 0022-2275
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.533 1.344
Publication Forum (2016): 1
Scopus rating (2015): 2.583 1.329
Web of Science (2015): 4.368 4.542 8.8 1.06 0.0331 1.568
Publication Forum (2015): 1
Scopus rating (2014): 2.514 1.318
Web of Science (2014): 4.421 5.175 8.5 1.104 0.04284 1.816
Publication Forum (2014): 2
Chitosan membranes in a rat model of full-thickness cutaneous wounds: Healing and IL-4 levels

Objective: The aim of this study was to examine the effect of chitosan membrane on wound healing. Method: The effect of chitosan membranes was evaluated in an experimental rat model. On day 0, circular full-thickness skin sections were excised from the scalps of rats. The wounds were then measured and the surrounding area tattooed. Rats were sacrificed either immediately after excision, or randomised into control and chitosan groups and followed up on day 3, 7, 14 or 21. Control group wounds were covered with Aquacel (wound dressing). Chitosan group wounds were covered with chitosan membranes and the wound dressing. Wounds and the distances between the tattooed marks were measured on follow-up, the wound sites were harvested and histologically examined, and serum interleukin (IL-4) levels were analysed.

Results: A total of 54 rats were examined and all time points included 6 control and 6 chitosan treated animals, except for day 0 which consisted of control animals only. On day 3, wounds in the chitosan group were significantly (p<0.05) smaller (60 ± 6% versus 78 ± 19% of the original wound area) than in the control group. Chitosan membranes were found to degrade at the wound sites between days 7 and 14. Leukocyte counts were lower in the chitosan group than in the control group on day seven (p<0.05). IL-4 levels were significantly higher on day 7 (p<0.001) and 14 (p<0.001) in the chitosan group.

Conclusion: According to our results chitosan membrane may promote early wound healing, reduce inflammation and affect the IL-4 pathway, however, the membrane degrades at the wound site after day 7.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Tampere University Hospital, BioMediTech, Department of Plastic Surgery
Authors: Nordback, P. H., Miettinen, S., Kääriäinen, M., Haaparanta, A. M., Kellomäki, M., Kuokkanen, H., Seppänen, R.
Keywords: (Chitosan, Chitosan membrane, Full-thickness, IL-4, Wound healing)
Number of pages: 7
Pages: 245-251
Publication date: 1 Jun 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Nursing (miscellaneous), Fundamentals and skills

Publication information
Journal: Journal of Wound Care
Volume: 24
Issue number: 6
ISSN (Print): 0969-0700
Signal analysis and classification methods for the calcium transient data of stem cell-derived cardiomyocytes

Calcium cycling is crucial in the excitation-contraction coupling of cardiomyocytes, and therefore has a key role in cardiac functionality. Cardiac disorders and different drugs alter the calcium transients of cardiomyocytes and can cause serious dysfunction of the heart. New insights into this biochemical phenomena can be achieved by studying and analyzing calcium transients. Calcium transients of spontaneously beating human induced pluripotent stem cell-derived cardiomyocytes were recorded for a data set of 280 signals. Our objective was to develop and program procedures: (1) to automatically detect cycling peaks from signals and to classify the peaks of signals as either normal or abnormal, and (2) on the basis of the preceding peak detection results, to classify the entire signals into either a normal class or an abnormal class. We obtained a classification accuracy of approximately 80% compared to class decisions made separately by an experienced researcher, which is promising for the further development of an automatic classification approach. Automated classification software would be beneficial in the future for analyzing cardiomyocyte functionality on a large scale when screening for the adverse cardiac effects of new potential compounds, and also in future clinical applications. (C) 2015 Elsevier Ltd. All rights reserved.
In this paper, we investigate treatment cycles inferred from diabetes data by means of graph theory. We define the term treatment cycles graph-theoretically and perform a descriptive as well as quantitative analysis thereof. Also, we interpret our findings in terms of nursing and clinical management.

Structural analysis of treatment cycles representing transitions between nursing organizational units inferred from diabetes

In this paper, we investigate treatment cycles inferred from diabetes data by means of graph theory. We define the term treatment cycles graph-theoretically and perform a descriptive as well as quantitative analysis thereof. Also, we interpret our findings in terms of nursing and clinical management.
Using shRNA experiments to validate gene regulatory networks

Quantitative validation of gene regulatory networks (GRNs) inferred from observational expression data is a difficult task usually involving time-intensive and costly laboratory experiments. We were able to show that gene knock-down experiments can be used to quantitatively assess the quality of large-scale GRNs via a purely data-driven approach (Olsen et al. 2014). Our new validation framework also enables the statistical comparison of multiple network inference techniques, which was a long-standing challenge in the field. In this Data in Brief we detail the contents and quality controls for the gene expression data (available from NCBI Gene Expression Omnibus repository with accession number GSE53091) associated with our study published in Genomics (Olsen et al. 2014). We also provide R code to access the data and reproduce the analysis presented in this article.

General information

Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, BioMediTech, Research Community on Data-to-Decision (D2D), BioMediTech - Institute of Biosciences and Medical Technology, University of Toronto, Canada, Machine Learning Group, Interuniversity Institute of Bioinformatics in Brussels (IB), Computational Biology and Functional Genomics Laboratory, Dana-Farber Cancer Institute, Harvard School of Public Health, Bioinformatics and Computational Genomics Laboratory, Princess Margaret Cancer Centre, University Health Network University of Toronto, Department of Medical Biophysics, University of Toronto
Authors: Olsen, C., Fleming, K., Prendergast, N., Rubio, R., Emmert-Streib, F., Bontempi, G., Quackenbush, J., Haibe-Kains, B.
Keywords: (Colon cancer, Gene expression, Knock-down, Microarray, ShRNA)
Number of pages: 4
Pages: 123-126
Publication date: 1 Jun 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Molecular Medicine, Biochemistry, Biotechnology, Genetics

Publication information
Technologies for Ambient Assisted Living: Ambient Communication and Indoor Positioning

In all industrialised countries, the population is aging rapidly as the average life expectancy continues to rise and the number of younger age groups grows smaller. Hence, due to economical and practical reasons, the elders of the near future will likely live longer in their own apartments, particularly because institutionalization is significantly expensive and there is not room for the entire elderly population in currently existing nursing homes. Even more important, nearly all people would choose to live independently as long as possible before moving into an assisted-living facility.

A longer period of independent living for elders can be enabled by technical solutions. In this work, two technology areas for assisted living are studied. First, the prevention of feelings of loneliness in elders living alone is studied, and a solution for social inclusion and remote presence is presented. The results of long-lasting field trials are presented and analysed. Secondly, as information regarding the location of the inhabitant in the apartment can be used to provide several assistive services, indoor positioning systems are also studied in this work. Several technologies for indoor positioning are presented and compared. Furthermore, a new system based on capacitive measurement and the results of testing of the system are introduced.

Technologies and systems developed here have been implemented into actual systems, and real end users have tested them over long periods of time. Thus, these technologies can be developed into commercial products with reasonable effort. Moreover, in this work it has been proven that the systems developed can actually be used to support the independent living of elders.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Electronics and Communications Engineering
Authors: Kivimäki, T.
Number of pages: 54
Publication date: 22 May 2015

Publication information
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1295
ISSN (Print): 1459-2045
Electronic versions: kivimaki_1295

Bibliographical note
Awarding institution:Tampere University of Technology
Versio ok 16.12.2015
Investigating the possible effect of electrode support structure on motion artifact in wearable bioelectric signal monitoring

Background: With advances in technology and increasing demand, wearable biosignal monitoring is developing and new applications are emerging. One of the main challenges facing the widespread use of wearable monitoring systems is the motion artifact. The sources of the motion artifact lie in the skin-electrode interface. Reducing the motion and deformation at this interface should have positive effects on signal quality. In this study, we aim to investigate whether the structure supporting the electrode can be designed to reduce the motion artifact with the hypothesis that this can be achieved by stabilizing the skin deformations around the electrode.

Methods: We compare four textile electrodes with different support structure designs: a soft padding larger than the electrode area, a soft padding larger than the electrode area with a novel skin deformation restricting design, a soft padding the same size as the electrode area, and a rigid support the same size as the electrode. With five subjects and two electrode locations placed over different kinds of tissue at various mounting forces, we simultaneously measured the motion artifact, a motion affected ECG, and the real-time skin-electrode impedance during the application of controlled motion to the electrodes.

Results: The design of the electrode support structure has an effect on the generated motion artifact; good design with a skin stabilizing structure makes the electrodes physically more motion artifact resilient, directly affecting signal quality. Increasing the applied mounting force shows a positive effect up to 1,000 gr applied force. The properties of tissue under the electrode are an important factor in the generation of the motion artifact and the functioning of the electrodes. The relationship of motion artifact amplitude to the electrode movement magnitude is seen to be linear for smaller movements. For larger movements, the increase of motion generated a disproportionally larger artifact. The motion artifact and the induced impedance change were caused by the electrode motion and contained the same frequency components as the applied electrode motion pattern.

Conclusion: We found that stabilizing the skin around the electrode using an electrode structure that manages to successfully distribute the force and movement to an area beyond the borders of the electrical contact area reduces the motion artifact when compared to structures that are the same size as the electrode area.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cömert, A., Hyttinen, J.
Keywords: (Motion artifact, Surface electrodes, Textile electrodes, Un-gelled electrodes, Electrode design, Electrode structure, Wearable monitoring, Skin-electrode impedance, ECG, EMG, AMERICAN-HEART-ASSOCIATION, TEXTILE ELECTRODES, DRY ELECTRODES, CLINICAL-CARDIOLOGY, SKIN, ELECTROCARDIOGRAPHY, POTENTIALS, IMPEDANCE, STANDARDIZATION, RECOMMENDATIONS)
Number of pages: 18
Publication date: 15 May 2015
Peer-reviewed: Yes

Publication Information
Journal: Biomedical Engineering Online
Volume: 14
Article number: 44
ISSN (Print): 1475-925X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.487 1.048
Publication Forum (2016): 1
Scopus rating (2015): 0.521 0.84
Web of Science (2015): 1.382 1.814 4.8 0.242 0.00438 0.496
Publication Forum (2015): 1
Scopus rating (2014): 0.517 1.133
Web of Science (2014): 1.427 1.989 4.4 0.213 0.00373 0.526
Publication Forum (2014): 2
Scopus rating (2013): 0.577 1.007
Publication Forum (2013): 2
Scopus rating (2012): 0.443 1.059
Publication Forum (2012): 2
Scopus rating (2011): 0.401 1.054
Scopus rating (2010): 0.428 1.102
Urothelial cancer gene regulatory networks inferred from large-scale RNAseq, Bead and Oligo gene expression data

Background: Urothelial pathogenesis is a complex process driven by an underlying network of interconnected genes. The identification of novel genomic target regions and gene targets that drive urothelial carcinogenesis is crucial in order to improve our current limited understanding of urothelial cancer (UC) on the molecular level. The inference of genome-wide gene regulatory networks (GRN) from large-scale gene expression data provides a promising approach for a detailed investigation of the underlying network structure associated to urothelial carcinogenesis. Methods: In our study we inferred and compared three GRNs by the application of the BC3Net inference algorithm to large-scale transitional cell carcinoma gene expression data sets from Illumina RNAseq (179 samples), Illumina Bead arrays (165 samples) and Affymetrix Oligo microarrays (188 samples). We investigated the structural and functional properties of GRNs for the identification of molecular targets associated to urothelial cancer. Results: We found that the urothelial cancer (UC) GRNs show a significant enrichment of subnetworks that are associated with known cancer hallmarks including cell cycle, immune response, signaling, differentiation and translation. Interestingly, the most prominent subnetworks of co-located genes were found on chromosome regions 5q31.3 (RNAseq), 8q24.3 (Oligo) and 1q23.3 (Bead), which all represent known genomic regions frequently deregulated or aberated in urothelial cancer and other cancer types. Furthermore, the identified hub genes of the individual GRNs, e.g., HID1/DMC1 (tumor development), RNF17/TDRD4 (cancer antigen) and CYP4A11 (angiogenesis/metastasis) are known cancer associated markers. The GRNs were highly dataset specific on the interaction level between individual genes, but showed large similarities on the biological function level represented by subnetworks. Remarkably, the RNAseq UC GRN showed twice the proportion of significant functional subnetworks. Based on our analysis of inferential and experimental networks the Bead UC GRN showed the lowest performance compared to the RNAseq and Oligo UC GRNs. Conclusion: To our knowledge, this is the first study investigating genome-scale UC GRNs. RNAseq based gene expression data is the data platform of choice for a GRN inference. Our study offers new avenues for the identification of novel putative diagnostic targets for subsequent studies in bladder tumors.
Age-related circulatory responses to whole body cooling: observations by heart rate variability

The purpose was to study potential age-related changes in the circulatory system via heart rate variability (HRV) by gradually lowering ambient temperature (0.2°C/min) from thermoneutral (32°C) towards cold (18°C). ECG was recorded from a young (31 years) and from an older subject (78 years), both males. During the tests, brachium blood pressure (BP) was recorded.

During the cooling, BP increased in both subjects (young from 95/69 to 132/75 mmHg, old from 125/68 to 176/101 mmHg), the latter exhibiting a prominent rise in diastolic values after cooling. HRV parameters increased in both subjects during the cold exposure being modest in the younger subject as compared to the older one. Also, recovery from the cold in terms of HRV was faster in the younger subject. The present preliminary observations indicate that older age is coupled with altered HRV response to a mild whole-body skin cooling.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Physiological Measurement Systems and Methods Group, Lund University
Authors: Alametsä, J., Kuklane, K., Smolander, J., Vanggaard, L., Halder, A., Lundgren, K., Gao, C., Viik, J.
Keywords: (ECG, Heart rate variability, elderly, thermal balance, mild whole-body cooling, Blood pressure)
Pages: 57-64
Publication date: 11 May 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering

Publication information
Journal: Finnish Journal of eHealth and eWelfare
Volume: 7
Issue number: 2-3
ISSN (Print): 1798-0798
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
Links:

Bibliographical note
EXT="Smolander, Juhani"
Research output: Scientific - peer-review › Article
Experiments of the sonification of the sleep electroencephalogram

It is becoming possible to perform sleep recordings at home with equipment targeted for the regular consumers. This alleviates the pressures to increase capacity in sleep clinics. The interpretation of the sleep recordings is not very easy for the laymen and alternative assisting methods should be sought for this. Sonification is a method by which a phenomenon is converted to a sound for human listeners. This paper describes experiments made for the sonification of the electric activity of the brain, the electroencephalography (EEG) for the purpose of recognizing the presence and absence of the necessary refreshing components of sleep, deep sleep and rapid eye movement (REM) sleep. The methods are based on the calculation of features of the EEG signal which are characteristic to the deep and REM sleep as well as wakefulness. The features are converted to amplitude modulation functions of artificial and musical instrument sounds by using mathematical transforms such as Principal Component Analysis and Linear Discriminant Analysis. The results indicate that modulated sinusoidal signals are not appropriate for the sonification of sleep EEG but that modulating the sound of musical instruments could be a viable option for making the recognition of good and bad sleep possible.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Sleep and Sensory Signal Analysis Group-SSSAG, Instituto Superior Tecnico, Lissabon, Portugal
Authors: Franco, P., Värri, A.
Keywords: (sonification; sleep; electroencephalogram; sleep stage scoring)
Number of pages: 10
Pages: 65-74
Publication date: 11 May 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Engineering(all), Neuroscience(all)

Publication information
Journal: Finnish Journal of eHealth and eWelfare
Volume: 7
Issue number: 2-3
ISSN (Print): 1798-0798

Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
Links:
Research output: Scientific - peer-review » Article

Microarray analysis of differentially expressed genes in ovarian and fallopian tube epithelium from risk-reducing salpingo-oophorectomies

Mutations in the BRCA1 and BRCA2 genes confer an increased lifetime risk for breast and ovarian cancer. Ovarian cancer risk can be decreased by risk-reducing salpingo-oophorectomy (RRSO). Studies on RRSO material have altered the paradigm of serous ovarian cancer pathogenesis. The purpose of this study was to identify candidate genes possibly involved in the pathogenesis of serous ovarian cancer by carrying out a microarray analysis of differentially expressed genes in BRCA1/2- mutation positive ovarian and fallopian tube epithelium derived from RRSO surgery. Freshly frozen ovarian and fallopian tube samples from nine BRCA1/2 mutation carriers scheduled for RRSO were prospectively collected together with five mutation-negative control patients undergoing salpingo-oophorectomy for benign indications. Microarray analysis of genome-wide gene expression was performed on ovarian and fallopian tube samples from the BRCA1/2 and control patients. The validation of microarray data was performed by quantitative real-time polymerase chain reaction (qRT-PCR) in selected cases of RRSO samples and also in high grade serous carcinoma samples collected from patients with a BRCA phenotype. From 22,733 genes, 454 transcripts were identified that were differentially expressed in BRCA1/2 mutation carriers when compared with controls, pooling all ovarian and fallopian tube samples together. Of these, 299 genes were statistically significantly downregulated and 155 genes upregulated. Differentially expressed genes in BRCA1/2 samples reported here might be involved in serous ovarian carcinogenesis and provide interesting targets for further studies.

General information
Sec14-nodulin proteins and the patterning of phosphoinositide landmarks for developmental control of membrane morphogenesis

Polarized membrane morphogenesis is a fundamental activity of eukaryotic cells. This process is essential for the biology of cells and tissues, and its execution demands exquisite temporal coordination of functionally diverse membrane signaling reactions with high spatial resolution. Moreover, mechanisms must exist to establish and preserve such organization in the face of randomizing forces that would diffuse it. Here we identify the conserved AtSfh1 Sec14-nodulin protein as a novel effector of phosphoinositide signaling in the extreme polarized membrane growth program exhibited by growing Arabidopsis root hairs. The data are consistent with Sec14-nodulin proteins controlling the lateral organization of phosphatidylinositol 4,5-bisphosphate (PtdIns(4,5)P₂) landmarks for polarized membrane morphogenesis in plants. This patterning activity requires both the PtdIns(4,5)P₂ binding and homo-oligomerization activities of...
the AtSfh1 nodulin domain and is an essential aspect of the polarity signaling program in root hairs. Finally, the data suggest a general principle for how the phosphoinositide signaling landscape is physically bit mapped so that eukaryotic cells are able to convert a membrane surface into a high-definition lipid-signaling screen.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Physics, Research group: Biological Physics and Soft Matter, Computational Science X (CompX), Mahidol Univ, Mahidol University, Phramongkutklao College of Medicine, Fac Dent, Dept Anat, University of Southern Denmark, Department of Molecular and Cellular Medicine, Texas A AndM Health Sciences Center, Center for Plant Molecular Biology, Plant Physiology, Universität Tübingen, Zentrum für Datenverarbeitung, Unidad de Biofísica (CSIC, UPV/EHU), Departamento de Bioquímica, Universidad del País Vasco, Institut de Formation Aux Carrieres de Sante de Rabat, Department of Biochemistry and Biophysics, Texas A AndM University


Number of pages: 18

Pages: 1764-1781

Publication date: 1 May 2015

Peer-reviewed: Yes

ASJC Scopus subject areas: Molecular Biology, Cell Biology

**Publication Information**

Journal: Molecular Biology of the Cell

Volume: 26

Issue number: 9

ISSN (Print): 1059-1524

Ratings:

Publication Forum (2017): 2

Scopus rating (2016): 2.78 0.946

Publication Forum (2016): 2

Scopus rating (2015): 3.573 1.11

Web of Science (2015): 4.037 4.358 8.9 0.847 0.05994 2.071

Publication Forum (2015): 2

Scopus rating (2014): 3.693 1.145

Web of Science (2014): 4.466 4.806 8.4 0.862 0.06956 2.189

Publication Forum (2014): 3

Scopus rating (2013): 4.008 1.212

Publication Forum (2013): 3

Scopus rating (2012): 4.132 1.192

Publication Forum (2012): 3

Scopus rating (2011): 4.83 1.221

Scopus rating (2010): 5.605 1.286

Scopus rating (2009): 5.779 1.288

Scopus rating (2008): 5.798 1.284

Scopus rating (2007): 6.031 1.335


Scopus rating (2005): 5.965 1.416

Scopus rating (2004): 6.469 1.439

Scopus rating (2003): 6.879 1.396

Scopus rating (2002): 6.345 1.386

Scopus rating (2001): 6.283 1.359


Scopus rating (1999): 7.456 1.337

Original language: English

DOIs:

10.1091/mbc.E14-10-1475

Links:

http://www.scopus.com/inward/record.url?scp=84929485344&partnerID=8YFLogxK (Link to publication in Scopus)
Standardized evaluation of algorithms for computer-aided diagnosis of dementia based on structural MRI: The CADementia challenge

Algorithms for computer-aided diagnosis of dementia based on structural MRI have demonstrated high performance in the literature, but are difficult to compare as different data sets and methodology were used for evaluation. In addition, it is unclear how the algorithms would perform on previously unseen data, and thus, how they would perform in clinical practice when there is no real opportunity to adapt the algorithm to the data at hand. To address these comparability, generalizability and clinical applicability issues, we organized a grand challenge that aimed to objectively compare algorithms based on a clinically representative multi-center data set. Using clinical practice as the starting point, the goal was to reproduce the clinical diagnosis. Therefore, we evaluated algorithms for multi-class classification of three diagnostic groups: patients with probable Alzheimer's disease, patients with mild cognitive impairment and healthy controls. The diagnosis based on clinical criteria was used as reference standard, as it was the best available reference despite its known limitations. For evaluation, a previously unseen test set was used consisting of 354 T1-weighted MRI scans with the diagnoses blinded. Fifteen research teams participated with a total of 29 algorithms. The algorithms were trained on a small training set (n = 30) and optionally on data from other sources (e.g., the Alzheimer's Disease Neuroimaging Initiative, the Australian Imaging Biomarkers and Lifestyle flagship study of aging). The best performing algorithm yielded an accuracy of 63.0% and an area under the receiver-operating-characteristic curve (AUC) of 78.8%. In general, the best performances were achieved using feature extraction based on voxel-based morphometry or a combination of features that included volume, cortical thickness, shape and intensity. The challenge is open for new submissions via the web-based framework: http://caddementia.grand-challenge.org. (C) 2015 Elsevier Inc. All rights reserved.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Imperial College, London, 24.8.2012, Univ Nacl Colombia, Universidad Nacional de Colombia, Signal Proc & Recognit Grp, Old Domin Univ, Old Dominion University, Vis Lab, Universite' Pierre et Marie Curie, Sorbonne, France, 13.12.2011, Univ Porto, Universidade do Porto, Fac Med, Dept Med Imaging, Delf University of Technology, Univ Reading, University of Reading, Sch Syst Engn, Hosp Sao Joao, Sao Joao Hospital, Dept Neurol, CNRS, Centre National de la Recherche Scientifique (CNRS), Universite de Bordeaux - PRES, Lab Bordelais Rech Informat, PICTURA Res Grp, UMR 5800, Erasmus University Medical Center, VU University Medical Center, Universitäts Klinikum Freiburg und Medizinische Fakultät, Universitat Freiburg im Breisgau, Istituto Nazionale Di Fisica Nucleare, Frascati, Universita degli Studi di Bari, Aarhus Universitet, Montreal Neurological Institute and Hospital, Jena University Hospital, Centre d'Analyse et de Traitement des Images (CATI), Universita degli studi Magna Graecia di Catanzaro, Kobenhavns Universitet, MIT Computer Science and Artificial Intelligence Laboratory, Massachusetts General Hospital
Keywords: (Alzheimer's disease, Challenge, Classification, Computer-aided diagnosis, Mild cognitive impairment, Structural MRI)
Number of pages: 18
Pages: 562-579
Publication date: 1 May 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Cognitive Neuroscience, Neurology

Publication information
Journal: NeuroImage
Volume: 111
ISSN (Print): 1053-8119
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 3.823 1.752
Publication Forum (2016): 2
Scopus rating (2015): 4.48 1.84
Web of Science (2015): 5.463 6.797 6.7 1.16 0.18031 2.325
Transbilayer lipid interactions mediate nanoclustering of lipid-anchored proteins

Understanding how functional lipid domains in live cell membranes are generated has posed a challenge. Here, we show that transbilayer interactions are necessary for the generation of cholesterol-dependent nanoclusters of GPI-anchored proteins mediated by membrane-adjacent dynamic actin filaments. We find that long saturated acyl-chains are required for forming GPI-anchor nanoclusters. Simultaneously, at the inner leaflet, long acyl-chain-containing phosphatidylserine (PS) is necessary for transbilayer coupling. All-atom molecular dynamics simulations of asymmetric multicomponent-membrane bilayers in a mixed phase provide evidence that immobilization of long saturated acyl-chain lipids at either leaflet stabilizes cholesterol-dependent transbilayer interactions forming local domains with characteristics similar to a liquid-ordered (lo) phase. This is verified by experiments wherein immobilization of long acyl-chain lipids at one leaflet affects transbilayer interactions of corresponding lipids at the opposite leaflet. This suggests a general mechanism for the generation and stabilization of nanoscale cholesterol-dependent and actin-mediated lipid clusters in live cell membranes.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, National Centre for Biological Sciences (TIFR), Shamugha Arts Science Technology and Research Academy, Indian Institute of Integrative Medicine (CSIR), Wayne State University, Manipal University Karnataka, Raman Research Institute, Institute for Stem Cell Biology and Regenerative Medicine
Number of pages: 14
Pages: 581-594
Publication date: 23 Apr 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biochemistry, Genetics and Molecular Biology(all), Medicine(all)

Publication information

Journal: Cell
Volume: 161
Issue number: 3
ISSN (Print): 0092-8674
Ratings:
IGFBP2 potentiates nuclear EGFR-STAT3 signaling

Insulin-like growth factor binding protein 2 (IGFBP2) is a pleiotropic oncogenic protein that has both extracellular and intracellular functions. Despite a clear causal role in cancer development, the tumor-promoting mechanisms of IGFBP2 are poorly understood. The contributions of intracellular IGFBP2 to tumor development and progression are also unclear. Here we present evidence that both exogenous IGFBP2 treatment and cellular IGFBP2 overexpression lead to aberrant activation of epidermal growth factor receptor (EGFR), which subsequently activates signal transducer and activator of transcription factor 3 (STAT3) signaling. Furthermore, we demonstrate that IGFBP2 augments the nuclear accumulation of EGFR to potentiate STAT3 transactivation activities, via activation of the nuclear EGFR signaling pathway. Nuclear IGFBP2 directly influences the invasive and migratory capacities of human glioblastoma cells, providing a direct link between intracellular (and particularly nuclear) IGFBP2 and cancer hallmarks. These activities are also consistent with the strong association between IGFBP2 and STAT3-activated genes derived from The Cancer Genome Atlas database for human glioma. A high level of all three proteins (IGFBP2, EGFR and STAT3) was strongly correlated with poorer survival in an independent patient data set. These results identify a novel tumor-promoting function for IGFBP2 of activating EGFR/STAT3 signaling and facilitating EGFR accumulation in the nucleus, thereby deregulating EGFR signaling by two distinct mechanisms. As targeting EGFR in glioma has been relatively unsuccessful, this study suggests that IGFBP2 may be a novel therapeutic target.

Oncogene advance online publication, 20 April 2015; doi:10.1038/onc.2015.131.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, BioMediTech
Pages: 738-747
Highly Porous Freeze-Dried Composite Scaffolds for Cartilage and Osteochondral Tissue Engineering

Cartilage lesions are known to heal poorly and their tissue engineering with optimal scaffolds are widely studied. If the cartilage lesion is deep, there is a need to also repair the underlying bone (i.e. subchondral bone) and the lesion is called an osteochondral lesion. There are several methods used for osteochondral tissue engineering and various scaffold compositions are being studied. The studied scaffold compositions include the one scaffold method, where only one scaffold is used for the osteochondral lesion, or independent structures for cartilage and bone. These two scaffolds could be combined during processing, before surgery or in surgery to obtain osteochondral solutions for cartilage repair. In this thesis, freeze-drying was used to manufacture highly porous scaffolds with an interconnected pore structure. Natural polymer-based scaffolds often lack the required mechanical stability. Therefore, natural polymer-based hybrids with improved stiffness were manufactured for cartilage tissue engineering scaffolds. Synthetic polymer-based composites with improved osteoconductivity were manufactured for bone or osteochondral tissue engineering scaffolds. The scaffolds were studied to determine the structure of the scaffolds, the effect of the fibrous filler mesh or filler particles on the characteristics of the hybrids or composites, and the suitability of the hybrids for cartilage tissue engineering and the composites for bone or osteochondral tissue engineering. The majority of the studied scaffolds were also cultured with cells in vitro to define the suitability of the scaffolds for tissue engineering. The results show the freeze-drying method to be useful for manufacturing highly porous hybrid and composite scaffolds with improved properties compared with plain polymer scaffolds. Also, all the studied scaffolds had an interconnected porous structure. Improved wettability characteristics showed the method of cross-linking collagen post freeze-drying to be more effective way of cross-linking.
collagen compared to crosslinking collagen prior to freeze-drying. Synthetic polymer-based composites with an inhomogeneous scaffold structure with β-tricalcium phosphate (TCP) or bioactive glass (BG) filler particles showed improved osteoconductivity. TCP was found to improve the cell proliferation and alkaline phosphatase (ALP) activity of adipose stem cells (ASCs) over plain poly(L/D,L)lactide 70/30 (PLA70) scaffolds or PLA70+BG composites. A porous polymer matrix with a highly porous fibrous filler was successfully combined into highly porous freeze-dried hybrids with a natural polymer matrix (collagen/ chitosan and poly(L/D)Lactide 96/4 fibres (PLA96)) and composites with a synthetic polymer matrix (poly(D,L-lactide-co-glycolide)70/30 (PLGA)) with bioactive glass fibres (BGf). The PLA96 fibrous mesh improved the penetration of the chondrocytes into the hybrids compared with plain natural polymer scaffolds. The manufactured scaffolds were found to be applicable for cartilage, bone and osteochondral tissue engineering applications. Based on the structures developed in this thesis, more optimal scaffold structures are currently being studied.
Role of subunit III and its lipids in the molecular mechanism of cytochrome c oxidase

The terminal respiratory enzyme cytochrome c oxidase (CcO) reduces molecular oxygen to water, and pumps protons across the inner mitochondrial membrane, or the plasma membrane of bacteria. A two-subunit CcO harbors all the elements necessary for oxygen reduction and proton pumping. However, it rapidly undergoes turnover-induced irreversible damage, which is effectively prevented by the presence of subunit III and its tightly bound lipids. We have performed classical atomistic molecular dynamics (MD) simulations on a three-subunit CcO, which show the formation of water wires between the polar head groups of lipid molecules bound to subunit III and the proton uptake site Asp91 (Bos taurus enzyme numbering). Continuum electrostatic calculations suggest that these lipids directly influence the proton affinity of Asp91 by 1-2 pK units. We surmise that lipids bound to subunit III influence the rate of proton uptake through the D-pathway, and therefore play a key role in preventing turnover-induced inactivation. Atomistic MD simulations show that subunit III is rapidly hydrated in the absence of internally bound lipids, which is likely to affect the rate of O$_2$ diffusion into the active-site. The role of subunit III with its indigenous lipids in the molecular mechanism of CcO is discussed.
A prospective biopsychosocial study of the persistent post-concussion symptoms following mild traumatic brain injury

This study examined multiple biopsychosocial factors relating to post-concussion symptom (PCS) reporting in patients with mild traumatic brain injuries (mTBI), including structural (computed tomography and magnetic resonance imaging [MRI]) and microstructural neuroimaging (diffusion tensor imaging [DTI]). Patients with mTBIs completed several questionnaires and cognitive testing at approximately one month (n=126) and one year (n=103) post-injury. At approximately three weeks post-injury, DTI was undertaken using a Siemens 3T scanner in a subgroup (n=71). Measures of fractional anisotropy were calculated for 16 regions of interest (ROIs) and measures of apparent diffusion coefficient were calculated for 10 ROIs. Patients were compared with healthy control subjects. Using International Classification of Diseases, Tenth Revision (ICD-10) PCS criteria and mild or greater symptom reporting, 59% of the mTBI sample met criteria at one month and 38% met criteria at one year. However, 31% of the healthy control sample also met criteria for the syndrome - illustrating a high false-positive rate. Significant predictors of ICD-10 PCS at one month were pre-injury mental health problems and the presence of extra-cranial bodily injuries. Being symptomatic at one month was a significant predictor of being symptomatic at one year, and depression was significantly related to PCS at both one month and one year. Intracranial abnormalities visible on MRI were present in 12.1% of this sample, and multifocal areas of unusual white matter as measured by DTI were present in 50.7% (compared with 12.4% of controls). Structural MRI abnormalities and microstructural white matter findings were not significantly associated with greater post-concussion symptom reporting. The personal experience and reporting of post-concussion symptoms is likely individualized, representing the cumulative effect of multiple variables, such as genetics, mental health history, current life stress, medical problems, chronic pain, depression, personality factors, and other psychosocial and environmental factors. The extent to which damage to the structure of the brain contributes to the persistence of post-concussion symptoms remains unclear.
Cancer research in the era of next-generation sequencing and big data calls for intelligent modeling

We examine the role of big data and machine learning in cancer research. We describe an example in cancer research where gene-level data from The Cancer Genome Atlas (TCGA) consortium is interpreted using a pathway-level model. As the complexity of computational models increases, their sample requirements grow exponentially. This growth stems from the fact that the number of combinations of variables grows exponentially as the number of variables increases. Thus, a large sample size is needed. The number of variables in a computational model can be reduced by incorporating biological knowledge. One particularly successful way of doing this is by using available gene regulatory, signaling, metabolic, or context-specific pathway information. We conclude that the incorporation of existing biological knowledge is essential for the progress in using big data for cancer research.
Dissolution behavior of the bioactive glass S53P4 when sodium is replaced by potassium, and calcium with magnesium or strontium

The initial dissolution behavior of glasses based on bioactive glass S53P4 was studied with a dynamic measurement setup in a Tris-buffered solution. The glass composition was modified systematically on a molar basis by replacing sodium oxide with potassium oxide (0-100% K) and calcium oxide with magnesium (0-18% Mg) or strontium oxide (0-100% Sr). The concentrations of the ions dissolving from the glasses were measured continuously on-line in the fluid flow for 15 to 25 min using an inductively coupled plasma emission optical spectrometer. This method enabled attainment of detailed information on the initial dissolution mechanisms without the, for bioactive glasses typical, interference of apatite layer formation. The results showed that initial dissolutions of sodium and potassium were markedly higher from the mixed alkali oxide glasses than from the compositions containing only one alkali oxide. Introducing MgO in S53P4 caused a minor decrease in the dissolution rates of all ions. The glass containing 3 mol% of MgO showed the best chemical durability. In contrast, replacing CaO gradually with SrO increased the dissolution rates of all ions. The glasses with the highest replacement of CaO with SrO showed rapid release of both Sr and Na ions. The results corroborate the overall knowledge of glass durability and can be utilized to design bioactive glasses with controlled ion release rate for tissue engineering applications.
Workplace performance of a loose-fitting powered air purifying respirator during nanoparticle synthesis

Nanoparticle (particles with diameter ≤100 nm) exposure is recognized as a potentially harmful size fraction for pulmonary particle exposure. During nanoparticle synthesis, the number concentrations in the process room may exceed $10 \times 10^6 \text{ cm}^{-3}$. During such conditions, it is essential that the occupants in the room wear highly reliable high-performance respirators to prevent inhalation exposure. Here we have studied the in-use program protection factor (PPF) of loose-fitting powered air purifying respirators, while workers were coating components with TiO$_2$ or Cu$_x$O$_y$ nanoparticles under a hood using a liquid flame spray process. The PPF was measured using condensation particle counters, an electrical low pressure impactor, and diffusion chargers. The room particle concentrations varied from $4 \times 10^6$ to $40 \times 10^6 \text{ cm}^{-3}$, and the count median aerodynamic diameter ranged from 32 to 180 nm. Concentrations inside the respirator varied from 0.7 to 7.2 cm$^{-3}$. However, on average, tidal breathing was assumed to increase the respirator concentration by 2.3 cm$^{-3}$. The derived PPF exceeded $1.1 \times 10^6$, which is more than $40 \times 10^3$ times the respirator assigned protection factor. We were unable to measure clear differences in the PPF of respirators with old and new filters, among two male and one female user, or assess most penetrating particle size. This study shows that the loose-fitting powered air purifying respirator provides very efficient protection against nanoparticle inhalation exposure if used properly.
N-Glycosylation as determinant of epidermal growth factor receptor conformation in membranes

The epidermal growth factor receptor (EGFR) regulates several critical cellular processes and is an important target for cancer therapy. In lieu of a crystallographic structure of the complete receptor, atomistic molecular dynamics (MD) simulations have recently shown that they can excel in studies of the full-length receptor. Here we present atomistic MD simulations of the monomeric N-glycosylated human EGFR in biomimetic lipid bilayers that are, in parallel, also used for the reconstitution of full-length receptors. This combination enabled us to experimentally validate our simulations, using ligand binding assays and antibodies to monitor the conformational properties of the receptor reconstituted into membranes. We find that N-glycosylation is a critical determinant of EGFR conformation, and specifically the orientation of the EGFR ectodomain relative to the membrane. In the absence of a structure for full-length, posttranslationally modified membrane receptors, our approach offers new means to structurally define and experimentally validate functional properties of cell surface receptors in biomimetic membrane environments.
A Bayesian approach for suppression of limited angular sampling artifacts in single particle 3D reconstruction

In the single particle reconstruction, the initial 3D structure often suffers from the limited angular sampling artifact. Selecting 2D class averages of particle images generally improves the accuracy and efficiency of the reference-free 3D angle estimation, but causes an insufficient angular sampling to fill the information of the target object in the 3D frequency space. Similarly, the initial 3D structure by the random-conical tilt reconstruction has the well-known "missing cone" artifact. Here, we attempted to solve the limited angular sampling problem by sequentially applying maximum a posteriori estimate with expectation maximization algorithm (sMAP-EM). Using both simulated and experimental cryo-electron
microscope images, the sMAP-EM was compared to the direct Fourier method on the basis of reconstruction error and resolution. To establish selection criteria of the final regularization weight for the sMAP-EM, the effects of noise level and sampling sparseness on the reconstructions were examined with evenly distributed sampling simulations. The frequency information filled in the missing cone of the conical tilt sampling simulations was assessed by developing new quantitative measurements. All the results of visual and numerical evaluations showed the sMAP-EM performed better than the direct Fourier method, regardless of the sampling method, noise level, and sampling sparseness. Furthermore, the frequency domain analysis demonstrated that the sMAP-EM can fill the meaningful information in the unmeasured angular space without detailed a priori knowledge of the objects. The current research demonstrated that the sMAP-EM has a high potential to facilitate the determination of 3D protein structures at near atomic-resolution.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: M2oBSI, BioMediTech, UC Davis, BioMediTech
Authors: Moriya, T., Acar, E., Cheng, R. H., Ruotsalainen, U.
Keywords: (Cryo-electron microscopy, Maximum a posteriori probability estimation, Median root prior reconstruction, Missing cone, Poisson image formation model, Sparse angular sampling)
Number of pages: 14
Pages: 318–331
Publication date: 3 Apr 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Structural Biology

Publication information
Journal: Journal of Structural Biology
Volume: 191
Issue number: 3
ISSN (Print): 1047-8477
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.664 0.905
Publication Forum (2016): 1
Scopus rating (2015): 3.466 1.124
Web of Science (2015): 2.57 3.067 8.4 0.48 0.02563 1.754
Publication Forum (2015): 1
Scopus rating (2014): 2.496 1.257
Web of Science (2014): 3.231 3.279 7.6 0.644 0.02173 1.427
Publication Forum (2014): 2
Scopus rating (2013): 2.579 1.259
Publication Forum (2013): 2
Scopus rating (2012): 2.254 1.231
Publication Forum (2012): 2
Scopus rating (2011): 2.082 1.222
Scopus rating (2010): 2.586 1.187
Scopus rating (2009): 2.964 1.249
Scopus rating (2008): 3.39 1.397
Scopus rating (2006): 2.616 1.209
Scopus rating (2005): 2.781 1.226
Scopus rating (2004): 2.334 1.293
Scopus rating (2003): 2.826 1.345
Scopus rating (2001): 2.95 1.158
Scopus rating (2000): 2.567 1.007
Scopus rating (1999): 3.277 0.989
Original language: English
DOIs: 10.1016/j.jsb.2015.07.007
Links: http://www.scopus.com/inward/record.url?scp=84937459131&partnerID=8YFLogxK (Link to publication in Scopus)
Oxidation of cholesterol does not alter significantly its uptake into high-density lipoprotein particles

Using replica exchange umbrella sampling we calculated free energy profiles for uptake of cholesterol and one of its oxysterols (7-ketocholesterol) from an aqueous solution into a high-density lipoprotein particle. These atomistic molecular dynamics simulations show that both sterols are readily taken up from the aqueous solution with comparable free energy minima at the surface of the particle of -17 kcal/mol for cholesterol and -14 kcal/mol for 7-ketocholesterol. Moreover, given its preferred position at the particle surface, 7-ketocholesterol is expected to be able to participate directly in biological signaling processes.
Genomically amplified Akt3 activates DNA repair pathway and promotes glioma progression

Akt is a robust oncogene that plays key roles in the development and progression of many cancers, including glioma. We evaluated the differential propensities of the Akt isoforms toward progression in the well-characterized RCAS/Ntv-a mouse model of PDGFB-driven low grade glioma. A constitutively active myristoylated form of Akt1 did not induce high-grade glioma (HGG). In stark contrast, Akt2 and Akt3 showed strong progression potential with 78% and 97% of tumors diagnosed as HGG, respectively. We further revealed that significant variations in polarity and hydropathy values among the Akt isoforms in both the pleckstrin homology domain (P domain) and regulatory domain (R domain) were critical in mediating glioma progression. Gene expression profiles from representative Akt-derived tumors indicated dominant and distinct roles for Akt3, consisting primarily of DNA repair pathways. TCGA data from human GBM closely reflected the DNA repair function, as Akt3 was significantly correlated with a 76-gene signature DNA repair panel. Consistently, compared with Akt1 and Akt2 overexpression models, Akt3-expressing human GBM cells had enhanced activation of DNA repair proteins, leading to increased DNA repair and subsequent resistance to radiation and temozolomide. Given the wide range of Akt3-amplified cancers, Akt3 may represent a key resistance factor.
Bioabsorbable fabrics for musculoskeletal scaffolds
This chapter discusses how woven, braided, and knitted scaffolds have been used in bone, cartilage, tendon, and ligament tissue engineering (TE). First, we describe the different steps for manufacturing filaments, yarns, and bioabsorbable textiles. Then we discuss issues related to the characterization and modelling of fabrics and scaffolds. In separate sections, we also consider four different applications of experimental TE using textile scaffolds, and we list currently available commercial products.

New perspectives on proton pumping in cellular respiration
Complexes I, III (cytochrome bc1), and IV (cytochrome c oxidase) of the respiratory chain employ fundamentally different mechanisms for redox-coupled proton pumping. In the Q-cycle of cytochrome bc1, charge separation is the result of electron transfer through the membrane, whereas the protons are shuttled across the membrane by a neutral quinol carrier, QH2. In this Q cycle, the mobile quinols get protonated on the N-side of the membrane and deprotonated on the P-side. Cytochrome bc1 thus transduces chemical energy into an electrochemical gradient through a redox loop, but is not a true proton pump in the sense of moving protonic charge through the protein directly against a pmf. By contrast, cytochrome c oxidase, the terminal enzyme of the respiratory chain, operates as a true proton pump. In cytochrome c oxidase (CcO), the pathways of chemical electron and proton fluxes intersect in the binuclear center, and the pathway of pumped protons passes close to the BNC as well. This spatial proximity of proton and electron pathways establishes the tight electrostatic interactions one might expect for a redox-coupled proton pump.
Resveratrol interferes with the aggregation of membrane-bound human-IAPP: A molecular dynamics study

Amyloid aggregation of islet amyloid polypeptide (IAPP) in pancreatic tissues is a typical feature of type 2 diabetes mellitus. Resveratrol, a natural product extensively studied for its wide range of biological effects, has been shown to inhibit IAPP aggregation. However, the mechanism by which resveratrol inhibits IAPP aggregation is still far from complete elucidation. Now, an increasing knowledge of the mechanism of amyloid toxicity shifts the target of research towards the development of compounds which can prevent amyloid-mediated membrane damage rather than merely inhibit fiber
formation. In this study we used all atom molecular dynamics to investigate the interaction of resveratrol with full-length human IAPP in a negatively charged membrane environment. Our results show that the presence of resveratrol induces the formation of secondary structures (sheets and helices) by inserting in a hydrophobic pocket between the interaction surface of two IAPP molecules in aqueous solution. On the other hand, resveratrol significantly perturbs the interaction of IAPP with negatively charged membranes by anchoring specific hydrophobic regions (23FGA25 and 32VGS34) of the peptide and forming a stable 1:2 IAPP:resveratrol complex at the water/membrane interphase.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, NEST Istituto Nanoscienze-CNR, Department of Chemical Sciences, University of Catania, Unità Organizzativa e di Supporto di Catania, Istituto di Biostrutture e Bioimmagini
Authors: Lolicato, F., Raudino, A., Milardi, D., La Rosa, C.
Keywords: (Atomistic simulation, Membrane, Molecular dynamics, Resveratrol, Type II diabetes)
Number of pages: 6
Pages: 876-881
Publication date: 6 Mar 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Drug Discovery, Organic Chemistry, Pharmacology

Publication information
Journal: European Journal of Medicinal Chemistry
Volume: 92
ISSN (Print): 0223-5234
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.272 1.562
Publication Forum (2016): 1
Scopus rating (2015): 1.152 1.471
Web of Science (2015): 3.902 3.982 5.0 1.063 0.03839 0.695
Publication Forum (2015): 1
Scopus rating (2014): 1.074 1.668
Web of Science (2014): 3.447 3.946 4.7 0.786 0.03869 0.72
Publication Forum (2014): 1
Scopus rating (2013): 1.209 1.876
Publication Forum (2013): 1
Scopus rating (2012): 1.201 1.922
Publication Forum (2012): 1
Scopus rating (2011): 1.065 1.804
Scopus rating (2010): 0.877 1.692
Scopus rating (2009): 0.955 1.843
Scopus rating (2008): 0.9 1.603
Scopus rating (2007): 0.833 1.501
Scopus rating (2006): 0.723 1.405
Scopus rating (2005): 0.673 1.243
Scopus rating (2004): 0.714 1.294
Scopus rating (2003): 0.677 1.349
Scopus rating (2002): 0.579 1.006
Scopus rating (2001): 0.471 0.851
Scopus rating (2000): 0.496 0.811
Scopus rating (1999): 0.506 0.752
Original language: English
DOIs:
10.1016/j.ejmech.2015.01.047
Links:
http://www.scopus.com/inward/record.url?scp=84922216978&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84922216978
Research output: Scientific - peer-review › Article
Longitudinal assessment of clinically isolated syndrome with diffusion tensor imaging and volumetric MRI

The potential of diffusion tensor imaging (DTI) indices and volumes of focal lesions on conventional magnetic resonance imaging to predict conversion to multiple sclerosis (MS) was analyzed in subjects with clinically isolated syndrome (CIS) over 4 years. Twenty patients with CIS and 10 healthy controls were included in the study. The data showed an association between the volumes of T1 and fluid-attenuated inversion recovery (FLAIR) lesions and conversion to MS (T1: \(P= .02\); FLAIR: \(P= .02\)). The worsening of DTI indices (mean diffusivity and fractional anisotropy) was primarily seen in patients progressing to MS, but clear-cut association with conversion could not be detected.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), University of Tampere, Medical School, Tampere University Hospital, Neuroimmunology Unit, Pirkanmaa Hospital District and School of Health Sciences, Department of Neurology, Seinäjoki Central Hospital, Department of Radiology, Medical Imaging Centre
Authors: Kolasa, M., Hakulinen, U., Helminen, M., Hagman, S., Raunio, M., Rossi, M., Brander, A., Dastidar, P., Elovaara, I.
Keywords: (Clinically isolated syndrome, Diffusion tensor, Normal-appearing gray matter, Normal-appearing white matter, Volume measurements)
Number of pages: 6
Pages: 207-212
Publication date: 1 Mar 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Radiology Nuclear Medicine and imaging

Publication information

Journal: Clinical Imaging
Volume: 39
Issue number: 2
ISSN (Print): 0899-7071
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.426 0.669
Publication Forum (2016): 1
Scopus rating (2015): 0.428 0.746
Web of Science (2015): 0.966 0.946 6.3 0.156 0.00282 0.262
Publication Forum (2015): 1
Scopus rating (2014): 0.407 0.7
Web of Science (2014): 0.81 0.882 6.3 0.107 0.00263 0.267
Publication Forum (2014): 1
Scopus rating (2013): 0.387 0.515
Publication Forum (2013): 1
Scopus rating (2012): 0.407 0.701
Publication Forum (2012): 1
Scopus rating (2011): 0.361 0.79
Scopus rating (2010): 0.387 0.649
Scopus rating (2009): 0.43 0.856
Scopus rating (2008): 0.491 0.726
Scopus rating (2007): 0.485 0.963
Scopus rating (2006): 0.41 0.802
Scopus rating (2005): 0.477 0.949
Scopus rating (2004): 0.459 0.965
Scopus rating (2003): 0.379 0.689
Scopus rating (2002): 0.284 0.343
Scopus rating (2001): 0.316 0.409
Scopus rating (2000): 0.317 0.504
Scopus rating (1999): 0.268 0.472
Original language: English
Dynamics of intracranial electroencephalographic recordings from epilepsy patients using univariate and bivariate recurrence networks

Recently Andrezejak et al. combined the randomness and nonlinear independence test with iterative amplitude adjusted Fourier transform (iAAFT) surrogates to distinguish between the dynamics of seizure-free intracranial electroencephalographic (EEG) signals recorded from epileptogenic (focal) and nonepileptogenic (nonfocal) brain areas of epileptic patients. However, stationarity is a part of the null hypothesis for iAAFT surrogates and thus nonstationarity can violate the null hypothesis. In this work we first propose the application of the randomness and nonlinear independence test based on recurrence network measures to distinguish between the dynamics of focal and nonfocal EEG signals. Furthermore, we combine these tests with both iAAFT and truncated Fourier transform (TFT) surrogate methods, which also preserves the nonstationarity of the original data in the surrogates along with its linear structure. Our results indicate that focal EEG signals exhibit an increased degree of structural complexity and interdependency compared to nonfocal EEG signals. In general, we find higher rejections for randomness and nonlinear independence tests for focal EEG signals compared to nonfocal EEG signals. In particular, the univariate recurrence network measures, the average clustering coefficient $C$ and assortativity $R$, and the bivariate recurrence network measure, the average cross-clustering coefficient $C_{cross}$, can successfully distinguish between the focal and nonfocal EEG signals, even when the analysis is restricted to nonstationary signals, irrespective of the type of surrogates used. On the other hand, we find that the univariate recurrence network measures, the average path length $L$, and the average betweenness centrality $BC$ fail to distinguish between the focal and nonfocal EEG signals when iAAFT surrogates are used. However, these two measures can distinguish between focal and nonfocal EEG signals when TFT surrogates are used for nonstationary signals. We also report an improvement in the performance of nonlinear prediction error $N$ and nonlinear interdependence measure $L$ used by Andrezejak et al., when TFT surrogates are used for nonstationary EEG signals. We also find that the outcome of the nonlinear independence test based on the average cross-clustering coefficient $C_{cross}$ is independent of the outcome of the randomness test based on the average clustering coefficient $C$. Thus, the univariate and bivariate recurrence network measures provide independent information regarding the dynamics of the focal and nonfocal EEG signals. In conclusion, recurrence network analysis combined with nonstationary surrogates can be applied to derive reliable biomarkers to distinguish between epileptogenic and nonepileptogenic brain areas using EEG signals.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), BioMediTech
Authors: Subramaniyam, N. P., Hyttinen, J.
Publication date: 27 Feb 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Condensed Matter Physics, Statistical and Nonlinear Physics, Statistics and Probability

Publication information
Journal: Physical Review E
Volume: 91
Issue number: 2
Article number: 022927
ISSN (Print): 1539-3755
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.993 0.896
Publication Forum (2016): 1
Scopus rating (2015): 1.047 0.978
Publication Forum (2015): 1
Scopus rating (2014): 1.22 1.123
Web of Science (2014): 2.288 2.269 8.5 0.595 0.16687 0.859
Publication Forum (2014): 2
Scopus rating (2013): 1.311 1.239
Publication Forum (2013): 2
Scopus rating (2012): 1.42 1.226
Publication Forum (2012): 2
Unobtrusive Monitoring of Heart Rate and Respiration Rate during Sleep

Sleep deprivation has various adverse psychological and physiological effects. The effects range from decreased vigilance causing an increased risk of e.g. traffic accidents to a decreased immune response causing an increased risk of falling ill. Prevalence of the most common sleep disorder, insomnia can be, depending on the study, as high as 30 % in adult population. Physiological information measured unobtrusively during sleep can be used to assess the quantity and the quality of sleep by detecting sleeping patterns and possible sleep disorders. The parameters derived from the signals measured with unobtrusive sensors may include all or some of the following: heartbeat intervals, respiration cycle lengths, and movements. The information can be used in wellness applications that include self-monitoring of the sleep quality or it can also be used for the screening of sleep disorders and in following-up of the effect of a medical treatment. Unobtrusive sensors do not cause excessive discomfort or inconvenience to the user and are thus suitable for long-term monitoring. Even though the monitoring itself does not solve the sleeping problems, it can encourage the users to pay more attention on their sleep. While unobtrusive sensors are convenient to use, their common drawback is that the quality of the signals they produce is not as good as with conventional measurement methods. Movement artifacts, for example, can make the detection of the heartbeat intervals and respiration impossible. The accuracy and the availability of the physiological information extracted from the signals however depend on the measurement principle and the signal analysis methods used. Three different measurement systems were constructed in the studies included in the thesis and signal processing methods were developed for detecting heartbeat intervals and respiration cycle lengths from the measured signals. The performance of the measurement systems and the signal analysis methods were evaluated separately for each system with healthy young adult subjects. The detection of physiological information with the three systems was based on the measurement of ballistocardiographic and respiration movement signals with force sensors placed under the bedposts, the measurement of electrocardiographic (ECG) signal with textile electrodes attached to the bed sheet, and the measurement of the ECG signal with non-contact capacitive electrodes. Combining the information produced by different measurement methods for improving the detection performance was also tested. From the evaluated methods, the most accurate heartbeat interval information was obtained with contact electrodes attached to the bed sheet. The same method also provided the highest heart rate detection coverage. This monitoring method, however, has a limitation that it requires a naked upper body, which is not necessarily acceptable for everyone. For respiration cycle length detection, better results were achieved by using signals recorded with force sensors placed under a bedpost than when extracting the respiration information from the ECG signal recorded with textile bed sheet electrodes. From the data quality point of view, an ideal night-time physiological monitoring system would include a contact ECG measurement for the heart rate monitoring and force sensors for the respiration monitoring. The force sensor signals could also be used for movement detection.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
Authors: Vehkaoja, A.
Number of pages: 70
Publication date: 27 Feb 2015

Publication information
Publisher: Tampere University of Technology
Rigid-Body Registration

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Signal Processing
Authors: Tohka, J.
Number of pages: 5
Pages: 301-305
Publication date: 14 Feb 2015

Host publication information
Title of host publication: Brain Mapping: An Encyclopedic Reference
Volume: 1
Publisher: Elsevier
ISBN (Print): 9780123970251
ISBN (Electronic): 9780123973160
ASJC Scopus subject areas: Medicine(all)
DOIs: 10.1016/B978-0-12-397025-1.00299-2
Source: Scopus
Source-ID: 84943258897
Research output: Scientific - peer-review › Chapter

Thermal transport characteristics of human skin measured in vivo using ultrathin conformal arrays of thermal sensors and actuators

Measurements of the thermal transport properties of the skin can reveal changes in physical and chemical states of relevance to dermatological health, skin structure and activity, thermoregulation and other aspects of human physiology. Existing methods for in vivo evaluations demand complex systems for laser heating and infrared thermography, or they require rigid, invasive probes; neither can apply to arbitrary regions of the body, offers modes for rapid spatial mapping, or enables continuous monitoring outside of laboratory settings. Here we describe human clinical studies using mechanically soft arrays of thermal actuators and sensors that laminate onto the skin to provide rapid, quantitative in vivo determination of both the thermal conductivity and thermal diffusivity, in a completely non-invasive manner. Comprehensive analysis of measurements on six different body locations of each of twenty-five human subjects reveal systematic variations and directional anisotropies in the characteristics, with correlations to the thicknesses of the epidermis (EP) and stratum corneum (SC) determined by optical coherence tomography, and to the water content assessed by electrical impedance based measurements. Multivariate statistical analysis establishes four distinct locations across the body that exhibit different physical properties: heel, cheek, palm, and wrist/volar forearm/dorsal forearm. The data also demonstrate that
thermal transport correlates negatively with SC and EP thickness and positively with water content, with a strength of correlation that varies from region to region, e.g., stronger in the palmar than in the follicular regions.

Real-space Wigner-Seitz Cells Imaging of Potassium on Graphite via Elastic Atomic Manipulation

Atomic manipulation in the scanning tunnelling microscopy, conventionally a tool to build nanostructures one atom at a time, is here employed to enable the atomic-scale imaging of a model low-dimensional system. Specifically, we use low-temperature STM to investigate an ultra thin film (4 atomic layers) of potassium created by epitaxial growth on a graphite substrate. The STM images display an unexpected honeycomb feature, which corresponds to a real-space visualization of the Wigner-Seitz cells of the close-packed surface K atoms. Density functional simulations indicate that this behaviour arises from the elastic, tip-induced vertical manipulation of potassium atoms during imaging, i.e. elastic atomic manipulation, and reflects the ultrasoft properties of the surface under strain. The method may be generally applicable to other soft e.g. molecular or biomolecular systems.
Epileptic seizure classification of EEG time-series using rational discrete short-time fourier transform

A system for epileptic seizure detection in electroencephalography (EEG) is described in this paper. One of the challenges is to distinguish rhythmic discharges from nonstationary patterns occurring during seizures. The proposed approach is based on an adaptive and localized time-frequency representation of EEG signals by means of rational functions. The corresponding rational discrete short-time Fourier transform (DSTFT) is a novel feature extraction technique for epileptic EEG data. A multilayer perceptron classifier is fed by the coefficients of the rational DSTFT in order to separate seizure epochs from seizure-free epochs. The effectiveness of the proposed method is compared with several state-of-art feature extraction algorithms used in offline epileptic seizure detection. The results of the comparative evaluations show that the proposed method outperforms competing techniques in terms of classification accuracy. In addition, it provides a compact representation of EEG time-series.
Modeling and Experimental Characterization of Pressure Drop in Gravity-Driven Microfluidic Systems

Passive pumping using gravity-driven flow is a fascinating approach for microfluidic systems. When designing a passive pumping system, generated flow rates should be known precisely. While reported models used to estimate the flow rates do not usually consider capillary forces, this paper shows that their exclusion is unrealistic in typical gravity-driven systems. Therefore, we propose a new analytical model to estimate the generated flow rates. An extensive set of measurements is used to verify that the proposed model provides a remarkably more precise approximation of the real flow rates compared to the previous models. It is suggested that the developed model should be used when designing a gravity-driven pumping system.

General information
State: Published
Micro CT visualization of silver nanoparticles in the middle and inner ear of rat and transportation pathway after transtympanic injection

Background: Silver nanoparticles (Ag NPs) displayed strong activities in anti-bacterial, anti-viral, and anti-fungal studies and were reportedly efficient in treating otitis media. Information on distribution of AgNPs in different compartments of the ear is lacking.

Objective: To detect distribution of Ag NPs in the middle and inner ear and transportation pathways after transtympanic injection.

Methods: Contrast effect of Ag NPs in the micro CT imaging was assessed in a phantom. AgNPs at various concentrations (1.85 mM, 37.1 mM, and 370.7 mM) were administered to rat middle ear using transtympanic injection and cadaver heads were imaged using micro CT at several time points.

Results: The lowest concentration of Ag NPs that could be visualized using micro CT was 37.1 mM. No difference was observed between the solvents, deionized H2O and saline. Ag NPs at 37.1 mM were visible in the middle ear on 7 d post-administration. Ag NPs at 370.7 mM generated signals in the middle ear, ossicular chain, round window membrane, oval window, scala tympani, and Eustachian tube for both 4 h and 24 h time points. A gradient distribution of Ag NPs from the middle ear to the inner ear was detected. The pathways for Ag NPs to be transported from the middle ear into the inner ear are round and oval windows.

Conclusion: This study provided the imaging evidence that Ag NPs are able to access the inner ear in a dose-dependent manner after intratympanic administration, which is relevant to design the delivery concentration in the future clinic application in order to avoid adverse inner ear effect.
Antimicrobial activity and molecular analysis of azoderivatives of β-diketones

The emergence and increase in the number of multidrug resistant microorganisms have highly increased the need of therapeutic trials, necessitating a deep exploration on novel antimicrobial response tactics. This study is intended to screen and analyze the activity of a novel set of azoderivatives of β-diketones and their known analogs for antimicrobial properties. The compounds were analyzed to determine their minimum inhibitory concentration. Hit compounds 5-(2-(2-hydroxyphenyl)hydrazono)pyrimidine-2,4,6(1H,3H,5H)-trione (C5), 5-chloro-3-(2-(4,4-dimethyl-2,6-dioxocyclohexylidene)hydrazinyl)-2-hydroxybenzenesulfonic acid (C8), 2-(2-carboxyphenylhydrazo)malononitrile (C11) were then considered in evaluating their effect on transcription, translation and cellular oxidation impact. All three compounds were found to have in vitro inhibitory action on E. coli cell growth. The study also revealed that those compounds have a notable impact on cellular activities. It is determined that the newly synthesized azoderivative of barbituric acid (C8) have maximum growth inhibitory activity among the three compounds considered, characterized by a MIC50 of 0.42 mg/ml. The MS2 reporter system was used to detect the transcriptional response of the bacteria to the treatment with the selected drugs. All three compounds are found to down regulate the transcriptional pathway. The novel compound, C8, showed maximum inhibition of transcription mechanism, followed by C5 and C11. The effect of the compounds on translation was analyzed using a Yellow Fluorescent protein reporter system. All the compounds displayed reductive impact on translation of which C8 was found to the best, exhibiting 8.5-fold repression followed by C5 and C11, respectively. Fluctuations of the Reactive Oxygen Species (ROS) concentrations were investigated upon incubation in hit compounds using ROS sensor protein. All the three compounds were found to contribute to oxidative pathway. C8 is found to have the best oxidative effect than C5 and C11. All experiments were repeated at least twice, the results being verified to be significant using statistical analysis.

General information

State: Published
Ministry of Education publication type: A1 Journal article refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: Molecular Signaling Lab, Prostate cancer research center (PCRC), Institute for Systems Biology, Seattle, Washington, USA
Authors: Viswanathan, A., Sala, A., Yli-Harja, O., Kandhavelu, M.
Keywords: (Antimicrobial activity, Azoderivatives of β-diketones, Oxidation, Single cell, Transcription, Translation)
Number of pages: 7
Pages: 83-89
Publication date: 23 Jan 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Pharmaceutical Science

Publication information

Journal: European Journal of Pharmaceutical Sciences
Volume: 66
ISSN (Print): 0928-0987
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.223 1.499
Publication Forum (2016): 2
Scopus rating (2015): 1.156 1.415
Web of Science (2015): 3.773 3.752 6.6 0.561 0.01365 0.802
Publication Forum (2015): 2
Scopus rating (2014): 0.994 1.247
Web of Science (2014): 3.35 3.463 6.6 0.776 0.01296 0.764
Publication Forum (2014): 3
Scopus rating (2013): 1.038 1.287
Publication Forum (2013): 3
Scopus rating (2012): 1.254 1.425
Publication Forum (2012): 3
Scopus rating (2011): 1.236 1.428
Radio Frequency Identification (RFID) is a wireless automatic identification technology that utilizes electrically active tags – low-cost and low-power wireless communication devices that let themselves transparently and unobstructively be embedded into everyday objects to remotely track information of the object's physical location, origin, and ownership. At ultra-high frequencies (UHF), this technology uses propagating electromagnetic waves for communication, which enables the fast identification of tags at large distances. A passive RFID tag includes two main components; a tag antenna and an RFID integrate circuit (tag IC). A passive tag relies solely on the external power harvested from an incident electromagnetic wave to run its circuitry and for data transmission. The passiveness makes the tag maintenance-free, simple, and low-cost, allowing large-scale commercial applications in the supply chain, ticketing, and asset tracking. The future of RFID, however, lies in the transition from traditional embedded applications to wearable intelligent systems, in which the tags are seamlessly integrated with everyday clothing. Augmented with various ambient and biochemical sensors, the tag is capable of detecting physical parameters of its environment and providing continuous monitoring of human vital signs. Tremendous amount of tagged entities establish an intelligent infrastructure that is personalized and tailored to the needs of each individual and ultimately, it recedes into the background of our daily life. Although wearable tags in intelligent systems have the enormous potential to revolutionize the quality of human life, the emerging wearable RFID applications introduce new challenges for designers developing efficient and sophisticated RFID systems. Traditional tag design parameters and solutions will no longer respond to the new requirements. Instead, the whole RF community must adopt new methods and unconventional approaches to achieve advanced wearable tags that are highly transparently integrated into our daily life. In this research work, an empirical as well as a theoretical approach is taken to address the above-mentioned wearable RFID tag challenges. Exploiting new analysis tools in combination with computational electromagnetics, a novel technique to model the human body in UHF applications for initiating the design of optimized wearable tags is developed. Further, fundamental unprecedented UHF characteristics of advanced wearable electronics materials – electro-textiles, are established. As an extremely important outcome of this research work, innovative optimization methodologies for the promotion of novel and advanced wearable UHF antennas are proposed. Particularly, it is evidenced that proper embroidery fabrication techniques have the great potential to realize wearable tag antennas exhibiting excellent RF performance and structural properties for the seamless integration with clothing. The kernel of this research work is the realization of a flexible and fully embroidered passive UHF RFID patch tag prototype achieving optimized performance in close vicinity of the high-permittivity and dissipative human body. Its performance may be considered as a benchmark for future wearable antenna designs. This shows that this research work outcome forms an important contribution to the state of the art and a milestone in the development towards wearable intelligence.
This paper presents a lossless compression method performing separately the compression of the vessels and of the remaining part of eye fundus in retinal images. Retinal images contain valuable information sources for several distinct medical diagnosis tasks, where the features of interest can be e.g. the cotton wool spots in the eye fundus, or the volume of the vessels over concentric circular regions. It is assumed that one of the existent segmentation methods provided the segmentation of the vessels. The proposed compression method transmits losslessly the segmentation image, and then transmits the eye fundus part, or the vessels image, or both, conditional on the vessels segmentation. The independent compression of the two color image segments is performed using a sparse predictive method. Experiments are provided over a database of retinal images containing manual and estimated segmentations. The codelength of encoding the overall image, including the segmentation and the image segments, proves to be better than the codelength for the entire image obtained by JPEG2000 and other publicly available compressors.

Lossless compression of regions-of-interest from retinal images

In this preliminary research we examine the suitability of hierarchical strategies of multi-class support vector machines for classification of induced pluripotent stem cell (iPSC) colony images. The iPSC technology gives incredible possibilities for safe and patient specific drug therapy without any ethical problems. However, growing of iPSCs is a sensitive process and abnormalities may occur during the growing process. These abnormalities need to be recognized and the problem returns to image classification. We have a collection of 80 iPSC colony images where each one of the images is prelabeled by an expert to class bad, good or semigood. We use intensity histograms as features for classification and we evaluate
histograms from the whole image and the colony area only having two datasets. We perform two feature reduction procedures for both datasets. In classification we examine how different hierarchical constructions effect the classification. We perform thorough evaluation and the best accuracy was around 54% obtained with the linear kernel function. Between different hierarchical structures, in many cases there are no significant changes in results. As a result, intensity histograms are a good baseline for the classification of iPSC colony images but more sophisticated feature extraction and reduction methods together with other classification methods need to be researched in future.

**General information**

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE), University of Tampere
Number of pages: 7
Pages: 86-92
Publication date: 13 Jan 2015
Host publication information
Publisher: The Institute of Electrical and Electronics Engineers, Inc.
Article number: 7008152
ISBN (Print): 9781479945191
ASJC Scopus subject areas: Artificial Intelligence, Information Systems, Signal Processing, Software
DOIs: 10.1109/CIDM.2014.7008152
Source: Scopus
Source-ID: 84925047729
Research output: Scientific - peer-review > Conference contribution

**A motion artifact generation and assessment system for the rapid testing of surface biopotential electrodes**

Dry electrodes can reduce cost while increasing the usability and comfort of wearable monitoring systems. They are, however, susceptible to motion artifacts. The present electrode testing methods lack reliability and do not separate the factors that affect the motion artifact. In this paper, we introduce a first generation motion artifact generation and assessment system that generates the speed, amplitude, and pattern-wise programmable movement of the electrode. The system simultaneously measures electrode-skin impedance, the motion artifact, and one channel of an electrocardiogram that contains the motion artifact and monitors the mounting force applied to the electrode. We demonstrate the system by comparing the applied movement and the measured signals for electrode movements up to 6 mm and movement frequencies from 0.4 Hz to 4 Hz. Results show that the impedance change and surface potential are visually clearly related to the applied motion, with average correlations of 0.89 and 0.64, respectively. The applied force, electrode location, and electrode structure all affect the motion artifact. The setup enables the motion of the electrode to be accurately controlled. The system can be used as a precursor to the testing of integrated systems because it enables thorough, repeatable, and robust motion artifact studies. The system allows a deeper insight into motion artifacts and the interplay of the various factors that affect them.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), BioMediTech
Authors: Cömert, A., Hyttinen, J.
Keywords: (Dry electrodes, ECG, Electrode-skin impedance, EMG, Motion artifact, Prototyping, Surface electrodes, Testing)
Number of pages: 25
Pages: 1-25
Publication date: 1 Jan 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biophysics, Physiology, Physiology (medical)

**Publication Information**

Journal: Physiological Measurement
Volume: 36
Issue number: 1
Article number: 1
Estimation of GFP-tagged RNA numbers from temporal fluorescence intensity data

Motivation: MS2-GFP-tagging of RNA is currently the only method to measure intervals between consecutive transcription events in live cells. For this, new transcripts must be accurately detected from intensity time traces. Results: We present a novel method for automatically estimating RNA numbers and production intervals from temporal data of cell fluorescence intensities that reduces uncertainty by exploiting temporal information. We also derive a robust variant, more resistant to outliers caused e.g. by RNAs moving out of focus. Using Monte Carlo simulations, we show that the quantification of RNA numbers and production intervals is generally improved compared with previous methods. Finally, we analyze data from live Escherichia coli and show statistically significant differences to previous methods. The new methods can be used to quantify numbers and production intervals of any fluorescent probes, which are present in low copy numbers, are brighter than the cell background and degrade slowly. Availability: Source code is available under Mozilla Public License at http://www.cs.tut.fi/~hakkin22/jumpdet/. Contact:

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Häkkinen, A., Ribeiro, A. S.
Number of pages: 7
Pages: 69-75
Publication date: 1 Jan 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)
Mild cognitive impairment (MCI) is a transitional stage between age-related cognitive decline and Alzheimer's disease (AD). For the effective treatment of AD, it would be important to identify MCI patients at high risk for conversion to AD. In this study, we present a novel magnetic resonance imaging (MRI)-based method for predicting the MCI-to-AD conversion from one to three years before the clinical diagnosis.

First, we developed a novel MRI biomarker of MCI-to-AD conversion using semi-supervised learning and then integrated it with age and cognitive measures about the subjects using a supervised learning algorithm resulting in what we call the aggregate biomarker. The novel characteristics of the methods for learning the biomarkers are as follows: 1) We used a semi-supervised learning method (low density separation) for the construction of MRI biomarker as opposed to more typical supervised methods; 2) We performed a feature selection on MRI data from AD subjects and normal controls without using data from MCI subjects via regularized logistic regression; 3) We removed the aging effects from the MRI data before the classifier training to prevent possible confounding between AD and age related atrophies; and 4) We constructed the aggregate biomarker by first learning a separate MRI biomarker and then combining it with age and cognitive measures about the MCI subjects at the baseline by applying a random forest classifier. We experimentally demonstrated the added value of these novel characteristics in predicting the MCI-to-AD conversion on data obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database. With the ADNI data, the MRI biomarker achieved a 10-fold cross-validated area under the receiver operating characteristic curve (AUC).
of 0.7661 in discriminating progressive MCI patients (pMCI) from stable MCI patients (sMCI). Our aggregate biomarker based on MRI data together with baseline cognitive measurements and age achieved a 10-fold cross-validated AUC score of 0.9020 in discriminating pMCI from sMCI. The results presented in this study demonstrate the potential of the suggested approach for early AD diagnosis and an important role of MRI in the MCI-to-AD conversion prediction. However, it is evident based on our results that combining MRI data with cognitive test results improved the accuracy of the MCI-to-AD conversion prediction. (C) 2014 Elsevier Inc. All rights reserved.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Vision, Research Community on Data-to-Decision (D2D), Jena Univ Hosp, Friedrich Schiller University of Jena, Dept Psychiat, Struct Brain Mapping Grp

Authors: Moradi, E., Pepe, A., Gaser, C., Huttunen, H., Tohka, J., Alzheimer's Dis Neuroimaging Initi

Keywords: (Low density separation, Mild cognitive impairment, Feature selection, Support vector machine, Magnetic resonance imaging, Classification, Semi-supervised learning, Alzheimer's disease, ADNI, Early diagnosis, MILD COGNITIVE IMPAIRMENT, MULTIMODAL CLASSIFICATION, LOGISTIC-REGRESSION, EARLY-DIAGNOSIS, DISEASE, SEGMENTATION, PATTERNS, BIOMARKERS, ATROPHY)

Number of pages: 15

Pages: 398-412

Publication date: 1 Jan 2015

Peer-reviewed: Yes

**Publication Information**

Journal: NeuroImage

Volume: 104

ISSN (Print): 1053-8119

Ratings:

Publication Forum (2017): 2
Scopus rating (2016): 3.823 1.752
Publication Forum (2016): 2
Scopus rating (2015): 4.48 1.84
Web of Science (2015): 5.463 6.797 6.7 1.16 0.18031 2.325
Publication Forum (2015): 2
Scopus rating (2014): 4.201 2.029
Web of Science (2014): 6.357 7.289 6.5 1.5 0.17239 2.257
Publication Forum (2014): 3
Scopus rating (2013): 4.376 2.026
Publication Forum (2013): 3
Scopus rating (2012): 3.922 1.937
Publication Forum (2012): 3
Scopus rating (2011): 3.626 1.81
Scopus rating (2010): 3.573 1.866
Scopus rating (2009): 3.859 1.897
Scopus rating (2008): 4.094 1.765
Scopus rating (2007): 3.7 1.981
Scopus rating (2006): 3.41 1.924
Scopus rating (2005): 3.703 1.918
Scopus rating (2004): 3.401 1.794
Scopus rating (2003): 1.974 1.003
Scopus rating (2002): 0.885 0.403
Scopus rating (2001): 0.526 0.253
Scopus rating (2000): 0.534 0.341
Scopus rating (1999): 0.641 0.494

Original language: English

DOIs:

10.1016/j.neuroimage.2014.10.002

**Bibliographical note**

MicroRNA expression profile of primary prostate cancer stem cells as a source of biomarkers and therapeutic targets

MicroRNA (miRNA) expression profiles were generated from prostate epithelial subpopulations enriched from patient-derived benign prostatic hyperplasia (n = 5), Gleason 7 treatment-naive prostate cancer (PCa) (n = 5), and castration-resistant PCa (CRPC) (n = 3). Microarray expression was validated in an independent patient cohort (n = 10). Principal component analysis showed that miRNA expression is clustered by epithelial cell phenotype, regardless of pathologic status. We also discovered concordance between the miRNA expression profiles of unfractionated epithelial cells from CRPCs, human embryonic stem cells (SCs), and prostate epithelial SCs (both benign and malignant). MiR-548c-3p was chosen as a candidate miRNA from this group to explore its usefulness as a CRPC biomarker and/or therapeutic target. Overexpression of miR-548c-3p was confirmed in SCs (fivefold, p < 0.05) and in unfractionated CRPCs (1.8-fold, p < 0.05). Enforced overexpression of miR-548c-3p in differentiated cells induced stemlike properties (p < 0.01) and radioresistance (p < 0.01). Reanalyses of published studies further revealed that miR-548c-3p is significantly overexpressed in CRPC (p < 0.05) and is associated with poor recurrence-free survival (p < 0.05), suggesting that miR-548c-3p is a functional biomarker for PCa aggressiveness. Our results validate the prognostic and therapeutic relevance of miRNAs for PCa management while demonstrating that resolving cell-type and differentiation-specific differences is essential to obtain clinically relevant miRNA expression profiles. Patient summary We report microRNA (miRNA) expression profiles of epithelial cell fractions from the human prostate, including stem cells. miR-548c-3p was revealed as a functional biomarker for prostate cancer progression. The evaluation of miR-548c-3p in a larger patient cohort should yield information on its clinical usefulness.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, BioMediTech, Prostate cancer research center (PCRC), Tampere University Hospital, University of York, Molecular Biology of Prostate Cancer Group, Terry Fox Laboratory, Eaves Lab, BC Cancer Research Centre, Hull York Medical School, University of Hull, Department of Urology, Castle Hill Hospital
Authors: Rane, J. K., Scaravilli, M., Ylipää, A., Pellacani, D., Mann, V. M., Simms, M. S., Nykter, M., Collins, A. T., Visakorpi, T., Maitland, N. J.
Keywords: (Biomarker, Castration-resistant prostate cancer, MicroRNA, Stem cells)
Number of pages: 4
Pages: 7-10
Publication date: 1 Jan 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Urology, Medicine(all)

Publication information

Journal: European Urology
Volume: 67
Issue number: 1
ISSN (Print): 0302-2838
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 7.455 4.777
Publication Forum (2016): 3
Publication Forum (2014): 2
Publication Forum (2013): 2
Publication Forum (2012): 2
Scopus rating (2010): 3.103 2.154
Scopus rating (2009): 3.381 2.345
Accidents and Close Call Situations Connected to the Use of Mobile Phones in Working-Age People ≥ 50 Years Old

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen, University of Modena and Reggio Emilia
Authors: Korpinen, L., Pääkkönen, R., Gobba, F.
Number of pages: 3
Pages: 1353-1356
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication Information
Journal: International Journal of Social, Behavioral, Educational, Economic and Management Engineering
Volume: 9
Issue number: 5
ISSN (Print): 2010-376X
Ratings:
Publication Forum (2016): 0
Original language: English
Links:
http://waset.org/publication/Accidents-and-Close-Call-Situations-Connected-to-the-Use-of-Mobile-Phones-in-Working-Age-People-%C3%A2%C2%89%C2%A5-50-Years-Old/10001217

Research output: Scientific - peer-review › Article

A fast stimulability screening protocol for neuronal cultures on microelectrode arrays
Microelectrode arrays (MEAs) are used to study the electrical activity in brain slices and neuronal cultures. MEA experiments for the analysis of electrical stimulation responses require the tissue or culture to be prone to stimulation. For brain slices, potential stimulation sites may be directly visible in microscope, in which case the determination of stimulability at those locations is sufficient. In unstructured neuronal cultures, potential stimulation sites may not be known a priori, and spatial stimulability screening should be performed. Considering, e.g., 59 microelectrode sites, each to be stimulated several times, may result in long screening times, unacceptable with a MEA system without an integrated CO2 incubator, or in high stimulation effects on the networks. Here, we describe an implementation of a fast stimulation protocol employing pseudorandom stimulation site switching aiming at alleviating the network effects of the stimulability screening. In this paper, we show the usability of the proposed protocol by first detecting stimulable locations and subsequently apply repeated stimulation on the identified potentially stimulable locations to observe an exemplary neuronal pathway.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Age dependence of arterial pulse wave parameters extracted from dynamic blood pressure and blood volume pulse waves

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Peltokangas, M., Vehkaoja, A., Verho, J., Mattila, V. M., Romsi, P., Lekkala, J., Oksala, N.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Journal of Biomedical and Health Informatics
ISSN (Print): 2168-2194
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.852 1.971
Publication Forum (2016): 2
Scopus rating (2015): 0.823 2.297
Web of Science (2015): 2.093 2.1 1.8 0.488 0.00317 0.652
Publication Forum (2015): 2
Scopus rating (2014): 0.692 2.37
Web of Science (2014): 1.44 1.448 1.3 0.351 5.9E-4 0.318
Publication Forum (2014): 2
Scopus rating (2013): 1.049 2.405
Scopus rating (2012): 0.799 2.261
Scopus rating (2011): 0.681 2.042
Scopus rating (2010): 0.632 1.862
Scopus rating (2009): 0.588 1.809
Scopus rating (2008): 0.605 2.01
Scopus rating (2007): 0.716 2.154
Scopus rating (2006): 0.685 2.199
Scopus rating (2005): 0.596 1.843
Scopus rating (2004): 0.486 1.355
Scopus rating (2003): 0.616 1.65
Scopus rating (2002): 0.491 1.309
Scopus rating (2001): 0.821 1.548
Scopus rating (2000): 0.459 1.515
Scopus rating (1999): 0.367 0.952
Original language: English
DOIs: 10.1109/JOBI.2015.2503889
A new method for automatic marking epileptic spike-wave discharges in local field potential signals
This work proposes a new method for automatic marking epileptic spike-wave discharges in local field potential (LFP) signals. The method is based on empirical modelling using radial basis functions to approximate dependency of a further state on the current one. Number and type of radial basis functions used are adjusted to data based on statistical criteria. Due to this the method needs only a few manual efforts for its application to new data. The time resolution of the method is close to the sampling interval of the original data, and real time detection is possible. Detection accuracy of the proposed approach is validated analysing the LFP signals obtained using WAG/Rij rats.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: MMDM, Research group: Laboratory of Biosystem Dynamics-LBD, Saratov NG Chemychevskii State Univ, Saratov State University, Dept Nano & Biomed Technol, Radboud Univ Nijmegen, Radboud University Nijmegen, Donders Ctr Cognit, Univ Munster, University of Munster, Inst Physiol
Authors: Startceva, S., Lüttjohann, A., Sysoev, I. V., van Luijtelaar, G.
Keywords: (local field potentials, epilepsy, signal processing, radial-basis functions, SEIZURES, MODELS, EEG)
Number of pages: 8
Publication date: 2015

Host publication information
Title of host publication: Saratov Fall Meeting 2014: Optical Technologies in Biophysics and Medicine XVI; Laser Physics and Photonics XVI; and Computational Biophysics
Place of publication: Bellingham
Publisher: SPIE
Editors: Genina, E., Derbov, V., Larin, K., Postnov, D., Tuchin, V.

Publication series
Name: Proceedings of SPIE
Publisher: SPIE-INT SOC OPTICAL ENGINEERING
Volume: 9448
ISSN (Print): 0277-786X
DOIs: 10.1117/12.2179017
Source: WOS
Source-ID: 000353791300062
Research output: Scientific - peer-review » Conference contribution

Antennas for Telemetric Wireless Body Area Networks: Analysis, Design and Performance Validation

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Identification and Sensing Systems Research Group
Authors: Moradi, E.
Publication date: 2015

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1325
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution:Tampere University of Technology
Antennas in Body-Centric Sensor Network Devices

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Identification and Sensing Systems Research Group
Authors: Ukkonen, L., Rahmat-Samii, Y.
Number of pages: 20
Pages: 1-20
Publication date: 2015

Host publication information
Title of host publication: Handbook of Antenna Technologies
Publisher: Springer
ISBN (Electronic): 978-981-4560-75-7
DOIs:
10.1007/978-981-4560-75-7_108-1
Research output: Scientific - peer-review

Automatic quantification of mitochondrial fragmentation from two-photon microscope images of mouse brain tissue

The morphology of mitochondria can inform about their functional state and, thus, about cell vitality. For example, fragmentation of the mitochondrial network is associated with many diseases. Recent advances in neuronal imaging have enabled the observation of mitochondria in live brains for long periods of time, enabling the study of their dynamics in animal models of diseases. To aid these studies, we developed an automatic method, based on supervised learning, for quantifying the degree of mitochondrial fragmentation in tissue images acquired via two-photon microscopy from transgenic mice, which exclusively express Enhanced cyan fluorescent protein (ECFP) under Thy1 promoter, targeted to the mitochondrial matrix in subpopulations of neurons. We tested the method on images prior to and after cardiac arrest, and found it to be sensitive to significant changes in mitochondrial morphology because of the arrest. We conclude that the method is useful in detecting morphological abnormalities in mitochondria and, likely, in other subcellular structures as well.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM), Neurotar LTD, University of Helsinki
Authors: Lihavainen, E., Kislin, M., Toptunov, D., Khiroug, L., S. Ribeiro, A.
Keywords: (Beta regression, Image analysis, Intravital imaging, Mitochondrial fragmentation, Mitochondrial morphology, Two-photon microscopy)
Pages: 338–351
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Histology, Pathology and Forensic Medicine

Publication information
Journal: Journal of Microscopy: Oxford
Volume: 206
Issue number: 3
ISSN (Print): 0022-2720
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.734 0.852
Publication Forum (2016): 1
Scopus rating (2015): 0.964 1.106
Web of Science (2015): 2.136 2.034 >10.0 0.479 0.00706 0.759
Publication Forum (2015): 1
Scopus rating (2014): 1.059 1.357
Web of Science (2014): 2.331 2.144 >10.0 0.31 0.00842 0.781
Publication Forum (2014): 1
Biological networks: the microscope of the twenty-first century?

General information
State: Published
Ministry of Education publication type: B1 Article in a scientific magazine
Organisations: Department of Signal Processing, BioMediTech
Authors: Emmert-Streib, F., Dehmer, M.
Publication date: 2015
Peer-reviewed: No

Publication information
Journal: Frontiers in Genetics
Volume: 6
ISSN (Print): 1664-8021
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.99 0.888
Publication Forum (2016): 1
Scopus rating (2015): 2.001 0.847
Publication Forum (2015): 1
Scopus rating (2014): 1.765 0.752
Publication Forum (2014): 1
Scopus rating (2013): 1.327 0.597
Publication Forum (2013): 1
Scopus rating (2012): 0.721 0.353
Publication Forum (2012): 1
Scopus rating (2011): 0.147 0.022
Original language: English
DOIs:
10.1111/jmi.12301
Source: Scopus
Source-ID: 84939492144
Research output: Scientific - peer-review › Article
CIP2A is a candidate therapeutic target in clinically challenging prostate cancer cell populations
Residual androgen receptor (AR)-signaling and presence of cancer stem-like cells (SCs) are the two emerging paradigms for clinically challenging castration-resistant prostate cancer (CRPC). Therefore, identification of AR-target proteins that are also overexpressed in the cancer SC population would be an attractive therapeutic approach. Our analysis of over three hundred clinical samples and patient-derived prostate epithelial cultures (PPECs), revealed Cancerous inhibitor of protein phosphatase 2A (CIP2A) as one such target. CIP2A is significantly overexpressed in both hormonenaive prostate cancer (HN-PC) and CRPC patients. CIP2A is also overexpressed, by 3- and 30-fold, in HN-PC and CRPC SCs respectively. In vivo binding of the AR to the intronic region of CIP2A and its functionality in the AR-moderate and AR-high expressing LNCaP cell-model systems is also demonstrated. Further, we show that AR positively regulates CIP2A expression, both at the mRNA and protein level. Finally, CIP2A depletion reduced cell viability and colony forming efficiency of AR-independent PPECs as well as AR-responsive LNCaP cells, in which anchorage-independent growth is also impaired. These findings identify CIP2A as a common denominator for AR-signaling and cancer SC functionality, highlighting its potential therapeutic significance in the most clinically challenging prostate pathology: castration-resistant prostate cancer.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, BioMediTech, Prostate cancer research center (PCRC), BioMediTech - Institute of Biosciences and Medical Technology, Tampere University Hospital and Medical School, YCR Cancer Research Unit, Department of Biochemistry/Molecular Plant Biology, Columbia University in the City of New York, Department of Pathology and Neuro-Oncology, University of Turku, Prostate Cancer Research Center (PCRC), Adult Cancer Program, The Prince of Wales Clinical School, Lowy Cancer Research Centre, UNSW Medicine, University of New South Wales, Centre for Molecular Medicine Norway (NCMM), Nordic EMBL Partnership, University of Oslo and Oslo University Hospital, Department of Cancer Prevention, Institute for Cancer Research, Oslo University Hospital, Turku Centre for Biotechnology
Keywords: (Androgen receptor, Cancer stem-like cells, Castration-resistant prostate cancer, CIP2A)
Number of pages: 10
Pages: 19661-19670
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Oncology

Publication information
Journal: Oncotarget
Volume: 6
Issue number: 23
ISSN (Print): 1949-2553
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.927 1.056
Publication Forum (2016): 1
Scopus rating (2015): 2.262 1.113
Web of Science (2015): 5.008 5.415 1.6 0.714 0.031 1.362
Publication Forum (2015): 1
Scopus rating (2014): 2.521 1.277
Web of Science (2014): 6.359 6.368 2.4 0.572 0.01434 1.724
Publication Forum (2014): 1
Scopus rating (2013): 3.041 1.268
Publication Forum (2013): 1
Scopus rating (2012): 2.474 1.096
Publication Forum (2012): 1
Scopus rating (2011): 1.481 0.494
Original language: English
DOIs:
10.18632/oncotarget.3875
Source: Scopus
Source-ID: 84939224156
Research output: Scientific - peer-review › Article
Collecting a citizen’s digital footprint for health data mining

This paper describes a case study for collecting digital footprint data for the purpose of health data mining. The case study involved 20 subjects residing in Finland who were instructed to collect data from registries which they evaluated to be useful for understanding their health or health behavior, current or past. 11 subjects were active, sending 100 data requests to 49 distinct organizations in total. Our results indicate that there are still practical challenges in collecting actionable digital footprint data. Our subjects received a total of 75 replies (reply rate of 75.0%) and 61 datasets (reception rate of 61%). Out of the received data, 44 datasets (72.1%) were delivered in paper format, 4 (6.6%) in portable document format and 13 (21.3%) in structured digital form. The time duration between the sending of the information requests and reception of a reply was 26.4 days on the average.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Gencoglu, O., Similä, H., Honko, H., Isomursu, M.
Keywords: (Banking, Data mining, Education, Insurance, Medical services, Organizations, Portable document format)
Number of pages: 4
Pages: 7626-7629
Publication date: 2015

Comparison of HRV parameters derived from photoplethysmography and electrocardiography signals

Heart rate variability (HRV) has become a useful tool in analysis of cardiovascular system in both research and clinical fields. HRV has been also used in other applications such as stress level estimation in wearable devices. HRV is normally obtained from ECG as the time interval of two successive R waves. Recently PPG has been proposed as an alternative for ECG in HRV analysis to overcome some difficulties in measurement of ECG. In addition, PPG-HRV is also used in some commercial devices such as modern optical wrist-worn heart rate monitors. However, some researches have shown that PPG is not a surrogate for heart rate variability analysis. In this work, HRV analysis was applied on beat-to-beat intervals obtained from ECG and PPG in 19 healthy male subjects. Some important HRV parameters were calculated from PPG-HRV and ECG-HRV. Maximum of PPG and its second derivative were considered as two methods for obtaining the beat-to-beat signals from PPG and the results were compared with those achieved from ECG-HRV. Our results show that the smallest error happens in SDNN and SD2 with relative error of 2.46% and 2%, respectively. The most affected parameter is pNN50 with relative error of 29.89%. In addition, in our trial, using the maximum of PPG gave better results than its second derivative.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Jeyhani, V., Mahdiani, S., Peltokangas, M., Vehkaoja, A.
Keywords: (Biomedical monitoring, Electrocardiography, Heart rate variability, Interpolation, Monitoring, Photoplethysmography)
Number of pages: 4
Pages: 5952-5955
Publication date: 2015
Comparison of methods to define power line and substation's busbar wire capacitances in electric field calculation task

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, National Technical University
Authors: Okun, O., Korpinen, L.
Number of pages: 6
Pages: 55-61
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

Computational Model of Ca2+ Wave Propagation in Human Retinal Pigment Epithelial ARPE-19 Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Vainio, I., Abu Khamidakh, A., Paci, M., Skottman, H., Juuti-Uusitalo, K., Hyttinen, J., Nymark, S.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: PLoS One
Article number: 0128434
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Scopus rating (2015): 1.414 1.131
Web of Science (2015): 3.057 3.535 3.1 0.396 1.81924 1.139
Publication Forum (2015): 1
Computer vision for virus image classification

In this paper we present a new ensemble of descriptors for the classification of transmission electron microscopy images of viruses that is based on texture analysis. A set of six well-assessed texture descriptors, namely Local Binary Pattern (LBP), Local Ternary Pattern (LTP), Dense LBP (DLBP), Rotation Invariant co-occurrence among LBP (RI), Local Phase Quantization (LPQ), and LBP Histogram Fourier (LHF), are combined with innovative approaches to improve their performances in virus classification. To generate new variants of the aforementioned descriptors, different approaches are applied: (i) the Edge approach (ED), which extracts the textural information from specific regions of the image instead of from the original image; (ii) the Bag of Features (BOF) scheme, which is used to build vocabularies of the most representative patterns; and (iii) Multi-Quinary coding (MQ). Moreover, to demonstrate the generalizability and applicability of ED and BOF, they are tested on additional datasets containing subcellular parts and tissues. We observe that ED improves the performance of the single standard descriptors, while BOF is particularly effective in fusion by sum rule with the standard application of texture descriptors (i.e., when they are extracted from the entire image). In contrast, the combination of MQ with LHF, DLBP, and RI does not improve virus classification. Using these results, we suggest a new ensemble of descriptors called NewF, which is based on the best methods investigated in this paper, as well as on some other state-of-the-art descriptors. NewF accuracy in virus classification is 85.7%, outperforming previous methods proposed in the literature for the same task (i.e., virus classification using the object scale dataset). The MATLAB code for our methods and NewF descriptor are available at https://www.dei.unipd.it/node/2357.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Universita degli Studi di Padova, Italy, Missouri State University
Authors: Caetano dos Santos, F. L., Paci, M., Nanni, L., Brahnam, S., Hyttinen, J.
Keywords: (Texture descriptors, feature selection, Local binary patterns, Ensemble of descriptors)
Number of pages: 12
Pages: 11-22
Publication date: 2015
Peer-reviewed: Yes
Early online date: 11 Feb 2015

Publication information
Journal: Biosystems Engineering
Volume: 138
ISSN (Print): 1537-5110
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.738 1.573
Publication Forum (2016): 1
Scopus rating (2015): 0.856 1.64
Web of Science (2015): 1.997 2.063 6.9 0.431 0.006 0.556
Publication Forum (2015): 1
Controlling cell migration and adhesion into a scaffold by external electric currents

Fabrication of more complex tissue-engineered structures, resembling the tissues and organs in vivo requires combining more than one cell type within the same construct. This can be achieved by designing and fabricating complex scaffolds with asymmetric properties but controlled arrangement of cells within the scaffold could also be realized by using electric current. External electric currents are able to modify cell adhesion, orientation and migration and this can be used for influencing cell location within a scaffold. In this paper we studied the effect of an electric current on cell migration and adhesion into a three-dimensional scaffold through a conductive mesh.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Jaatinen, L., Voros, J., Hyttinen, J.
Number of pages: 4
Pages: 3549-3552
Publication date: 2015

Host publication information
Title of host publication: 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
ISBN (Print): 978-1-4244-9270-1
DOIs:
10.1109/EMBC.2015.7319159
Source: RIS
Source-ID: urn:D0D70068CB64ADD8CD860CE72A911
Research output: Scientific - peer-review » Article
Data Correction for Seven Activity Trackers based on Regression Models

Using an activity tracker for measuring activity-related parameters, e.g. steps and energy expenditure (EE), can be very helpful in assisting a person's fitness improvement. Unlike the measuring of number of steps, an accurate EE estimation requires additional personal information as well as accurate velocity of movement which is hard to achieve due to inaccuracy of sensors. In this paper, we have evaluated regression-based models to improve the precision for both steps and EE estimation. For this purpose, data of seven activity trackers and two reference devices was collected from 20 young adult volunteers wearing all devices at once in three different tests, namely 60-minute office work, 6-hour overall activity and 60-minute walking. Reference data is used to create regression models for each device and relative percentage errors of adjusted values are then statistically compared to that of original values. The effectiveness of regression models are determined based on the result of a statistical test. During a walking period, EE measurement was improved in all devices. The step measurement was also improved in five of them. The results show that improvement of EE estimation is possible only with low-cost implementation of fitting model over the collected data e.g. in the app or in corresponding service back-end.

Detection and Segmentation of Nucleoids Based on Gradient Path Labelling

Cellular aging is one of the topics that live cell imaging can assist. With age, there is an increase of aggregates of misfolded proteins, to which age-related diseases have been linked to. In Escherichia coli, protein aggregates linked to its aging process exhibit a spatial distribution that appears to be caused by the nucleoid at midcell. To correlate the locations of protein aggregates and the nucleoid, it is necessary to detect and segment the nucleoid from microscopy images. We present an adaptation of methods for Drusens' detection and segmentation to nucleoids in E. coli. The size of the nucleoid, extracted using the method here proposed, was compared with an alternative measure (FWHM-based measure) and with the regions of anisotropies in aggregates motions. These comparisons suggest that our new method is of use,
providing more accurate minor axis lengths. Also, it provides additional measures, such as the nucleoid’s center orientation angle, area, and pixel list.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD
Authors: Santinha, J., Mora, A. D., Fonseca, J., Goncalves, N., Ribeiro, A. S.
Number of pages: 5
Pages: 51-55
Publication date: 2015
Peer-reviewed: Yes

**Publication information**
Journal: International Journal of Pharma Medicine and Biological Sciences
Volume: 4
Issue number: 1
ISSN (Print): 2278-5221
Publication Forum (2017): 0
Publication Forum (2016): 0
Scopus rating (2015): 0.124 0.0
Scopus rating (2014): 0.123 0.0
Scopus rating (2013): 0.122 0.0
Original language: English
Links:
Research output: Scientific - peer-review › Article

**Detection of exercise load-associated differences in hip muscles by texture analysis**

We examined whether specific physical exercise loading is associated with texture parameters from hip muscles scanned with magnetic resonance imaging (MRI). Ninety-one female athletes representing five distinct exercise-loading groups (high-impact, odd-impact, low-impact, nonimpact and high-magnitude) and 20 nonathletic female controls underwent MRI of the hip. Texture parameters were computed from the MRI images of four hip muscles (gluteus maximus, gluteus medius, iliopsoas and obturator internus). Differences in muscle texture between the athlete groups and the controls were evaluated using Mann-Whitney U-test. Significant (P<0.05) textural differences were found between the high-impact (triple and high jumpers) and the control group in gluteus medius, iliopsoas and obturator internus muscles. Texture of the gluteus maximus, gluteus medius and obturator internus muscles differed significantly between the odd impact (soccer and squash players) and the control group. Textures of all studied muscles differed significantly between the low impact (endurance runners) and the controls. Only the gluteus medius muscle differed significantly between the nonimpact (swimmers) and the controls. No significant difference in muscle texture was found between the high-magnitude (powerlifters) and the control group. In conclusion, MRI texture analysis provides a quantitative method capable of detecting textural differences in hip muscles that are associated with specific types of long-term exercise loadings.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Nketiah, G., Savio, S., Dastidar, P., Nikander, R., Eskola, H., Sievänen, H.
Number of pages: 7
Pages: 428-434
Publication date: 2015
Peer-reviewed: Yes

**Publication information**
Volume: 25
Issue number: 3
ISSN (Print): 0905-7188
Publication Forum (2017): 2
Scopus rating (2016): 1.61 1.414
Effects of fungal species, cultivation time, growth substrate, and air exposure velocity on the fluorescence properties of airborne fungal spores

Real-time bioaerosol monitoring is possible with fluorescence based instruments. This study provides information on major factors that can affect the fluorescence properties of airborne fungal spores. Two fluorescence-based bioaerosol detectors, BioScout, and ultraviolet aerodynamic particle sizer (UVAPS), were used to study fluorescent particle fractions (FPFs) of released spores of three fungal species (Aspergillus versicolor, Cladosporium cladosporioides, and Penicillium brevicompactum). Two culture media (agar and gypsum board), three ages of the culture (one week, one month, and four months), and three aerosolization air velocities (5, 15, and 27 m/s) were tested. The results showed that the FPF values for spores released from gypsum were typically lower than for those released from agar indicating that poor nutrient substrate produces spores with lower amounts of fluorescent compounds. The results also showed higher FPF values with lower air velocities in aerosolization. This indicates that easily released fully developed spores have more fluorescent compounds compared to forcibly extracted non-matured spores. The FPFs typically were lower with older samples. The FPF results between the two instruments were similar, except with four-month-old samples. The results can be utilized in field measurements of fungal spores to estimate actual concentrations and compare different instruments with fluorescence-based devices as well as in instrument calibration and testing in laboratory conditions. © 2015 John Wiley
Effects of sensor type and sensor location on signal quality in bed mounted ballistocardiographic heart rate and respiration monitoring

Sleeping is a crucial part of our circadian rhythm and the quality of sleep has substantial impact on the quality of life in general and the overall well-being of a person. That is why sleep related physiological measurements have been in the focus of many scientific studies along the years, and why a large number of different measurement methods have been developed for this purpose. The ability to monitor heart rate respiration without any sensors or electrodes being directly attached to the body is extremely useful especially in long-term monitoring and it allows automated daily measurements without any medical staff present. This is the reason why ballistocardiographic force sensors and accelerometers have been introduced alongside electrocardiography (ECG) and thermistors or respiration belts as a means to monitor the heart rate and respiration during sleep. While ECG remains as the most reliable and accurate method for heart rate monitoring, the development of unobtrusive monitoring methods has improved to the point where the commercialization of such sleep monitoring systems has been possible. In this paper, the signals of five sensors and sensor placement combinations for measuring physiological parameters from a sleeping person are evaluated and compared in terms of their measurement sensitivities and waveform quality. The sensors are accelerometer and film type force sensors made of PVDF and EMFi material placed under the mattress topper and PVDF and EMFi sensors placed under the bed posts.
Evaluation of the beat-to-beat detection accuracy of PulseOn wearable optical heart rate monitor

Heart rate variability (HRV) provides significant information about the health status of an individual. Optical heart rate monitoring is a comfortable alternative to ECG based heart rate monitoring. However, most available optical heart rate monitoring devices do not supply beat-to-beat detection accuracy required by proper HRV analysis. We evaluate the beat-to-beat detection accuracy of a recent wrist-worn optical heart rate monitoring device, PulseOn (PO). Ten subjects (8 male and 2 female; 35.9±10.3 years old) participated in the study. HRV was recorded with PO and Firstbeat Bodyguard 2 (BG2) device, which was used as an ECG based reference. HRV was recorded during sleep. As compared to BG2, PO detected on average 99.57% of the heartbeats (0.43% of beats missed) and had 0.72% extra beat detection rate, with 5.94 ms
mean absolute error (MAE) in beat-to-beat intervals (RRI) as compared to the ECG based RRI BG2. Mean RMSSD difference between PO and BG2 derived HRV was 3.1 ms. Therefore, PO provides an accurate method for long term HRV monitoring during sleep.

**General information**

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: Personal Health Informatics-PHI, Department of Signal Processing
Authors: Parak, J., Tarniceriu, A., Renevey, P., Bertschi, M., Delgado-Gonzalo, R., Korhonen, I.
Keywords: (Accuracy, Biomedical monitoring, Electrocardiography, Heart rate variability, Monitoring, Optical sensors)
Number of pages: 4
Pages: 8099-8102
Publication date: 2015

**Host publication information**

Title of host publication: 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
ISBN (Print): 978-1-4244-9270-1
DoIs: 10.1109/EMBC.2015.7320273
Source: RIS
Source-ID: urn:55CB955EA5E26024C54AE9738A47CB72
Research output: Scientific - peer-review › Conference contribution

**Example measurements of exposure to ELF magnetic fields on the metro station in Finland**

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Helsinki City Transport, Combinova, Reijers Oy
Authors: Korpinen, L., Lähdetie, A., Amundin, Å., Piippo, H., Sydänheimo, L.
Number of pages: 4
Pages: 250-253
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

**Publication information**

Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

**Examples of occupational exposure to electric and magnetic fields at 110-kV gas-insulated substations (GISs)**

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 4
Pages: 394-397
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering
Examples of the Teaching of the Health Questions of Electric and Magnetic Fields at Tampere University of Technology in Finland

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 6
Pages: 277-282
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Journal of Physical Science and Application
Volume: 5
Issue number: 4
ISSN (Print): 2159-5348
Ratings:
Publication Forum (2017): 0
Experimental determination and computational interpretation of biophysical properties of lipid bilayers enriched by cholesteryl hemisuccinate

Cholesteryl hemisuccinate (CHS) is one of the cholesterol-mimicking detergents not observed in nature. It is, however, widely used in protein crystallography, in biochemical studies of proteins, and in pharmacology. Here, we performed an extensive experimental and theoretical study on the behavior of CHS in lipid membranes rich in unsaturated phospholipids. We found that the deprotonated form of CHS (that is the predominant form under physiological conditions) does not mimic cholesterol very well. The protonated form of CHS does better in this regard, but also its ability to mimic the physical effects of cholesterol on lipid membranes is limited. Overall, although ordering and condensing effects characteristic to cholesterol are present in systems containing any form of CHS, their strength is appreciably weaker compared to cholesterol. Based on the considerable amount of experimental and atomistic simulation data, we conclude that these differences originate from the fact that the ester group of CHS does not anchor it in an optimal position at the water-membrane interface. The implications of these findings for considerations of protein-cholesterol interactions are briefly discussed.
Exploration of different boundary conditions in the sideways falling situation in hip fracture finite element modelling

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mechanical Engineering and Industrial Systems, Research area: Applied Mechanics, Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, UKK Institute for Health Promotion Research
Authors: Abe, S., Ylinen, A., Narra Girish, N., Nikander, R., Hyttinen, J., Kouhia, R., Sievänen, H.
Number of pages: 6
Pages: 130-135
Publication date: 2015

Host publication information
Title of host publication: Proceeding of the XII Finnish Mechanics Days
Publisher: Rakenteiden Mekaniikan Seura ry
ISBN (Print): 978-952-93-5608-9

Exploratory analysis of associations between individual lifestyles and heart rate variability-based recovery during sleep
Sleep is the most important period for recovering from daily stress and load. Assessment of the stress recovery during sleep is therefore, an important metric for care and quality of life. Heart rate variability (HRV) is a non-invasive marker of autonomic nervous system (ANS) activity, and HRV-based methods can be used to assess physiological recovery, characterized by parasympathetic domination of the ANS. HRV is affected by multiple factors of which some are unmodifiable (such as age and gender) but many are related to daily lifestyle choices (e.g. alcohol consumption, physical activity, sleeping times). The purpose of this study was to investigate the association of these aforementioned factors on HRV-based recovery during sleep on a large sample. Variable importance measures yielded by random forest were used for identifying the most relevant predictors of sleep-time recovery. The results emphasize the disturbing effects of alcohol consumption on sleep-time recovery. Good physical fitness is associated to good recovery, but acute physical activity seems to challenge or delay the recovery process for the next night. Longer sleeping time enables more recovery minutes, but the proportion of recovery (i.e. recovery efficiency) seems to peak around 7.0–7.25 hours of sleep.

General information
State: Published
Host publication information
Title of host publication: 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
ISBN (Print): 978-1-4244-9270-1
DOIs:
10.1109/EMBC.2015.7318862

Bibliographical note
EXT="Jimison, Holly"
Source: RIS
Source-ID: urn:FD3E2171E145AFAE9241038AA0724993
Research output: Scientific - peer-review › Conference contribution

Exposure to RF fields during the remote readings of the smart meter in Finland

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 3
Pages: 69-71
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

Fabrication and characterization of superluminescent diodes for 2–3 µm wavelength

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications, Optoelectronics Research Centre, Tampere University of Technology
Authors: Zia, N., Viheriälä, J., Koskinen, R., Koskinen, M., Suomalainen, S., Guina, M.
Publication date: 2015

Host publication information
Title of host publication: Northern Optics and Photonics 2015 : June 2-4, 2015, Lappeenranta
Research output: Scientific › Conference contribution
Health issues in the bioenergy supply chain - Aims at best practices

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, Finnish Institute of Occupational Health, University of Eastern Finland
Authors: Korpijärvi, K., Fagernäs, L., Ojanen, K., Laitinen, S., Aatamila, M., Laitinen, J., Jumpponen, M., Koponen, H., Jokiniemi, J., Korpinen, L.
Number of pages: 7
Pages: 63-69
Publication date: 2015

Host publication information
Title of host publication: Bionergy 2015 Conference 2.-3.9.2015
ISBN (Print): 978-952-67890-3-3
Research output: Scientific - peer-review » Conference contribution

Health surveillance according to the new EU directive 2013/35/EU: possible criteria

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, University of Modena and Reggio Emilia
Authors: Korpinen, L., Gobba, F.
Number of pages: 3
Pages: 127-129
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review » Article

Human induced pluripotent stem cell-derived versus adult cardiomyocytes: an in silico electrophysiological study on ionic current block effects

Background and purpose.
Two new technologies hold the promise to revolutionize cardiac safety and drug development: in vitro experiments on human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs) and in silico human adult ventricular cardiomyocyte (hAdultV-CM) models. Their combination was recently proposed as a potential replacement for the present hERG-based QT study in safety pharmacology assessment. Here, we systematically compare in silico the effects of selective ionic current block on hiPSC-CM and hAdultV-CM action potentials (APs), to identify similarities/differences and to illustrate the potential of computational models as supportive tools for evaluating new in vitro technologies.

Experimental approach.
In silico AP models of ventricular-like and atrial-like hiPSC-CMs and hAdultV-CM are used to simulate the main effects of four degrees of block of the main cardiac transmembrane currents.

Key results.
Qualitatively, hiPSC-CM and hAdultV-CM APs show similar responses to current block, consistent with experiments. However, quantitatively, hiPSC-CMs display stronger sensitivities to block of (i) L-type Ca2+ current due to the overexpression of the Na+-Ca2+ exchanger (leading to shorter APs) and (ii) inward rectifier K+ current due to reduced repolarization reserve (inducing diastolic potential depolarization and repolarization failure).

Conclusions and Implications.
In silico hiPSC-CMs and hAdultV-CMs exhibit similar response to selective current blocks. However, overall hiPSC-CMs show greater sensitivity to block, which may facilitate in vitro identification of drug-induced effects. Extrapolation of drug effects from hiPSC-CM to hAdultV-CM and pro-arrhythmic risk assessment can be facilitated by in silico predictions using biophysically-based computational models.

**Keywords**
hiPSC-derived cardiomyocytes, in silico models, action potential, cardiotoxicity assessment.

**General information**

State: Published  
Ministry of Education publication type: A1 Journal article-refereed  
Organisations: Research group: Computational Biophysics and Imaging Group, Department of Electronics and Communications Engineering, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), University of Oxford, University of Bologna, Italy  
Authors: Paci, M., Hyttinen, J., Rodriguez, B., Severi, S.  
Keywords: (hiPSC-derived cardiomyocytes, in silico models, action potential, cardiotoxicity assessment)  
Pages: 5147 - 5160  
Publication date: 2015  
Peer-reviewed: Yes
iCellFusion – a Tool for Fusion of Time-lapsed Multimodal Microscopy images

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: Laboratory of Biosystem Dynamics-LBD
Number of pages: 29
Pages: 71-99
Publication date: 2015

Host publication information
Title of host publication: Biomedical Image Analysis and Mining Techniques for Improved Health Outcomes
Publisher: IGI Global
ISBN (Electronic): 9781466688117
Research output: Scientific - peer-review » Chapter

Impedanssipneumografia pienten lasten alahengitytiesoireiden selvittelyssä

General information
State: Published
Ministry of Education publication type: D2 Article in professional manuals or guides or professional information systems or textbook material
Organisations: Department of Electronics and Communications Engineering, Research group: Physiological Measurement Systems and Methods Group
Authors: Seppä, V., Pelkonen, A. S., Kotaniemi-Syrjänen, A., Viik, J., Mäkelä, M. J., Malmberg, P.
Publication date: 2015

Host publication information
Title of host publication: Allergiatutkimussäätiön vuosikirja 2015
Publication series
Name: Allergiakoulu
Publisher: Allergiatutkimussäätiö
ISSN (Print): 1457-2508
Research output: Professional » Chapter

Infant respiration and heart rate monitoring with EMFi sensor

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Rajala, S., Lekkala, J.
Number of pages: 5
Publication date: 2015

Host publication information
Title of host publication: IMEKO XXI World Congress, Proceedings, August 30 - September 4, 2015, Prague, Czech Republic
Editor: Holub, J.
ISBN (Electronic): 978-80-01-05793-3
Research output: Scientific - peer-review » Conference contribution

Inkjet-printed push-buttons for epidermal electronics

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Electronics and Communications Engineering, Research group: Laboratory for Future Electronics
In silico analysis of division times of Escherichia coli populations as a function of the partitioning scheme of non-functional proteins

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Gupta, A., Lloyd-Price, J., Ribeiro, A. S.
Pages: 9-21
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: In Silico Biology
Volume: 1
Issue number: 2
ISSN (Print): 1386-6338
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.285 0.195
Publication Forum (2016): 1
Scopus rating (2015): 0.654 0.2
Publication Forum (2015): 1
Scopus rating (2014): 0.311 0.187
Publication Forum (2014): 1
Scopus rating (2013): 0.241 0.156
Publication Forum (2013): 1
Scopus rating (2012): 0.207 0.352
Publication Forum (2012): 1
Scopus rating (2011): 0.465 0.398
Scopus rating (2010): 0.364 0.268
Scopus rating (2009): 0.529 0.37
Scopus rating (2008): 0.6 0.339
Scopus rating (2007): 0.679 0.57
Scopus rating (2006): 0.882 0.653
Scopus rating (2005): 0.942 0.66
Scopus rating (2004): 0.679 0.811
Scopus rating (2003): 0.587 0.555
Scopus rating (2002): 1.258
Scopus rating (2001): 0.985
Scopus rating (2000): 0.47
Scopus rating (1999): 1.372
Integration of microfluidic sample delivery system on silicon nanowire-based biosensor

Silicon nanowire-based (SiNW) biosensors have gained a lot of attention during recent years. However, studies often totally neglect, or only briefly describe, the incorporation of microfluidic channel into the sensor architecture, although it is a crucial step towards a real lab-on-chip device. This paper proposes a process that can be applied to integration of microfluidic sample delivery system onto different SiNW biosensors. The sample delivery system includes a hydrophilic channel that enables the use of capillary action in delivering sample directly onto the sensor array, which leads to reduced sample loss, faster detection process, and frees from the use of external pumps. In addition, the microfluidic channel system protects the fragile SiNWs from mechanical shocks, chemical spatters, and dust. The sample delivery system was fabricated of surface treated polydimethylsiloxane (PDMS), using a four-step approach, as follows: (1) master molds for soft lithography were etched onto Si. (2) PDMS replicas of the molds were fabricated and (3) bonded onto example sensor chips using oxygen plasma. (4) Oxygen plasma treatment also enabled the attachment of polyvinylpyrrolidone (PVP) to the sample channel surfaces to synthesize hydrophilic polymer coating. A contact angle for the PVP treated PDMS was 21 after 17 days, indicating the formation of a long-term hydrophilic PDMS surface. Finally, the example SiNW sensor is modified to allow direct real-time detection of thyroid-stimulating hormone (TSH). The sensor was able to detect as low TSH concentration values as 0.5 mIU/l, which indicates a successfully integrated sample delivery system.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hemmilä, S., Gao, A., Lu, N., Li, T., Wang, Y., Kallio, P.
Number of pages: 10
Pages: 571-580
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Microsystem Technologies: Micro-and Nanosystems-Information Storage and Processing Systems
Volume: 21
Issue number: 3
ISSN (Print): 0946-7076
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.357 0.756
Publication Forum (2016): 1
Scopus rating (2015): 0.406 0.742
Web of Science (2015): 0.974 0.889 5.7 0.171 0.0042 0.231
Publication Forum (2015): 1
Scopus rating (2014): 0.343 0.828
Web of Science (2014): 0.875 0.834 6.0 0.227 0.00418 0.227
Publication Forum (2014): 1
Scopus rating (2013): 0.442 1.092
Publication Forum (2013): 1
Scopus rating (2012): 0.427 0.955
Publication Forum (2012): 1
Scopus rating (2011): 0.514 1.068
Scopus rating (2010): 0.519 1.045
Scopus rating (2009): 0.535 0.988
Scopus rating (2008): 0.557 1.085
Scopus rating (2007): 0.59 0.905
Scopus rating (2006): 0.443 0.733
Scopus rating (2005): 0.465 1.009
Scopus rating (2004): 0.39 0.812
Scopus rating (2003): 0.362 1.022
Is 50 Hz high enough ECG sampling frequency for accurate HRV analysis?

With the worldwide growth of mobile wireless technologies, healthcare services can be provided at anytime and anywhere. Usage of wearable wireless physiological monitoring system has been extensively increasing during the last decade. These mobile devices can continuously measure e.g. the heart activity and wirelessly transfer the data to the mobile phone of the patient. One of the significant restrictions for these devices is usage of energy, which leads to requiring low sampling rate. This article is presented in order to investigate the lowest adequate sampling frequency of ECG signal, for achieving accurate enough time domain heart rate variability (HRV) parameters. For this purpose the ECG signals originally measured with high 5 kHz sampling rate were down-sampled to simulate the measurement with lower sampling rate. Down-sampling loses information, decreases temporal accuracy, which was then restored by interpolating the signals to their original sampling rates. The HRV parameters obtained from the ECG signals with lower sampling rates were compared. The results represent that even when the sampling rate of ECG signal is equal to 50 Hz, the HRV parameters are almost accurate with a reasonable error.

Joint analysis of extracellular spike waveforms and neuronal network bursts

Background: Neuronal networks are routinely assessed based on extracellular electrophysiological micro electrode array (MEA) measurements by spike sorting, and spike and burst statistics. We propose to jointly analyze sorted spikes and detected bursts, and hypothesize that the obtained spike type compositions of the bursts can provide new information on the functional networks.
New method: Spikes are detected and sorted to obtain spike types and bursts are detected. In the proposed joint analysis, each burst spike is associated with a spike type, and the spike type compositions of the bursts are assessed.

Results: The proposed method was tested with simulations and MEA measurements of in vitro human stem cell derived neuronal networks under different pharmacological treatments. The results show that the treatments altered the spike type compositions of the bursts. For example, 6-cyano-7-nitroquinoxaline-2,3-dione almost completely abolished two types of spikes which had composed the bursts in the baseline, while bursts of spikes of two other types appeared more frequently. This phenomenon was not observable by spike sorting or burst analysis alone, but was revealed by the proposed joint analysis.

Comparison with existing methods: The existing methods do not provide the information obtainable with the proposed method: for the first time, the spike type compositions of bursts are analyzed.

Conclusions: We showed that the proposed method provides useful and novel information, including the possible changes in the spike type compositions of the bursts due to external factors. Our method can be employed on any data exhibiting sortable action potential waveforms and detectable bursts. (C) 2015 Elsevier B.V. All rights reserved.
Length of prostate biopsies is not necessarily compromised by pooling multiple cores in one paraffin block: An observational study

Background: Individually submitted prostatic needle biopsies are recommended by most guidelines because of their potential advantage in terms of core quality. However, unspecified bilateral biopsies are commonly submitted in many centers. The length of the core is the key quality indicator of prostate biopsies. Because there are few recent publications comparing the quality of 12 site-designated biopsies versus pooled biopsies, we compared the lengths of the biopsies obtained by both methods. Methods: The material was obtained from 471 consecutive subjects who underwent prostatic needle biopsy in the Tampere University Hospital district between January and June 2013. Biopsies from 344 subjects fulfilled the inclusion criteria. The total number of cores obtained was 4047. The core lengths were measured on microscope slides. Extraprostatic tissue was subtracted from the core length. Results: The aggregate lengths observed were 129.5±21.8 mm (mean±SD) for site-designated cores and 136.9±26.4 mm for pooled cores (p=0.09). The length of the core was 10.8±1.8 mm for site-designated cores and 11.4±2.2 mm for pooled cores (p=0.87). The median length for pooled cores was 11 mm (range 5 mm - 18 mm). For individual site-designated cores, the median length was 11 mm (range 7 mm -15 mm). The core length was not correlated with the number of cores embedded into one paraffin block (rho=0.015). There was no significant difference in cancer detection rate (p=0.62). Conclusions: Our results suggest that unspecified bilateral biopsies do not automatically lead to reduced core length. We conclude that carefully embedded multiple (three to nine) cores per block may yield cores of equal quality in a more cost-efficient way and that current guidelines favoring individually submitted cores may be too strict.
Low-profile head-worn antenna with a monopole-like radiation pattern

We present a low-profile antenna derived from a center-fed circular patch to provide uniform spatial coverage around a human head in 5.8 GHz ISM band. With the thickness of only 7 mm, it provides a compelling solution for a beacon-like radiator or harvester embedded in a smart headgear or in an in/off body communication relay-station. Below, we will first outline the development of an ellipsoid head model for numerically efficient optimization of the antenna and then detail the antenna development based on full-wave simulations. The results are validated using an anatomical head model and measurements both in air and in head-worn configuration. The measured results show that the antenna achieves a 0-dBi gain in the spatial angles around the head. The simulated radiation efficiency is 76% and SAR is well below ICNIRP and FCC limits even with 100 mW antenna power.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Wireless Identification and Sensing Systems Research Group, Department of Electronics and Communications Engineering
Authors: Björninen, T., Yang, F.
Number of pages: 4
Pages: 794-797
Publication date: 2015
Peer-reviewed: Yes
Early online date: 31 Aug 2015

Publication information

Journal: IEEE Antennas and Wireless Propagation Letters
Volume: 15
ISSN (Print): 1536-1225
Lung deposited surface area size distributions in different urban areas

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Physics, Research area: Aerosol Physics, Research group: The Instrumentation, Emissions, and Atmospheric Aerosols Group
Authors: Kuuluvainen, H., Järvinen, A., Pirjola, L., Niemi, J. V., Hillamo, R., Keskinen, J., Rönkkö, T.
Publication date: 2015

Host publication information
Title of host publication: AT 2015, Aerosol Technology, June 15-17, 2015, Tampere, Finland

Bibliographical note
ISBN kysytty, HO.
Ei ole, HO.
Research output: Professional › Conference contribution

Measurements of magnetic fields and contact currents produced by domestic induction hobs

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, University of Miyazaki, University of Tokushima
Authors: Tarao, H., Korpinen, L., Hayashi, N., Isaka, K.
Number of pages: 3
Methods for in vitro functional analysis of iPSC derived cardiomyocytes — Special focus on analyzing the mechanical beating behavior

Abstract
A rapidly increasing number of papers describing novel iPSC models for cardiac diseases are being published. To be able to understand the disease mechanisms in more detail, we should also take the full advantage of the various methods for analyzing these cell models. The traditionally and commonly used electrophysiological analysis methods have been recently accompanied by novel approaches for analyzing the mechanical beating behavior of the cardiomyocytes. In this review, we provide first a concise overview on the methodology for cardiomyocyte functional analysis and then concentrate on the video microscopy, which provides a promise for a new faster yet reliable method for cardiomyocyte functional analysis. We also show how analysis conditions may affect the results. Development of the methodology not only serves the basic research on the disease models, but could also provide the much needed efficient early phase screening method for cardiac safety toxicology. This article is part of a Special Issue entitled: Cardiomyocyte Biology: Integration of Developmental and Environmental Cues in the Heart edited by Marcus Schaub and Hughes Abriel.
Methods for in vitro functional analysis of iPSC derived cardiomyocytes

**DOIs:**
10.1016/j.bbamcr.2015.12.013

**Links:**
http://urn.fi/URN:NBN:fi:ttv-201606214293

**Source:** RIS

**Source-ID:** urn:4DF14E57C52E6B1C5D01B0E962572F8F

**Research output:** Scientific - peer-review › Article

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**Methods to use Big Wearable Heart Rate Data for Estimation of Physical Activity in Population Level**

**General information**

**State:** Published

**Ministry of Education publication type:** A4 Article in a conference publication

**Organisations:** Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)

**Authors:** Pietilä, J., Mutikainen, S., Helander, E., Myllymäki, T., Kujala, U. M., Korhonen, I.

**Number of pages:** 4

**Pages:** 66-69

**Publication date:** 2015

**Host publication information**

**Title of host publication:** The 6th European Conference of the International Federation for Medical and Biological Engineering (MBEC 2014), 7-11 September, Dubrovnik, Croatia

**Place of publication:** Dubrovnik

**Publisher:** Springer

**Editors:** Lackovic, I., Vasic, D.

**ISBN (Print):** 978-3-319-11127-8

**ISBN (Electronic):** 978-3-319-11128-5

**Publication series**

**Name:** IFMBE Proceedings

**Publisher:** Springer

**Volume:** 45

**ISSN (Print):** 1680-0737

**ISSN (Electronic):** 1433-9277

**DOIs:**
10.1007/978-3-319-11128-5_17

**Bibliographical note**

Julkaisuvuosi 2015, Siirretään 2015<br/>Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2015-01-10<br/>publication_forum:58152

**Source:** researchoutputwizard

**Source-ID:** 28

**Research output:** Scientific - peer-review › Conference contribution

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**Microcomputed Tomography–Based Assessment of Retrieved Dental Implants**
Monitoring urban air quality with a diffusion charger based electrical particle sensor

Abstract Urban air contains considerable amounts of harmful gaseous substances and aerosol particles. In this study, a recently introduced diffusion charger based PPS-M particle sensor (Pegasor Oy, Tampere, Finland) was evaluated for outdoor air quality measurements in urban environment. The PPS-M particle sensor was used in two stationary air quality measurement stations, one located in the roadside environment and the other in residential area, and in a mobile laboratory. The sampling of urban aerosol to the PPS-M sensor was performed without any pre-conditioning of aerosol. The sensor response to PM2.5 varied between the measurements, being between 7 and 30 fA/(µg/m3) depending on the aerosol source. The highest PM2.5 response was observed in the roadside study for exhaust particles while the lowest PM2.5 response was observed for large long range transported aerosol particles having relatively large mean particle size. The sensor signal was found to produce very linear response, with only minimal deviation, to the lung deposited particle surface area concentration (from 4.5 to 6 fA/(µm2/cm3)) and to the condensation sink of urban air particles (from 1.0 × 104 to 1.2 × 104 FA cm3). The sensor response to particle number concentration was defined to be 0.0044 fA/(1/cm3) in
roadside environment. In this environment, the signal was found to correlate also with NO and NO2 concentrations of roadside air due to the same origin of particulate and gaseous pollutants. Similar correlation between NOx and the PPS-M signal was not observed in residential area.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Physics, Department of Signal Processing, Research area: Aerosol Physics, Urban circular bioeconomy (UrCirBio)
Keywords: (Particle sensor, Urban air quality, Traffic emissions, Instrument comparison)
Publication date: 2015
Peer-reviewed: Yes
Early online date: 1 Jan 2014

**Publication information**
Journal: Urban Climate
Volume: 14
Issue number: 3
ISSN (Print): 2212-0955
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 1.09 1.313
Publication Forum (2015): 0
Scopus rating (2014): 0.494 1.095
Scopus rating (2013): 0.324 0.341
Original language: English
DOIs:
10.1016/j.uclim.2014.10.002

**Bibliographical note**
ORG=fys,0.5
ORG=sgn,0.5
Source: RIS
Source-ID: urn:C09F5E550C75A3945CB60BFFC830456C
Research output: Scientific - peer-review › Article

**MR image texture in Parkinson's disease: A longitudinal study**
Background: Few of the structural changes caused by Parkinson's disease (PD) are visible in magnetic resonance imaging (MRI) with visual inspection but there is a need for a method capable of observing the changes beyond the human eye. Texture analysis offers a technique that enables the quantification of the image gray-level patterns. Purpose: To investigate the value of quantitative image texture analysis method in diagnosis and follow-up of PD patients. Material and Methods: Twenty-six PD patients underwent MRI at baseline and after 2 years of follow-up. Four co-occurrence matrix-based texture parameters, describing the image homogeneity and complexity, were calculated within clinically interesting areas of the brain. In addition, correlations with clinical characteristics (Unified Parkinson's Disease Ranking Scales I-III and Mini-Mental State Examination score) along with a comparison to healthy controls were evaluated. Results: Patients at baseline and healthy volunteers differed in their brain MR image textures mostly in the areas of substantia nigra pars compacta, dentate nucleus, and basilar pons. During the 2-year follow-up of the patients, textural differences appeared mainly in thalamus and corona radiata. Texture parameters in all the above mentioned areas were also found to be significantly related to clinical scores describing the severity of PD. Conclusion: Texture analysis offers a quantitative method for detecting structural changes in brain MR images. However, the protocol and repeatability of the method must be enhanced before possible clinical use.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), University of Tampere, Medical School, Tampere University Hospital, Medical Imaging Center and Hospital Pharmacy, Department of Neurology and Rehabilitation
Muraglitazar-Eluting Bioabsorbable Vascular Stent Inhibits Neointimal Hyperplasia in Porcine Iliac Arteries

Purpose To evaluate the biocompatibility of a new muraglitazar-eluting polylactide copolymer stent and investigate its ability to prevent the formation of intimal hyperplasia.

Materials and Methods Ten self-expandable muraglitazar-eluting poly-96l/4d-lactic acid (PLA96) stents and 10 self-expandable control PLA96 stents were implanted into porcine common iliac arteries. After 28 days follow-up, all stent-implanted iliac arteries were harvested and prepared for quantitative histomorphometric analysis.
Results Angiographic analysis revealed that one control PLA96 stent had occluded and one had migrated. Histomorphometric analysis demonstrated that, with the control PLA96 stent, the luminal diameter and area were decreased versus the muraglitazar-eluting PLA96 stents (means ± standard error of the mean, 3.58 mm ± 0.34 vs 4.16 mm ± 0.14 and 9.83 mm² ± 2.41 vs 13.75 mm² ± 0.93, respectively). The control PLA96 stent induced more intimal hyperplasia than the bioactive muraglitazar-eluting PLA96 stent (557 μm ± 122 vs 361 μm ± 32). Vascular injury scores demonstrated only mild vascular trauma for both stents (muraglitazar-eluting, 0.68 ± 0.07; control, 0.75 ± 0.08). Inflammation scores also showed mild inflammation for both stents (muraglitazar-eluting, 1.05 ± 0.17; control, 1.23 ± 0.19).

Conclusions This new muraglitazar-eluting PLA96 stent was shown to be biocompatible with a tendency for better patency and less intimal hyperplasia compared with the control PLA96 stents.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Prostate cancer research center (PCRC)
Authors: Uruto, I., Hämäläinen, M., Suominen, V., Laurila, M., Kotsar, A., Isotalo, T., Tammela, T. L., Kellomäki, M., Salenius, J.
Number of pages: 7
Pages: 124-130
Publication date: 2015
Peer-reviewed: Yes

Publication Information
Journal: Journal of Vascular and Interventional Radiology
Volume: 26
Issue number: 1
ISSN (Print): 1051-0443
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.121 1.246
Publication Forum (2016): 1
Scopus rating (2015): 1.25 1.442
Web of Science (2015): 2.57 2.538 7.2 0.429 0.01305 0.732
Publication Forum (2015): 1
Scopus rating (2014): 1.089 1.299
Web of Science (2014): 2.409 2.355 7.1 0.479 0.01249 0.678
Publication Forum (2014): 1
Scopus rating (2013): 1.092 1.27
Publication Forum (2013): 1
Scopus rating (2012): 1.182 1.272
Publication Forum (2012): 1
Scopus rating (2011): 1.159 1.318
Scopus rating (2010): 1.105 1.245
Scopus rating (2009): 1.206 1.397
Scopus rating (2008): 1.434 1.45
Scopus rating (2006): 1.297 1.553
Scopus rating (2005): 1.226 1.471
Scopus rating (2004): 1.147 1.182
Scopus rating (2003): 1.097 1.263
Scopus rating (2002): 1.039 1.049
Scopus rating (2001): 1.146 1.15
Scopus rating (2000): 1.092 1.052
Scopus rating (1999): 0.993 1.222
Original language: English
DOIs:
10.1016/j.jvir.2014.10.005
Myostatin/activin blocking combined with exercise reconditions skeletal muscle expression profile of mdx mice

Duchenne muscular dystrophy is characterized by muscle wasting and decreased aerobic metabolism. Exercise and blocking of myostatin/activin signaling may independently or combined counteract muscle wasting and dystrophies. The effects of myostatin/activin blocking using soluble activin receptor-Fc (sActRIIB-Fc) administration and wheel running were tested alone or in combination for 7 weeks in dystrophic mdx mice. Expression microarray analysis revealed decreased aerobic metabolism in the gastrocnemius muscle of mdx mice compared to healthy mice. This was not due to reduced home-cage physical activity, and was further downregulated upon sActRIIB-Fc treatment in enlarged muscles. However, exercise activated pathways of aerobic metabolism and counteracted the negative effects of sActRIIB-Fc. Exercise and sActRIIB-Fc synergistically increased expression of major urinary protein, but exercise blocked sActRIIB-Fc induced phosphorylation of STAT5 in gastrocnemius muscle. In conclusion, exercise alone or in combination with myostatin/activin blocking corrects aerobic gene expression profiles of dystrophic muscle toward healthy wild type mice profiles.
Occupational and environmental exposure to extremely low frequency magnetic fields in a large group of workers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, University of Modena and Reggio Emilia, Italian Worker’s Compensation Authority (INAIL), Italian Ministry of Health
Authors: Gobba, F., Rossi, P., Bravo, G., Contessa, G. M., Korpinen, L.
Number of pages: 3
Pages: 211-213
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

On capacity of active relaying in magnetic induction based wireless underground sensor networks

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Wireless Communications and Positioning (WICO), Former organisation of the author
Authors: Kisseleff, S., Sackenreuter, B., Akyildiz, I., Gerstacker, W.
Pages: 6541-6546
Publication date: 2015

Host publication information
Title of host publication: Proceedings of IEEE ICC 2015
DOIs:
10.1109/ICC.2015.7249367

Bibliographical note
cited By 1
Source: Bibtex
Source-ID: urn:d60d0d5e915a86f0c868a160e5cb06f1
Research output: Scientific - peer-review › Conference contribution

Origins of Transcriptional Transition: Balance between Upstream and Downstream Regulatory Gene Sequences

By measuring individual mRNA production at the single-cell level, we investigated the lac promoter’s transcriptional transition during cell growth phases. In exponential phase, variation in transition rates generates two mixed phenotypes, low and high numbers of mRNAs, by modulating their burst frequency and sizes. Independent activation of the regulatory-gene sequence does not produce bimodal populations at the mRNA level, but bimodal populations are produced when the
regulatory gene is activated coordinately with the upstream and downstream region promoter sequence (URS and DRS, respectively). Time-lapse microscopy of mRNAs for lac and a variant lac promoter confirm this observation. Activation of the URS/DRS elements of the promoter reveals a counterplay behavior during cell phases. The promoter transition rate coupled with cell phases determines the mRNA and transcriptional noise. We further show that bias in partitioning of RNA does not lead to phenotypic switching. Our results demonstrate that the balance between the URS and the DRS in transcriptional regulation determines population diversity.

**IMPORTANCE** By measuring individual mRNA production at the single-cell level, we investigated the lac promoter transcriptional transition during cell growth phases. In exponential phase, variation in transition rate generates two mixed phenotypes producing low and high numbers of mRNAs by modulating the burst frequency and size. Independent activation of the regulatory gene sequence does not produce bimodal populations at the mRNA level, while it does when activated together through the coordination of upstream/downstream promoter sequences (URS/DRS). Time-lapse microscopy of mRNAs for lac and a lac variant promoter confirm this observation. Activation of the URS/DRS elements of the promoter reveals a counterplay behavior during cell phases. The promoter transition rate coupled with cell phases determines the mRNA and transcriptional noise. We further show that bias in partitioning of RNA does not lead to phenotypic switching. Our results demonstrate that the balance between URS and DRS in transcription regulation is determining the population diversity.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: Molecular Signaling Lab, Prostate cancer research center (PCRC), Tampere Univ Technol, Tampere University of Technology, Signal Proc Dept, Computat Syst Biol Res Grp, Mol Signaling Lab
Authors: Sala, A., Shoaib, M., Anufrieva, O., Mutharasu, G., Yli-Harja, O., Kandhavelu, M.
Keywords: (SINGLE-MOLECULE EVENT, ESCHERICHIA-COLI, EXPRESSION, TIME, CELL, STOCHASTICITY, MECHANISMS, INITIATION, PROTEINS, DYNAMICS)
Number of pages: 9
Publication date: 2015
Peer-reviewed: Yes

**Publication information**
Journal: mBio
Volume: 6
Issue number: 1
Article number: e02182-14
ISSN (Print): 2150-7511
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 3.99 1.587
Publication Forum (2016): 2
Web of Science (2015): 6.975 6.887 2.3 1.413 0.03972 2.779
Publication Forum (2015): 2
Web of Science (2014): 6.786 6.781 2.1 1.46 0.02587 2.762
Publication Forum (2014): 1
Scopus rating (2013): 3.149 1.408
Publication Forum (2013): 1
Scopus rating (2012): 2.845 1.517
Scopus rating (2011): 2.725 1.139
Original language: English
DOIs:
10.1128/mBio.02182-14

**Bibliographical note**
AUX=sgn,"Shoaib, Muhammad"
AUX=sgn,"Anufrieva, Olga"
Source: WOS
Source-ID: 000350631900057
Research output: Scientific › peer-review › Article
Piezoelectric sensitivity measurements of cellulose nanofibril sensors

Piezoelectric sensitivity of cellulose nanofibril (CNF) film sensors was measured using a mechanical shaker and charge amplifier setup. In-house fabricated CNF film sensors showed 5-7 pC/N sensitivity in ambient conditions. The CNF film used here contained randomly oriented fibrils, and the piezoelectric response is expected to increase remarkably after film polarization and fibril alignment. The results obtained in this study suggest that nanocellulose film is a suitable sensor material for applications in various fields such as material sciences, electronics and biomedical diagnostics.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Rajala, S., Vuoriuoto, M., Rojas, O., Franssila, S., Tuukkanen, S.
Number of pages: 5
Publication date: 2015

Possibility to decreasing the 50Hz electric field exposure with different jackets

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI Rauno Pääkkönen
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 4
Pages: 62-65
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Public information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links: http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

Possible Exposure of Persons with Cardiac Pacemakers to Extremely Low Frequency (ELF) Electric and Magnetic Fields

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, University of Modena and Reggio Emilia, Tampere University Hospital
Authors: Korpinen, L., Pääkkönen, R., Gobba, F., Virtanen, V.
Number of pages: 7
Preliminary measurements of smart meter electromagnetic field (50-100kHz) emissions in Finland

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health, TMI
Rauno Pääkkönen
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 3
Pages: 66-68
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Electrical and Electronic Engineering

Publication information
Journal: Bulgarian journal of public health
Volume: Supplement, VII
Issue number: 2(1)
ISSN (Print): 1313-860X
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Links:
http://goo.gl/tZgar9
Research output: Scientific - peer-review › Article

Printed hybrid systems for healthcare

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Electronics and Communications Engineering, Research group: Laboratory for Future Electronics
Authors: Mäntysalo, M., Vuorinen, T., Nurmentaus, S.
Number of pages: 2
Pages: 8-9
Publication date: 2015
Peer-reviewed: Unknown

Publication information
Journal: OPE Journal
Issue number: 11
Original language: English
Quantification of the ionic current contributions to alterations in the action potential repolarization by means of piecewise-linear approximation
Quantification and automatized adaptive detection of in vivo and in vitro neuronal bursts based on signal complexity

In this paper, we propose employing entropy values to quantify action potential bursts in electrophysiological measurements from the brain and neuronal cultures. Conventionally in the electrophysiological signal analysis, bursts are quantified by means of conventional measures such as their durations, and number of spikes in bursts. Here our main aim is to device metrics for burst quantification to provide for enhanced burst characterization. Entropy is a widely employed measure to quantify regularity/complexity of time series. Specifically, we investigate the applicability and differences of spectral entropy and sample entropy in the quantification of bursts in in vivo rat hippocampal measurements and in in vitro dissociated rat cortical cell culture measurement done with microelectrode arrays. For the task, an automatized and adaptive burst detection method is also utilized. Whereas the employed metrics are known from other applications, they are rarely employed in the assessment of burst in electrophysiological field potential measurements. Our results show that the proposed metrics are potential for the task at hand.

Recurrence network analysis of multiple local field potential bands from the orofacial portion of primary motor cortex

Local field potentials (LFPs), which have been considered as aggregate signals that reflect activities of a large number of neurons in the cerebral cortex, have been observed to mediate gross functional activities of a relatively small volume of the brain tissues. Historically there have been several frequency bands observed and defined across various brain areas. However, detailed analysis, either spectral analysis or any dynamical analysis of LFPs particularly in the orofacial part of the primary motor cortex (MlO) has not been done before. Here, we recorded LFPs from MlO using an electrode array from a non-human primate during feeding behavior. Then we performed spectral analysis during the whole feeding sequences and to characterize temporal evolution of spectrum around the time of swallow cycles. The spectrogram over the ß range...
showed dynamical change in its power around the swallow cycle onsets. We then characterized dynamical behaviors of LFPs over multiple bands, α, β, low γ, and high γ using two measures from the recurrence network (RN) method, network transitivity, T and average path length L. Temporal profile of T in α and β indicated that there was a sudden change in the dynamical properties around the swallow cycle onsets, while temporal profile of L indicated that a range of −200 to −150 ms and 200ms to the swallow cycle onsets exhibited large changes both in α and β ranges. Therefore, to further understand the involvement of cortical oscillation to behavior, particularly swallowing, the combination of traditional spectral methods and various dynamical methods such as RN method would be essential.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Subramaniyam, N. P., Hyttinen, J., Hatsopoulos, N. G., Ross, C. F., Takahashi, K.
Keywords: (Arrays, Complex networks, Kinematics, Oscillators, Time series analysis, Yttrium, Local field potentials, event evoked potentials, motor cortex, recurrence network, temporal dynamics)
Number of pages: 4
Pages: 5343-5346
Publication date: 2015

Host publication information
Title of host publication: 2015 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
ISBN (Print): 978-1-4244-9270-1
DOIs: 10.1109/EMBC.2015.7319598
Source: RIS
Source-ID: urn:F7D2827B40D79243F0D448865482E3AA
Research output: Scientific - peer-review › Conference contribution

Recurrent SKIL-activating rearrangements in ETS-negative prostate cancer
Prostate cancer is the third most common cause of male cancer death in developed countries, and one of the most comprehensively characterized human cancers. Roughly 60% of prostate cancers harbor gene fusions that juxtapose ETSfamily transcription factors with androgen regulated promoters. A second subtype, characterized by SPINK1 overexpression, accounts for 15% of prostate cancers. Here we report the discovery of a new prostate cancer subtype characterized by rearrangements juxtaposing the SMAD inhibitor SKIL with androgen regulated promoters, leading to increased SKIL expression. SKIL fusions were found in 6 of 540 (1.1%) prostate cancers and 1 of 27 (3.7%) cell lines and xenografts. 6 of 7 SKIL-positive cancers were negative for ETS overexpression, suggesting mutual exclusivity with ETS fusions. SKIL knockdown led to growth arrest in PC-3 and LNCaP cell line models of prostate cancer, and its overexpression led to increased invasiveness in RWPE-1 cells. The role of SKIL as a prostate cancer oncogene lends support to recent studies on the role of TGF-β signaling as a rate-limiting step in prostate cancer progression. Our findings highlight SKIL as an oncogene and potential therapeutic target in 1-2% of prostate cancers, amounting to an estimated 10,000 cancer diagnoses per year worldwide.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, BioMediTech, Multi-scaled biodata analysis and modelling (MultiBAM), Prostate cancer research center (PCRC), Tampere University Hospital, Department of Urology, Finnish Institutes and Medical School, University of Texas, M. D. Anderson Cancer Center, Cancer Genomics Laboratory, Houston, TX, USA
Keywords: (Fusion gene, Prostate cancer, Sequencing, SKIL)
Number of pages: 16
Pages: 6235-6250
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Oncology

Publication information
Journal: Oncotarget
Volume: 6
Issue number: 6
ISSN (Print): 1949-2553
Regional impedance pneumography heterogeneity during airway opening pressure chirp oscillations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Physiological Measurement Systems and Methods Group, Tampere University of Technology
Authors: Garcia, J., Seppä, V., Viik, J.
Keywords: (Transfer impedance, lung mechanics, impedance pneumography, multilead impedance pneumography, forced oscillation technique)
Pages: 42-51
Publication date: 2015
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering

Publication information
Journal: International Journal of Bioelectromagnetism
Volume: 17
Issue number: 1
ISSN (Print): 1456-7857
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
Source-ID: 84925607557
Research output: Scientific - peer-review › Article

Some aspects of molecular physics in measuring tissue samples using enose for disease diagnostics

General information
State: Published

Some aspects of molecular physics in measuring tissue samples using enose for disease diagnostics
eNose technologies can be used for disease diagnostics. One technology is based on ionized molecules and their drifting speed in an electric field. Ionized molecules can be measured with ion mobility spectrometry and with electrical mobility measurements. Depending on the size scale of these molecules, different physical effects are relevant. We studied the relevance of size scale dependent physics for disease diagnostics.
Structural and mechanical implications of PMMA implant shape and interface geometry in cranioplasty – a finite element study

This computational study investigates the effect of shape (defect contour curvature) and bone-implant interface (osteotomy angle) on the stress distribution within PMMA skull implants. Using finite element methodology, 15 configurations - combinations of simplified synthetic geometric shapes (circular, square, triangular, irregular) and interface angulations - were simulated under 50N static loads. Furthermore, the implant fixation devices were modelled and analysed in detail. Negative osteotomy configurations demonstrated the largest stresses in the implant (275 MPa), fixation devices (1258 MPa) and bone strains (0.04). The circular implant with zero and positive osteotomy performed well with maximum observed magnitudes of - implant stress (1.2 MPa and 1.2 MPa), fixation device stress (11.2 MPa and 2.2 MPa), bone strain (0.218e-3 and 0.750e-4). The results suggest that the preparation of defect sites is a critical procedure. Of the greatest importance is the angle at which the edges of the defect are sawed. If under an external load, the implant has no support from the interface and the stresses are transferred to the fixation devices. This can endanger their material integrity and lead to unphysiological strains in the adjacent bone, potentially compromising the bone morphology required for anchoring. These factors can ultimately weaken the stability of the entire implant assembly. (C) 2015 European Association for Cranio-Maxillo-Facial Surgery. Published by Elsevier Ltd. All rights reserved.
Synchrony between Genetic Repressilators in Sister Cells in Different Temperatures
We used live E. coli containing synthetic genetic oscillators to study how the degree of synchrony between the genetic circuits of sister cells changes with temperature. We found that both the mean and the variability of the degree of synchrony between the fluorescence signals from sister cells are affected by temperature. Also, while most pairs of sister cells were found to be highly synchronous in each condition, the number of asynchronous pairs increased with increasing temperature, which was found to be due to disruptions in the oscillations. Finally we provide evidence that these disruptions tend to affect multiple generations as opposed to individual cells. These findings provide insight in how to design more robust synthetic circuits and in how cell division can affect their dynamics.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD
Authors: Chandraseelan, J. G., Oliveira, S. M., Häkkinen, A., Startceva, S., Ribeiro, A. S.
Keywords: (repressilator, robustness, synchrony, synthetic biology)
Number of pages: 4
Pages: 725-728
Publication date: 2015

Host publication information
Title of host publication: ICCMSB 2015: International Conference on Computational and Molecular Systems Biology
Publisher: World Academy of Science, Engineering and Technology

Publication series
Name: Proceedings of the World Academy of Science, Engineering and Technology
ISSN (Print): 2010-376X
ISSN (Electronic): 2010-3778
Links:
http://waset.org/abstracts/Bioengineering-and-Life-Sciences
Source: Bibtex
Source-ID: urn:ad9f9ddacfd5c4da9d8411b8da981dc4
Research output: Scientific - peer-review » Conference contribution
The Combination of Electric Current and Copper Promotes Neuronal Differentiation of Adipose-Derived Stem Cells

Damage to the nervous system can be caused by several types of insults, and it always has a great effect on the life of an individual. Due to the limited availability of neural transplants, alternative approaches for neural regeneration must be developed. Stem cells have a great potential to support neuronal regeneration. Human adipose-derived stem cells (hADSCs) have gained increasing interest in the fields of regenerative medicine due to their multilineage potential and easy harvest compared to other stem cells. In this study, we present a growth factor-free method for the differentiation of hADSCs toward neuron-like cells. We investigated the effect of electric current and copper on neuronal differentiation. We analyzed the morphological changes, the mRNA and protein expression levels in the stimulated cells and showed that the combination of current and copper induces stem cell differentiation toward the neuronal lineage with elongation of the cells and the upregulation of neuron-specific genes and proteins. The induction of the neuronal differentiation of hADSCs by electric field and copper may offer a novel approach for stem cell differentiation and may be a useful tool for safe stem cell-based therapeutic applications.
The Shape of Health: A Comparison of Five Alternative Ways of Visualizing Personal Health and Wellbeing

The combination of clinical and personal health and wellbeing data can tell us much about our behaviors, risks and overall status. The way this data is visualized may affect our understanding of our own health. To study this effect, we conducted a small experiment with 30 participants in which we presented a holistic overview of the health and wellbeing of two modeled individuals, one of them with metabolic syndrome. We used an insight-based methodology to assess the effectiveness of the visualizations. The results show that adequate visualization of holistic health data helps users without medical background to better understand the overall health situation and possible health risks related to lifestyles. Furthermore, we found that the application of insight-based methodology in the health and wellbeing domain remains unexplored and additional research and methodology development are needed.

Time-series modeling of long-term weight self-monitoring data

Long-term self-monitoring of weight is beneficial for weight maintenance, especially after weight loss. Connected weight scales accumulate time series information over long term and hence enable time series analysis of the data. The analysis can reveal individual patterns, provide more sensitive detection of significant weight trends, and enable more accurate and timely prediction of weight outcomes. However, long term self-weighing data has several challenges which complicate the analysis. Especially, irregular sampling, missing data, and existence of periodic (e.g. diurnal and weekly) patterns are common. In this study, we apply time series modeling approach on daily weight time series from two individuals and describe information that can be extracted from this kind of data. We study the properties of weight time series data, missing data and its link to individuals behavior, periodic patterns and weight series segmentation. Being able to understand behavior through weight data and give relevant feedback is desired to lead to positive intervention on health behaviors.
Toll-like receptor 5 in obesity: The role of gut microbiota and adipose tissue inflammation

Objective This study aimed at establishing bacterial flagellin-recognizing toll-like receptor 5 (TLR5) as a novel link between gut microbiota composition, adipose tissue inflammation, and obesity. Methods An adipose tissue microarray database was used to compare women having the highest (n = 4, H-TLR) and lowest (n = 4, L-TLR) expression levels of TLR5-signaling pathway genes. Gut microbiota composition was profiled using flow cytometry and FISH. Standard laboratory techniques were used to determine anthropometric and clinical variables. In vivo results were verified using cultured human adipocytes. Results The H-TLR group had higher flagellated Clostridium cluster XIV abundance and Firmicutes-to-Bacteroides ratio. H-TLR subjects had obese phenotype characterized by greater waist circumference, fat %, and blood pressure (P < 0.05 for all). They also had higher leptin and lower adiponectin levels (P < 0.05 for both). Six hundred and sixty-eight metabolism-and inflammation-related adipose tissue genes were differentially expressed between the groups. In vitro studies confirmed that flagellin activated TLR5 inflammatory pathways, decreased insulin signaling, and increased glycerol secretion. Conclusions The in vivo findings suggest that flagellated Clostridium cluster XIV bacteria contribute to the development of obesity through distorted adipose tissue metabolism and inflammation. The in vitro studies in adipocytes show that the underlying mechanisms of the human findings may be due to flagellin-activated TLR5 signaling.
Transcription closed and open complex dynamics studies reveal balance between genetic determinants and co-factors

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Research group: Molecular Signaling Lab, Prostate cancer research center (PCRC)
Authors: Sala, A., Shoaib, M., Anufrieva, O., Mutharasu, G., Hoque, R. J., Yli-Harja, O., Kandhavelu, M.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Physical Biology
Volume: 12
Issue number: 3
Article number: 036003
ISSN (Print): 1478-3967
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.877 0.52
Publication Forum (2016): 1
Scopus rating (2015): 1.268 0.689
Web of Science (2015): 1.837 2.399 5.0 0.289 0.00623 1.052
Publication Forum (2015): 1
Scopus rating (2014): 1.639 0.811
Web of Science (2014): 2.536 2.694 4.4 0.254 0.00758 1.208
Publication Forum (2014): 2
Scopus rating (2013): 1.499 0.731
Publication Forum (2013): 2
Scopus rating (2012): 1.543 0.866
Publication Forum (2012): 2
Scopus rating (2011): 1.341 0.869
Scopus rating (2010): 1.852 0.978
Scopus rating (2009): 2.129 0.985
Typical and atypical domain combinations in human protein kinases: functions, disease causing mutations and conservation in other primates

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Signal Processing
Authors: Rakshambikai, R., Manoharan, M., Gnanavel, M., Srinivasan, N., Mutharasu, G.
Number of pages: 17
Pages: 25132-25148
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: RSC Advances
Volume: 5
Issue number: 32
ISSN (Print): 2046-2069
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.875 0.743
Publication Forum (2016): 1
Scopus rating (2015): 0.959 0.837
Web of Science (2015): 3.289 3.485 1.8 0.676 0.13014 0.628
Publication Forum (2015): 1
Scopus rating (2014): 1.114 0.965
Web of Science (2014): 3.84 3.907 1.7 0.597 0.0623 0.747
Publication Forum (2014): 1
Scopus rating (2013): 1.117 0.903
Publication Forum (2013): 1
Scopus rating (2012): 0.863 0.603
Original language: English
DOIs:
10.1039/C4RA11685B
Source: Bibtex
Source-ID: urn:9fca52452fe67a1aff95063567ca45a5
Research output: Scientific - peer-review › Article

Ultrathin Polyimide Membrane as Cell Carrier for Subretinal Transplantation of Human Embryonic Stem Cell Derived Retinal Pigment Epithelium

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
VECSELs: Innovative light sources for PDT
Photodynamic therapy (PDT) with porphyrins and red light (610–630 nm) is finding increasing clinical application for both the eradication of relatively small tumors and the palliation of inoperable or obstructive tumors. PDT also shows some promise for the sterilization of the tumor bed after surgical removal of neoplastic masses. Optically pumped vertical external-cavity surface-emitting lasers (VECSELs) appear to be a very innovative and efficient technology in this specific wavelength range. Furthermore, VECSELs are power scalable and wavelength tunable, and are an appealing light source for PDT.
**W2E - Wellness Warehouse Engine for Semantic Interoperability of Consumer Health Data**

Novel health monitoring devices and applications allow consumers easy and ubiquitous ways to monitor their health status. However, technologies from different providers lack both technical and semantic interoperability and hence the resulting health data is often deeply tied to a specific service, which is limiting its re-usability and utilization in different services. We have designed a Wellness Warehouse Engine (W2E) that bridges this gap and enables seamless exchange of data between different services. W2E provides interfaces to various data sources and makes data available via unified Representational State Transfer Application Programming Interface (REST API) to other services. Importantly, it includes Unifier – an engine that allows transforming input data into generic units re-usable by other services, and Analyzer – an engine that allows advanced analysis of input data, such as combining different data sources into new output parameters.

In this paper, we describe the architecture of W2E and demonstrate its applicability by using it for unifying data from four consumer activity trackers, using a test base of 20 subjects each carrying out three different tracking sessions. Finally, we discuss challenges of building a scalable Unifier engine for the ever-enlarging number of new devices.
Scopus rating (2004): 0.486 1.355
Scopus rating (2003): 0.616 1.65
Scopus rating (2002): 0.491 1.309
Scopus rating (2001): 0.821 1.548
Scopus rating (2000): 0.459 1.515
Scopus rating (1999): 0.367 0.952
Original language: English
DOIs:
10.1109/JBHI.2015.2469718

Bibliographical note
ORG=sgn,0.65
ORG=tie,0.25
ORG=elt,0.1
Research output: Scientific - peer-review › Article

Yellow-orange-red VECSELs: Emergence of a compact and versatile laser platform for medical applications: ePoster

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Authors: Guina, M., Kantola, E. L., Leinonen, T. P., Penttinen, J., Mordon, S. R.
Publication date: 2015

Host publication information
Title of host publication: 2015 annual conference of the American Society for Laser Medicine & Surgery, Florida, USA.

Bibliographical note
xposter
Research output: Scientific - peer-review › Conference contribution

Yellow-orange semiconductor disk lasers for medical applications

General information
State: Unpublished
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications
Research group: Ultrafast and intense lasers
Publication date: 2015

Host publication information
Title of host publication: Poster in Symposium on Future Prospects for Photonics, November 5.-6. 2015, Tampere, Finland

Bibliographical note
xposter
Research output: Scientific › Conference contribution

A Strap for a Portable Pulse Measuring Device and a Portable Pulse Measuring Device

According to one aspect, there is provided a strap (102) for a pulse measuring device, wherein the strap (102) comprises an indicator (112) configured to indicate tightness of the strap. According to another aspect, there is provided a portable pulse measuring device comprising a strap (112) configured to fasten the portable pulse measuring device on a human; and a mechanical indicator (112) configured to indicate tightness of the strap.

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, PULSEON OY
Authors: Nousiainen, J., Korhonen, I., Saunamäki, J., Hattula, J.
Publication date: 18 Dec 2014

Publication information
**Portable Pulse Measuring Device**

According to an aspect of the invention there is provided a portable pulse measuring device. The device comprises a lighting configuration comprising at least three elements (100, 102, 104, 106) selected from a light-emitting source (104, 106) for emitting radiant energy through a human body tissue and a light detector (100, 102) for detecting the intensity of said radiant energy after propagation through the human body tissue and for providing input signals representative of said propagation, wherein the lighting configuration comprises at least one light-emitting source (104, 106) and at least one light detector (100, 102); processing means for determining pulse rate in response to processing the input signals. The elements in the lighting configuration are arranged in the portable pulse measuring device in a configuration where the light-emitting sources (104, 106) in the lighting configuration are asymmetrically disposed in relation to the light detectors (100, 102) in the lighting configuration.

**Kumpi on kovempaa, marmori vai luu?**

**Microscopic determination of second-order nonlinear optical susceptibility tensors**

We demonstrate a microscopy technique that extracts tensorial information about the second-order nonlinear optical susceptibility and hyperpolarizability of molecular materials. Our technique is based on polarization-dependent second-harmonic generation and a genetic algorithm, using which the best possible match with the measured data, and the possible susceptibility tensor components are found. In contrast to existing techniques, which access only the magnitude
of the nonlinear response, our technique also provides information about the phase of the tensor components, which is associated with molecular resonances. After verifying the technique using simulated model structures with well-known symmetries, we demonstrate its capabilities using model surface samples consisting of single purple membrane (PM) fragments of bacteriorhodopsin (bR) chromoproteins. Since the supramolecular structures of PM, bR, and photoactive retinal molecules are known, complex-valued tensorial information on the molecular hyperpolarizabilities can also be extracted. Our technique opens new possibilities for obtaining detailed structural information on biomolecular samples with microscopic resolution.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Nonlinear Optics, Research area: Optics, Department of Physics, Frontier Photonics
Authors: Naskali, L., Huttunen, M., Virkki, M., Bautista, G., Der, A., Kauranen, M.
Number of pages: 6
Pages: 26409-26414
Publication date: 31 Oct 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 45
ISSN (Print): 1932-7447

Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.948 1.181
Publication Forum (2016): 1
Scopus rating (2015): 1.917 1.268
Web of Science (2015): 4.509 4.919 4.7 0.829 0.28449 1.171
Publication Forum (2015): 1
Scopus rating (2014): 2.027 1.448
Web of Science (2014): 4.772 5.295 4.3 0.768 0.30727 1.234
Publication Forum (2014): 3
Scopus rating (2013): 2.134 1.439
Publication Forum (2013): 3
Scopus rating (2012): 2.514 1.46
Publication Forum (2012): 3
Scopus rating (2011): 2.32 1.457
Scopus rating (2010): 2.438 1.356
Scopus rating (2009): 2.128 1.417
Scopus rating (2008): 1.856 1.033
Original language: English
DOIs: 10.1021/jp509453b

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-12-15<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 1125
Research output: Scientific › peer-review › Article

Printable, Transparent, and Flexible Touch Panels Working in Sunlight and Moist Environments
The ongoing revolution of touch-based user interfaces sets new requirements for touch panel technologies, including the need to operate in a wide range of environments. Such touch panels need to endure moisture and sunlight. Moreover, they often need to be curved or flexible. Thus, there is a need for new technologies suitable, for example, for home appliances used in the kitchen or the bathroom, automotive applications, and e-paper. In this work, the development of transparent and flexible touch panels for moist environments is reported. A piezoelectric polymer, poly(vinylidene difluoride) (PVDF), is used as a functional substrate material. Transparent electrodes are fabricated on both sides of a PVDF film using a graphene-based ink and spray coating. The excellent performance of the touch panels is demonstrated in moist and underwater conditions. Also, the transparent device shows very small pyroelectric response to radiative heating in comparison to a non-transparent device. Solution processable electrode materials in combination with functional...
substrates allow the low-cost and high-throughput manufacturing of touch panels using printing technologies.

**General information**

**State:** Published

**Ministry of Education publication type:** A1 Journal article-refereed

**Organisations:** Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Research group: Personal Electronics Group, Research group: Laboratory for Future Electronics, Research area: Microsystems, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)

**Authors:** Vuorinen, T., Zakrzewski, M., Rajala, S., Lupo, D., Vanhala, J., Palovuori, K., Tuukkanen, S.

**Keywords:** CARBON NANOTUBE, FILM SENSOR, SUPERCAPACITORS, PERFORMANCE, ELECTRODES, VIBRATION

**Number of pages:** 8

**Pages:** 6340-6347

**Publication date:** 29 Oct 2014

**Peer-reviewed:** Yes

**Publication information**

**Journal:** Advanced Functional Materials

**Volume:** 24

**Issue number:** 40

**ISSN (Print):** 1616-301X

**Ratings:**

- Publication Forum (2017): 3
- Scopus rating (2016): 4.915 2.24
- Publication Forum (2016): 3
- Scopus rating (2015): 4.964 2.55
- Web of Science (2015): 11.382 11.774 4.5 2.396 0.14187 3.09
- Scopus rating (2014): 4.603 2.61
- Publication Forum (2014): 3
- Scopus rating (2013): 4.445 2.39
- Publication Forum (2013): 3
- Scopus rating (2012): 5.679 2.643
- Publication Forum (2012): 3
- Scopus rating (2011): 4.849 2.481
- Scopus rating (2010): 4.754 2.263
- Scopus rating (2009): 4.08 2.088
- Scopus rating (2007): 4.415 2.294
- Scopus rating (2004): 3.875 2.35
- Scopus rating (2003): 2.615 1.775
- Scopus rating (2002): 2.115 1.331
- Scopus rating (2001): 0.497 0.882
- Scopus rating (2000): 0.261 0.503
- Scopus rating (1999): 0.432 0.637

**Original language:** English

**Electronic versions:**

- Vuorinen_2014_PVDF_Touch-panels_Post-print

**DOIs:**

- 10.1002/adfm.201401140

**Links:**


**Bibliographical note**

**Contribution:** organisation=elt,FACT1=0.86<br/>
**Contribution:** organisation=ase,FACT2=0.14<br/>
**Portfolio EDEND:** 2014-08-21<br/>
**Publisher name:** Wiley
Polarized THG Microscopy Identifies Compositionally Different Lipid Droplets in Mammalian Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Nonlinear Optics, Research area: Optics, Department of Physics, Frontier Photonics
Authors: Bautista, G., Pfisterer, S. G., Huttunen, M. J., Ranjan, S., Kanerva, K., Ikonen, E., Kauranen, M.
Number of pages: 7
Pages: 2230-2236
Publication date: 10 Oct 2014
Peer-reviewed: Yes

Publication information
Journal: Biophysical Journal
Volume: 107
Issue number: 10
ISSN (Print): 1542-0086
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.946 1.018
Publication Forum (2016): 2
Scopus rating (2015): 2.145 1.173
Web of Science (2015): 3.632 3.668 >10.0 0.919 0.07519 1.522
Publication Forum (2015): 2
Scopus rating (2014): 2.203 1.166
Web of Science (2014): 3.972 3.874 9.6 0.924 0.08587 1.538
Publication Forum (2014): 3
Scopus rating (2013): 2.229 1.165
Publication Forum (2013): 3
Scopus rating (2012): 2.343 1.154
Publication Forum (2012): 3
Scopus rating (2011): 2.322 1.204
Scopus rating (2010): 2.646 1.303
Scopus rating (2009): 2.953 1.361
Scopus rating (2008): 3.222 1.416
Scopus rating (2007): 3.119 1.422
Scopus rating (2006): 2.807 1.416
Scopus rating (2005): 2.659 1.403
Scopus rating (2004): 2.494 1.491
Scopus rating (2003): 2.617 1.428
Scopus rating (2002): 2.508 1.45
Scopus rating (2001): 2.428 1.386
Scopus rating (2000): 2.603 1.395
Scopus rating (1999): 2.775 1.437
Original language: English
DOIs:
10.1016/j.bpj.2014.10.009

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-12-15
How mono-va lent cations bend peptide turns and a first-principles database of amino acids and dipeptides

In this contribution we detail our efforts to investigate the structural effects of cations binding to peptides and amino acids. We perform first-principles studies employing long-range dispersion-corrected approximate density-functional theory and compare to gas-phase experiments.

Membrane-associated proteins do care about lipids - perspective based on atomistic molecular dynamics simulations

This thesis consists of three original articles that deal with lipid-protein interactions investigated using atomistic molecular dynamics simulations method, which in some cases were complemented with experimental data. Since very few molecular details of these important interactions are known, the data shown in this thesis can help to understand and develop a broader view on the role of lipids in protein's function. In the first part of this thesis, the membrane-binding part of the COMT protein was studied using the atomistic molecular dynamics simulations. The results indicate that the role of the transmembrane helix and the linker part of this protein is to enclose the enzymatic part of the protein in the close vicinity of the membrane, and therefore to keep it in the specific membrane-water interface environment. Moreover, the particular kind of protein fold, which includes a specific salt bridge in the linker part of the protein, was found in almost all of the simulations, and this information was evaluated further to reveal that this can be the general folding motif for all similar proteins that possess one transmembrane helix and a short linker part that joins it with the rest of the protein. By continuation of the urge to explain the role of the membrane in enzymatic function of COMT, another idea was also investigated: namely, the suggestion that ligands for that enzyme might have different characteristics in regard to their affinity to how the membrane was evaluated, to check whether the membrane binding part of COMT role is indeed meant to make it more accessible to those ligands which stay close to the membrane. This idea was studied with the atomistic molecular dynamics simulations where two COMT ligands—dopamine and L-dopa—were simulated with the membranes of various compositions, and furthermore the results were validated by experiments. The data from that study was consistent with the suggested idea of preferential binding of some ligands to lipids, but also this finding has been shown to have more possible implications for the neurotransmission process and other highly important physiological processes. The second part of this work focuses on the role of cholesterol in hydrophobic matching of peptides and the resulting sorting of transmembrane peptides according to their hydrophobic length. Experimental data from collaborating team suggested that under negative mismatch and the presence of cholesterol in membranes, peptides could laterally sort. Nevertheless, molecular mechanisms of that were unclear. Atomistic molecular dynamics simulations performed for this part of the thesis revealed that cholesterol increases the significance of the negative hydrophobic mismatch, and thus it shifts preference of proteins in such conditions to cluster into domains to minimize the mismatch. In the second part of this study, extended atomistic molecular dynamics simulations showed that cholesterol has a preference to stay in the vicinity of the peptide under negative mismatch when compared to a positive mismatch case. Even more strikingly, cholesterol orientates around the negatively mismatched peptide in a special geometrical configuration with its rough side exposed in the direction of peptide. In summation, studies for this work demonstrated a view on some aspects of the lipid-protein interactions at the molecular level retrieved through the atomistic molecular dynamics simulations. Importantly, many of
Capacitive Facial Activity Measurement

The human facial activity consists of voluntary and spontaneous behavior that can be measured to provide valuable information for several application domains. The objective of this thesis is to introduce a new, capacitive measurement method for the task. The motivation to develop a new method was to avoid some of the drawbacks that existing methods have. The existing ones that have been used to measure activity from the entire face are electromyography (EMG) that measures the electric activity of the facial muscles and image-based methods that use machine vision. EMG has drawbacks due to its requirement to attach electrodes to the face, whereas vision-based methods rely on using cameras and heavy computational processing to collect information about the facial behaviour. The presented capacitive method does not require physical contact to the face, the computational requirements of the needed signal processing are low, and it can be used in mobile applications because the measurement can be integrated to head-mounted devices. The thesis includes several studies where prototypes were constructed, experiments carried out, signal and data processing methods applied, and results analysed. The method was first applied as a way to detect facial movements for human–computer interaction. It was integrated with a gaze tracker to point targets on a computer screen with the gaze and click with facial movements. Later, the method was extended from the detection of single facial movements to be feasible in the detection and classification of movements and expressions of the entire face. It was also applied to the measurement of the activation intensities of certain facial muscles. The results of the thesis show that the new measurement method detects facial movements with a good performance. Pointing and clicking also performs well when the detection method is combined with gaze tracking. The classification of facial movements performs very well with the ones included in the experiments of the thesis, and the classification can be expected to work also with more complex facial expressions. Further, the measurement method’s performance in determining the intensities of facial muscle activations was good for ones that have a wide movement range. Finally, the thesis also states the limitations of the new measurement method and includes suggestions to overcome them and to develop the method further.
Computational Modeling of Functional Gold Nanoparticles in Biological Environment

This work focuses on exploring the properties and functions of charged monolayer-protected gold nanoparticles (AuNPs) in biologically relevant environments by use of atomic-scale molecular dynamics (MD) simulations.

The use of nanoparticles (NPs) in modern technology has been increasing rapidly during the last few years. NPs of different kinds have already been employed, e.g., in nanomedicine as cancer treatments, cleaning agents, cosmetics and new materials for industrial purposes. AuNPs are one type of nanoagents that are being employed for such purposes, and according to recent experimental findings they may have cytotoxic properties. In particular, AuNPs of 2-nm diameter or less are known to permeate through plasma membranes and induce cell death. Hence, studying potential harmful effects of AuNPs is of importance. Understanding the interaction between NPs and cell membranes is relevant also because all trafficking between the cell interior and extracellular space takes place through the cell membrane.

The first study concentrated on the properties of AuNPs in aqueous solution at physiological temperature (310 K). The results showed that electrostatic properties modulate the formation of a complex comprised of the AuNP together with surrounding ions and water, and suggested that electrostatics is one of the central factors in the complexation of AuNPs with other nanomaterials and biological systems. The results highlighted the importance of long-range electrostatic interactions in determining NP properties in aqueous solutions. This observation was concluded to indicate an important role in the interplay between NPs and lipid membranes, which surround cells.

The second part of the research comprises of studying AuNPs in the presence of model cell membranes. The binding of AuNP and membrane reorganization processes were discovered to be governed by co-operative effects where AuNP, counter ions, water and membrane all contribute. The results suggest that a permeation of a cationic AuNP takes place through pore-formation with partial NP neutralization, leading to membrane disruption at higher NP concentrations. The results also suggested a potential mechanism for cytotoxicity as cationic AuNP binding to the extracellular leaflet may trigger apoptosis through translocation of phosphatidylinerine.

Summa summarum, the work presented here provides novel aspects on the interactions of functional AuNPs on cellular level by means of atomistic MD simulation.
Flexible Piezoelectric Energy Harvesting Circuit With Printable Supercapacitor and Diodes

We report a flexible energy harvesting circuit fabricated by roll-to-roll compatible, solution-processable methods. The circuit incorporates a supercapacitor fabricated from a viscous carbon nanotube dispersion, printed Schottky diodes, and a piezoelectric element. Used low-temperature materials enabled component integration on poly(ethylene terephthalate) substrate. The supercapacitor was built with a paper separator and an aqueous NaCl electrolyte. Together with carbon-based electrodes, these materials translated into a disposable and environmentally safe electronic device. The energy harvested from mechanical movement was used to drive a commercial electrochromic display.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Pörhönen, J., Rajala, S., Lehtimäki, S., Tuukkanen, S.
Keywords: (Energy harvesting, piezoelectricity, printed electronics, supercapacitor, FILM SENSOR, RECTIFIER, DEVICES)
Number of pages: 6
Pages: 3303-3308
Publication date: Sep 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Electron Devices
Volume: 61
Issue number: 9
ISSN (Print): 0018-9383
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.022 1.735
Publication Forum (2016): 2
Scopus rating (2015): 1.328 1.791
Web of Science (2015): 2.207 2.312 8.0 0.382 0.03168 0.744
Publication Forum (2015): 2
Scopus rating (2014): 1.376 1.772
Web of Science (2014): 2.472 2.512 7.7 0.386 0.03266 0.79
Publication Forum (2014): 3
Scopus rating (2013): 1.411 1.801
Publication Forum (2013): 3
Scopus rating (2012): 1.33 1.808
Publication Forum (2012): 3
Scopus rating (2011): 1.688 2.146
In this study, we have developed a chip-surface stimulus electrode array for fully-implantable subretinal prosthesis chip. To realize visual restoration with high resolution, stimulus electrodes should be miniaturized and arrayed with high density. When we miniaturize them, however, their electrochemical impedances become higher and their amount of charge injection become smaller. Additionally, as the number of electrodes increases, it becomes difficult to make electrical connection to each pixel of the retinal prosthesis chip and each electrode by electrical wiring. To overcome these problems, we have developed the stimulus electrodes that have low electrochemical impedances and large charge injection capacities, and established a fabrication process of chip-surface stimulus electrode array. We fabricated the stimulus electrodes made of extremely porous platinum which had large-surface-area compared with conventional Pt. We also fabricated the chip-surface stimulus electrodes array on the subretinal prosthesis chip which surface was rough and covered with insulator film.
Development of Si neural probe module with adjustable gain amplifier for neuronal signal recording

In recent years, lots of research on biomedical technologies directly using bio-signals such as BMI (Brain Machine Interface) have been performed intensively. Among bio-signals, ECoG (Electrocorticogram), LFP (Local Field Potential), and AP (Action Potential) are usually recorded especially for diagnosis, treatment, and prevention of brain diseases. These bio-signals have different amplitudes and frequency bandwidths, and the signal intensities vary accordingly with recording electrode conditions and individual variation. Therefore, a multiple bio-signals recording system having adjustable gain and bandwidth is strongly required. In this study, we designed the adjustable gain amplifier appropriate for the system, and fabricated the module composed of the amplifier and a Si neural probe for the multiple bio-signal recording in the deep brain. Additionally, we verified fundamental functions of the module by in vitro experiments.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Research group: Computational Biophysics and Imaging Group, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Graduate School of Engineering, Electrical and Electronics Engineering Department, Department of Bioengineering and Robotics, Tohoku University, Nagasaki Institute of Applied Science
Authors: Tani, T., Naganuma, H., Harashima, T., Iwagami, T., Kino, H., Kiyoyama, K., Kellomäki, M., Hyttinen, J., Tanaka, T.
Keywords: (Adjustable gain amplifier, Multiple bio-signal recording, Si neural probe)
Pages: O-377-O-378
Publication date: 17 Aug 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomedical Engineering

Publication information

Journal: Transactions of Japanese Society for Medical and Biological Engineering
Volume: 52
ISSN (Print): 1347-443X
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 0.101 0.024
Publication Forum (2016): 0
Scopus rating (2015): 0.1 0.0
Publication Forum (2015): 0
Scopus rating (2014): 0.124 0.013
Scopus rating (2013): 0.103 0.393
Scopus rating (2012): 0.105 0.149
Scopus rating (2011): 0.104 0.198
Scopus rating (2010): 0.103 0.193
Scopus rating (2009): 0.102 0.437
Scopus rating (2008): 0.103 0.487
Scopus rating (2007): 0.111 0.167
Scopus rating (2006): 0.112 0.052
Scopus rating (2005): 0.106 0.126
Scopus rating (2004): 0.106 0.126
Scopus rating (2003): 0.106 0.075
Original language: English
DOIs: 10.11239/jsmbe.52.O-253
Source: Scopus
Source-ID: 84939439184
Research output: Scientific - peer-review > Article
Textile-Based Sensors and Smart Clothing System for Respiratory Monitoring

Long-term respiratory monitoring provides valuable information for diagnostic and clinical treatment. Traditional measures of respiration require a mouthpiece or a mask, neither of which can be used as ubiquitous healthcare equipment. Using a smart clothing system seems to be a better alternative. Researchers in the field of smart textiles have focused on the development of health-related products since the 1990s, and textile-based sensors used for respiratory measurements have been discussed in several projects. Although the soft and flexible characteristics of textile-based sensors make them attractive, the flexibility of the materials also affects the signal quality. In a laboratory situation, where each sensor is tested as a single element, this is not as critical as in a user situation, where the sensor is integrated into the clothing and worn by different users engaging in different activities. The principal objective of this thesis was to explore the possibility of performing reliable respiratory monitoring using a clothing platform. The research began by investigating the possible methods and materials that can be used to produce textile-based sensors for respiratory monitoring applications. The aim was to determine the most suitable method for integrating the sensing function into the clothing system. Study results have shown that sensors made with a conductive coating demonstrated superior performance in terms of sensitivity, stability, and reliability. Therefore, five prototype systems based on conductive coating technique were developed. Sensor placement, signal collection techniques, and the clothing system configuration were the main concerns, while issues related to the sensor wearability, maintenance, and aesthetic appearance, as well as the environment and health, were also discussed. Knitting was found to be the most economical method for producing the textile-based sensors; however, sensors made of knit fabric do not perform as well as the coated ones. Therefore, elastic-conductive hybrid yarns have been created to improve the electro-mechanical properties of knitted-based sensors, and eventually, a prototype with two sensors and a built-in data-bus was made by fully-fashion knitting technique. Two smart clothing system prototypes, based on conductive coating technique, were tested systematically by ten subjects. The first prototype consisted of one sensing element, and the results show that the smart clothing system could successfully monitor the subjects' breathing patterns during sitting, standing, and different forms of running. The system has also proven to be useful in the observation of sleep apnea disorder symptoms. The second prototype consisted of two sensing elements. Apart from all the characteristics of the first prototype system, a system with two sensing elements can be used to determine the relationship between the rib cage and abdomen compartments, which provides information for certain diseases, e.g., cardiac arrhythmias. The second smart clothing system prototype was compared with a conventional respiratory belt for validation. Signals from the clothing system and the respiratory belt were collected simultaneously with a self-designed LabVIEW program, and further processed with MATLAB. Quantitative analyses were conducted based upon different comparison techniques, such as Pearson’s correlation, ANOVA and Fast Fourier Transform analysis. The results demonstrate that the smart clothing system can provide reliable respiratory measurements, with signals of comparable quality to the conventional respiratory belt. In addition, the wearability and user acceptance were studied by means of a survey. The survey results indicate that users were more comfortable with the smart clothing system and that most believe that using a smart clothing system will improve both health condition and quality of life.
Quantitative Analysis of Dynamic Association in Live Biological Fluorescent Samples

Determining vesicle localization and association in live microscopy may be challenging due to non-simultaneous imaging of rapidly moving objects with two excitation channels. Besides errors due to movement of objects, imaging may also introduce shifting between the image channels, and traditional colocalization methods cannot handle such situations. Our approach to quantifying the association between tagged proteins is to use an object-based method where the exact match of object locations is not assumed. Point-pattern matching provides a measure of correspondence between two point-sets under various changes between the sets. Thus, it can be used for robust quantitative analysis of vesicle association between image channels. Results for a large set of synthetic images shows that the novel association method based on point-pattern matching demonstrates robust capability to detect association of closely located vesicles in live cell-microscopy where traditional colocalization methods fail to produce results. In addition, the method outperforms compared Iterated Closest Points registration method. Results for fixed and live experimental data shows the association method to perform comparably to traditional methods in colocalization studies for fixed cells and to perform favorably in association studies for live cells.
Adipose Stem Cells Used to Reconstruct 13 Cases With Cranio-Maxillofacial Hard-Tissue Defects

Although isolated reports of hard-tissue reconstruction in the cranio-maxillofacial skeleton exist, multipatient case series are lacking. This study aimed to review the experience with 13 consecutive cases of cranio-maxillofacial hard-tissue defects at four anatomically different sites, namely frontal sinus (3 cases), cranial bone (5 cases), mandible (3 cases), and nasal septum (2 cases). Autologous adipose tissue was harvested from the anterior abdominal wall, and adipose-derived stem cells were cultured, expanded, and then seeded onto resorbable scaffold materials for subsequent reimplantation into hard-tissue defects. The defects were reconstructed with either bioactive glass or p-tricalcium phosphate scaffolds seeded with adipose-derived stem cells (ASCs), and in some cases with the addition of recombinant human bone morphogenetic protein-2. Production and use of ASCs were done according to good manufacturing practice guidelines. Follow-up time ranged from 12 to 52 months. Successful integration of the construct to the surrounding skeleton was noted in 10 of the 13 cases. Two cranial defect cases in which nonrigid resorbable containment meshes were used sustained bone resorption to the point that they required the procedure to be redone. One septal perforation case failed outright at 1 year because of the postsurgical resumption of the patient's uncontrolled nasal picking habit.
Accurate Cortical Bone Detection in Peripheral Quantitative Computed Tomography Images

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cervinka, T., Hyttinen, J., Sievänen, H.
Number of pages: 4
Pages: 289-292
Publication date: 2014

Host publication information
Title of host publication: 13th Mediterranean Conference on Medical and Biological Engineering and Computing 2013, MEDICON 2013, Part IV, Seville, Spain, 25.-28.9.2013
Publisher: Springer
Editor: Roa Romero, L. M.
ISBN (Print): 978-3-319-00845-5
ISBN (Electronic): 978-3-319-00846-2

Publication series
Name: International Federation for Medical and Biological Engineering Proceedings
Volume: 41
ISSN (Print): 1680-0737
DOIs:
10.1007/978-3-319-00846-2_72

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-02-15<br/>Publisher name: Springer

Acute mild traumatic brain injury is not associated with white matter change on diffusion tensor imaging

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 7
A Health-IoT Platform Based on the Integration of Intelligent Packaging, Unobtrusive Bio-Sensor, and Intelligent Medicine Box

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA)
Authors: Yang, G., Xie, L., Mäntysalo, M., Zhou, X., Pang, Z., Xu, L., Kao-Walter, S., Chen, Q., Zheng, L.
Number of pages: 12
Pages: 2180-2191
Publication date: 2014
Peer-reviewed: Yes
Publication information
Journal: IEEE Transactions on Industrial Informatics
Volume: 10
Issue number: 4
ISSN (Print): 1551-3203
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.446
Publication Forum (2016): 2
Scopus rating (2015): 2.557
Web of Science (2015): 4.708 4.88 2.7 0.887 0.01639 1.587
Publication Forum (2015): 2
Scopus rating (2014): 2.298
Publication Forum (2014): 2
Scopus rating (2013): 2.204
Publication Forum (2013): 2
Scopus rating (2012): 1.038
Publication Forum (2012): 2
Scopus rating (2011): 0.875
Scopus rating (2010): 0.615
Scopus rating (2009): 0.99
Scopus rating (2008): 1.012
Scopus rating (2007): 0.803
Scopus rating (2006): 1.433
Original language: English
DOIs:
10.1109/TII.2014.2307795

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-11-10<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 1815
Research output: Scientific - peer-review › Article

Altistaako vai ei - Etäluettavat sähkömittarit kartoitettiin

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 4
Pages: 15-18
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Sähkö & Tele
Volume: 87
Issue number: 4
Original language: Finnish

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-06-27<br/>Publisher name: Sähköinsinööriliitto
Source: researchoutputwizard
Source-ID: 779
Research output: Professional › Article
A multi-tissue segmentation of the human head for detailed computational models

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hannula, M., Narra, N., Onnela, N., Dastidar, P., Hyttinen, J.
Number of pages: 4
Pages: 2484-2487
Publication date: 2014

Host publication information
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4244-7929-0
DOIs: 10.1109/EMBC.2014.6944126

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-10-08<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 410
Research output: Scientific - peer-review › Conference contribution

Analysis of Virus Textures in Transmission Electron Microscopy Images

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Nanni, L., Paci, M., Santos, F. L. C. D., Brahnam, S., Hyttinen, J.
Number of pages: 9
Pages: 83-91
Publication date: 2014

Host publication information
Publisher: IOS Press

Publication series
Name: Studies in Health Technology and Informatics
Volume: 207
ISSN (Print): 0926-9630
ISSN (Electronic): 1879-8365
DOIs: 10.3233/978-1-61499-474-9-83

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-12-09<br/>Publisher name: IOS Press
Source: researchoutputwizard
Source-ID: 1121
Research output: Scientific - peer-review › Conference contribution

A new Generation Sweating Thermal Manikin for the Evaluation of the Thermoregulation Properties of Protective Clothing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Antibacterial properties and chemical stability of superhydrophobic silver-containing surface produced by sol-gel route

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Heinonen, S., Huttunen-Saarivirta, E., Nikkanen, J., Raulio, M., Priha, O., Laakso, J., Strogårds, E., Levänen, E.
Number of pages: 13
Pages: 149-161
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Colloids and Surfaces A: Physicochemical and Engineering Aspects
Volume: 453
ISSN (Print): 0927-7757
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.797 1.104
Publication Forum (2016): 1
Scopus rating (2015): 0.803 1.116
Web of Science (2015): 2.76 2.834 7.5 0.581 0.02955 0.592
Publication Forum (2015): 1
Scopus rating (2014): 0.843 1.252
Web of Science (2014): 2.752 2.832 7.3 0.573 0.02898 0.607
Publication Forum (2014): 2
Scopus rating (2013): 0.811 1.255
Publication Forum (2013): 2
Scopus rating (2012): 0.841 1.189
Publication Forum (2012): 2
Scopus rating (2011): 0.812 1.183
Scopus rating (2010): 0.872 1.115
Scopus rating (2009): 0.848 1.059
Scopus rating (2008): 0.886 1.041
Scopus rating (2007): 0.795 0.978
Scopus rating (2006): 0.822 1.091
Scopus rating (2005): 0.813 1.004
Scopus rating (2004): 0.844 1.106
Scopus rating (2003): 0.824 1.033
Scopus rating (2002): 0.763 0.945
Scopus rating (2001): 0.825 0.971
Scopus rating (2000): 0.69 0.782
Application of Optical Heart Rate Monitoring

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Lemay, M., Bertschi, M., Sola, J., Renevey, P., Parak, J., Korhonen, I.
Number of pages: 24
Pages: 105-129
Publication date: 2014

Host publication information
Title of host publication: Wearable Sensors: Fundamentals, Implementation and Applications
Publisher: Elsevier; Imprint: Academic Press
Editors: Sazonov, E., Neuman, M. R.
ISBN (Print): 978-0-12-418662-0
DOIs: 10.1016/B978-0-12-418662-0.00023-4
Links: http://www.elsevier.com/books/wearable-sensors/sazonov/978-0-12-418662-0

Are breaks in daily Self-Weighing Associated with Weight Gain

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Helander, E. E., Vuorinen, A., Wansink, B., Korhonen, I. K.
Number of pages: 4
Pages: 1-4
Publication date: 2014
Peer-reviewed: Yes
A secretomics analysis reveals major differences in the macrophage responses towards different types of carbon nanotubes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Palomäki, J., Sund, J., Vippola, M., Kinaret, P., Greco, D., Savolainen, K., Puustinen, A., Alenius, H.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nanotoxicology
ISSN (Print): 1743-5390
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.594 1.251
Publication Forum (2016): 1
Scopus rating (2015): 2.106 1.551
Web of Science (2015): 7.913 8.137 3.3 1.814 0.00952 1.872
Publication Forum (2015): 1
Scopus rating (2014): 1.711 1.311
Web of Science (2014): 6.411 7.322 3.2 2.537 0.00676 1.559
Publication Forum (2014): 1
Scopus rating (2013): 2.009 1.433
Publication Forum (2013): 1
Scopus rating (2012): 2.106 1.378
Publication Forum (2012): 1
Scopus rating (2011): 1.584 1.097
Scopus rating (2010): 1.404 1.244
A Semi-Automatic Segmentation Method for the Structural Analysis of Carotid Atherosclerotic Plaques by Computed Tomography Angiography

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Caetano Santos, F. L., Joutsen, A., Terada, M., Salenius, J., Eskola, H.
Number of pages: 11
Pages: 930-940
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Atherosclerosis and Thrombosis
Volume: 21
Issue number: 9
ISSN (Print): 1340-3478

Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.051 1.08
Scopus rating (2015): 1.005 1.007
Web of Science (2015): 2.495 2.668 5.0 0.824 0.00593 0.665
Publication Forum (2014): 1
Scopus rating (2014): 1.062 1.154
Web of Science (2014): 2.733 2.761 4.5 0.366 0.00642 0.705
Publication Forum (2013): 1
Scopus rating (2013): 1.452 1.222
Publication Forum (2013): 1
Scopus rating (2012): 1.232 1.256
Publication Forum (2012): 1
Scopus rating (2011): 1.038 1.031
Scopus rating (2010): 0.779 1.116
Scopus rating (2009): 1.118 1.103
Scopus rating (2008): 1.602 1.04
Scopus rating (2007): 1.388 0.985
Scopus rating (2006): 0.915
Scopus rating (2005): 0.905
Scopus rating (2004): 0.654
Scopus rating (2003): 0.561
Scopus rating (2002): 0.464
Scopus rating (2001): 0.211
Scopus rating (2000): 0.482
Scopus rating (1999): 0.311
Original language: English
DOIs:
A Simplified Method for Calculation of High Voltage Power Substation Electric Fields

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Okun, O., Korpinen, L.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: EHE2014, 5th International Conference on Electromagnetic Fields, Health and Environment, Porto, Portugal, 24th - 26th April, 2014
Publisher: Portuguese Association for the Development of Electrical Engineering
Article number: PS.5
ISBN (Print): 978-972-8822-28-6

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-05-25
Publisher name: Portuguese Association for the Development of Electrical Engineering
Source: researchoutputwizard
Source-ID: 1190
Research output: Scientific - peer-review › Conference contribution

A structural and functional perspective on the evolution of the heme-copper oxidases

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Sharma, V., Wikström, M.
Number of pages: 6
Pages: 3787-3792
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: FEBS Letters
Volume: 588
Issue number: 21
ISSN (Print): 0014-5793
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.898 0.885
Publication Forum (2016): 1
Scopus rating (2015): 2.02 0.927
Web of Science (2015): 3.519 3.478 >10.0 0.569 0.05981 1.231
Publication Forum (2015): 1
Scopus rating (2014): 1.86 0.871
Web of Science (2014): 3.169 3.372 >10.0 0.844 0.06169 1.208
Publication Forum (2014): 1
Scopus rating (2013): 2.328 0.984
A texture analysis method for MR images of airway dilator muscles: a feasibility study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Kölhi, P., Järnstedt, J., Sikiö, M., Viik, J., Dastidar, P., Peltomäki, T., Eskola, H.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Dentomaxillofacial Radiology
Volume: 43
Issue number: 5
Article number: 20130403
ISSN (Print): 0250-832X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.761 0.989
Publication Forum (2016): 1
Scopus rating (2015): 0.981 1.326
Web of Science (2015): 1.919 1.859 7.3 0.44 0.00354 0.53
Publication Forum (2015): 1
Scopus rating (2014): 0.893 1.261
Web of Science (2014): 1.39 1.534 7.4 0.222 0.00334 0.467
Publication Forum (2014): 1
Scopus rating (2013): 0.827 1.2
Publication Forum (2013): 1
Scopus rating (2012): 0.871 1.362
Publication Forum (2012): 1
Atomistic Molecular Dynamics Simulations of Cytochrome bc1, and Epiderm Growth Factor Receptor Proteins

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics
Authors: Kaszuba, K.
Publication date: 2014

Publication information
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: Tampere University of Technology, Publication
Publisher: Tampere University of Technology
Volume: 1271
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 746
Research output: Monograph › Doctoral Thesis

Atomistic simulations of anionic Au144(SR)60 nanoparticles interacting with asymmetric model lipid membranes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Research group: Materials and Molecular Modeling, Department of Physics, Computational Science X (CompX)
Authors: Heikkilä, E., Martinez-Seara, H., Gurtovenko, A. A., Vattulainen, I., Akola, J.
Number of pages: 9
Pages: 2852-2860
Publication date: 2014
Biofunctional hybrid materials: bimolecular organosilane monolayers on FeCr alloys

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Vuori, L., Leppiniemi, J., Hannula, M., Lahtonen, K., Hirsimäki, M., Nömmiste, E., Costelle, L., Hytönen, V. P., Valden, M.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information

Biofunctional hybrid materials: bimolecular organosilane monolayers on FeCr alloys

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Vuori, L., Leppiniemi, J., Hannula, M., Lahtonen, K., Hirsimäki, M., Nömmiste, E., Costelle, L., Hytönen, V. P., Valden, M.
Number of pages: 10
Pages: 1-10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Bone loss patterns in cortical, subcortical, and trabecular compartments during simulated microgravity

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cervinka, T., Sievänen, H., Hyttinen, J., Rittweger, J.
Number of pages: 9
Pages: 80-88
Publication date: 2014
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Applied Physiology
Volume: 117
Issue number: 1
Carbon-based nanomaterials accelerate arteriolar thrombus formation in the murine microcirculation independently of their shape

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Holzer, M., Bihari, P., Praetner, M., Uhl, B., Reichel, C., Fent, J., Vippola, M., Lakatos, S., Krombach, F.
Number of pages: 10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Applied Toxicology
ISSN (Print): 0260-437X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.897 0.95
Publication Forum (2016): 1
Scopus rating (2015): 1.018 1.068
Cardiac pacemakers and electromagnetic fields: comparison of experimental results in France and Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Magne, I., Korpinen, L., Souques, M.
Number of pages: 6
Pages: 1149-1154
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 2014 International symposium on electromagnetic compatibility (EMC Europe 2014), Gothenburg, Sweden, September 1-4, 2014
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-3225-2
ISBN (Electronic): 978-1-4799-3226-9
DOIs: 10.1109/EMCEurope.2014.6931076

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-10-19
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 989
Research output: Scientific - peer-review » Conference contribution
Characterization of dynamical systems under noise using recurrence networks: Application to simulated and EEG data

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Puthanmadam Subramaniyam, N., Hyttinen, J.
Number of pages: 11
Pages: 3464-3474
Publication date: 2014
Peer-reviewed: Yes

Publication Information
Journal: Physics Letters A
Volume: 378
Issue number: 46
ISSN (Print): 0375-9601
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.683 1.064
Publication Forum (2016): 1
Scopus rating (2015): 0.713 1.159
Web of Science (2015): 1.677 1.627 >10.0 0.429 0.02702 0.51
Publication Forum (2015): 1
Scopus rating (2014): 0.699 1.024
Web of Science (2014): 1.683 1.627 >10.0 0.472 0.03177 0.534
Publication Forum (2014): 1
Scopus rating (2013): 0.631 1.065
Publication Forum (2013): 1
Scopus rating (2012): 0.797 1.167
Publication Forum (2012): 1
Scopus rating (2011): 0.873 1.188
Scopus rating (2010): 0.94 1.116
Scopus rating (2009): 0.994 1.2
Scopus rating (2007): 0.89 0.995
Scopus rating (2006): 0.764 0.962
Scopus rating (2005): 0.883 1.02
Scopus rating (2004): 0.898 0.988
Scopus rating (2003): 0.796 0.951
Scopus rating (2002): 0.85 1.012
Scopus rating (2001): 0.762 0.995
Scopus rating (2000): 0.937 0.903
Scopus rating (1999): 1.018 0.937
Original language: English
DOIs:
10.1016/j.physleta.2014.10.005
Characterization of microstructures using contour tree connectivity for fluid flow analysis

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Aydogan, D. B., Hyttinen, J.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of the Royal Society. Interface
Volume: 11
Issue number: 95
Article number: 20131042
ISSN (Print): 1742-5689
Ratings:
- Publication Forum (2017): 1
- Scopus rating (2016): 1.412 1.22
- Publication Forum (2016): 1
- Scopus rating (2015): 1.571 1.38
- Web of Science (2015): 3.818 4.409 4.5 0.744 0.03254 1.619
- Publication Forum (2015): 1
- Scopus rating (2014): 1.564 1.572
- Web of Science (2014): 3.917 4.65 4.4 0.68 0.03088 1.701
- Publication Forum (2014): 1
- Scopus rating (2013): 1.8 1.825
- Publication Forum (2013): 1
- Scopus rating (2012): 1.999 2.043
- Publication Forum (2012): 1
- Scopus rating (2011): 1.776 1.87
- Scopus rating (2010): 1.613 1.541
- Scopus rating (2009): 1.65 1.54
- Scopus rating (2008): 1.326 1.261
- Scopus rating (2007): 1.385 1.357
- Scopus rating (2006): 0.878 1.197
- Scopus rating (2005): 0.629 0.987
Original language: English
DOIs:
10.1098/rsif.2013.1042

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-05-09
Publisher name: Royal Society Publishing
Source: researchoutputwizard
Source-ID: 127
Research output: Scientific - peer-review Article

Cholesterol level affects surface charge of lipid membranes in saline solution

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Cholesterol, sphingolipids and glycolipids: What do we know about their role in raft-like membranes?
Co-exposure with fullerene may strengthen health effects of organic industrial chemicals

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organizations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX), Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Lehto, M., Karilainen, T., Rog, T., Cramariuc, O., Vanhala, E., Yornaeus, J., Taberman, H., Jänis, J., Alenius, H., Vattulainen, I., Laine, O.
Number of pages: 24
Pages: 1-24
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS One
Volume: 9
Issue number: 12
Article number: e114490
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Scopus rating (2015): 1.414 1.131
Web of Science (2015): 3.057 3.535 3.1 0.396 1.819 24 1.139
Publication Forum (2015): 1
Scopus rating (2014): 1.545 1.141
Comparative assessment of sleep quality estimates using home monitoring technology

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics- PHI, Research Community on Data-to-Decision (D2D)
Authors: Perez-Macias, J., Jimison, H., Korhonen, I., Pavel, M.
Number of pages: 4
Pages: 4979-4982
Publication date: 2014

Host publication information
Title of host publication: 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC'14, 26-30 August 2014, Chicago, IL, USA
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers
ISBN (Print): 978-1-4244-7929-0
DOIs:
10.1109/EMBC.2014.6944742

Bibliographical note
Contribution: organisation=ys,FACT1=1<br/>Portfolio EDEND: 2014-12-15<br/>Publisher name: Public Library of Science
Source: researchoutputwizard
Source-ID: 908
Research output: Scientific - peer-review › Article

Comparison of Chondroitin Sulfate and Hyaluronic Acid Doped Conductive Polypyrrole Films for Adipose Stem Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Björninen, M., Siljander, A., Pelto, J., Hyttinen, J., Kellomäki, M., Miettinen, S., Seppänén, R., Haimi, S.
Number of pages: 12
Pages: 1889-1900
Publication date: 2014
Peer-reviewed: Yes

Publication information

Web of Science (2014): 3.234 3.702 2.7 0.489 1.53341 1.209
Publication Forum (2014): 2
Scopus rating (2013): 1.74 1.147
Publication Forum (2013): 2
Scopus rating (2012): 1.945 1.142
Publication Forum (2012): 2
Scopus rating (2011): 2.369 1.23
Scopus rating (2010): 2.631 1.161
Scopus rating (2009): 2.473 0.985
Scopus rating (2008): 2.323 0.96
Scopus rating (2007): 1.289 0.525
Original language: English
DOIs: 10.1371/journal.pone.0114490

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-12-07<br/>Publisher name: Public Library of Science
Source: researchoutputwizard
Source-ID: 1266
Research output: Scientific - peer-review › Conference contribution
Comparison of electric field exposure measurement methods under power lines

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Kuisti, H., Tarao, H., Pääkkönen, R., Elovaara, J.
Number of pages: 3
Pages: 221-223
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Radiation Protection Dosimetry
Volume: 158
Issue number: 2
ISSN (Print): 0144-8420
Ratings:
Comparison of methods to define power line and substation's busbar wire capacitances in electric field calculation task

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Okun, O., Korpinen, L.
Number of pages: 6
Pages: 79-85
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria
Links:

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-11-15
Source: researchoutputwizard
Source-ID: 1191
Research output: Scientific - peer-review › Conference contribution
Co-operation between Industry, Authorities and Research Institutes in Environmental and Occupational Exposure to Electric and Magnetic Field Questions in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Pääkkönen, R., Korpinen, L.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: EHE2014, 5th International Conference on Electromagnetic Fields, Health and Environment, Porto, Portugal, 24th - 26th April, 2014
Correlations between Functional Imaging Markers Derived from PET/CT and Diffusion-Weighted MRI in Diffuse Large B-Cell Lymphoma and Follicular Lymphoma

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Wu, X., Pertovaara, H., Korkola, P., Dastidar, P., Järvenpää, R., Eskola, H., Kellokumpu-Lehtinen, P.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS One
Volume: 9
Issue number: 1
Article number: e84999
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Scopus rating (2015): 1.414 1.131
Web of Science (2015): 3.057 3.535 3.1 0.396 1.81924 1.139
Publication Forum (2015): 1
Scopus rating (2014): 1.545 1.141
Web of Science (2014): 3.234 3.702 2.7 0.489 1.53341 1.209
Publication Forum (2014): 2
Scopus rating (2013): 1.74 1.147
Publication Forum (2013): 2
Scopus rating (2012): 1.945 1.142
Publication Forum (2012): 2
Scopus rating (2011): 2.369 1.23
Scopus rating (2010): 2.631 1.161
Scopus rating (2009): 2.473 0.985
Scopus rating (2008): 2.323 0.96
Scopus rating (2007): 1.289 0.525
Original language: English
DOI: 10.1371/journal.pone.0084999

Current densities and total contact currents for 110 and 220 kV power line tasks
Degradation mechanisms of bioresorbable polyesters. Part 1. Effects of random scission, end scission and autocatalysis
Degradation mechanisms of bioresorbable polyesters. Part 2. Effects of initial molecular weight and residual monomer

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Gleadall, A., Pan, J., Kruft, M., Kellomäki, M.
Number of pages: 8
Pages: 2233-2240
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Acta Biomaterialia
Volume: 10
Issue number: 5
ISSN (Print): 1742-7061
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.789 1.921
Publication Forum (2016): 2
Web of Science (2015): 6.008 6.383 4.3 1.208 0.05394 1.462
Publication Forum (2015): 2
Scopus rating (2014): 1.814 2.324
Web of Science (2014): 6.025 6.589 3.9 1.337 0.05183 1.417
Publication Forum (2014): 2
Scopus rating (2013): 1.963 2.269
Publication Forum (2013): 2
Scopus rating (2012): 1.904 2.125
Publication Forum (2012): 2
Scopus rating (2011): 1.808 1.91
Scopus rating (2010): 1.794 1.964
Scopus rating (2009): 1.399 1.662
Scopus rating (2008): 1.404 1.981
Scopus rating (2007): 1.199 1.493
Scopus rating (2006): 0.837 1.131
Original language: English
DOIs:
10.1016/j.actbio.2013.12.039

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-04-30<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 349
Research output: Scientific - peer-review › Article
Dehydroergosterol as an Analogue for Cholesterol: Why It Mimics Cholesterol So Well - or Does It?

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX), Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Pourmousa, M., Rog, T., Mikkeli, R., Vattulainen, I., Solanko, L. M., Wustner, D., Holmgaard List, N., Kongsted, J., Karttunen, M.
Number of pages: 13
Pages: 7345-7357
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry Part B
Volume: 118
Issue number: 26
ISSN (Print): 1520-6106
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.348 1.02
Publication Forum (2016): 1
Scopus rating (2015): 1.367 1.096
Web of Science (2015): 3.187 3.265 9.8 0.808 0.11793 0.91
Publication Forum (2015): 1
Scopus rating (2014): 1.44 1.14
Web of Science (2014): 3.302 3.528 9.0 0.754 0.14274 0.989
Publication Forum (2014): 3
Scopus rating (2013): 1.494 1.2
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**Bibliographical note**
Contribution: organisation=fys,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 1296
Research output: Scientific - peer-review » Article

**Detection of Prostate Cancer by an Electronic Nose; A Proof of Principle Study**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), Prostate cancer research center (PCRC)
Number of pages: 6
Pages: 230-235
Publication date: 2014
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Urology
Volume: 192
Issue number: 1
ISSN (Print): 0022-5347
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.389 1.904
Publication Forum (2016): 2
Scopus rating (2015): 2.333 1.747
Web of Science (2015): 4.7 4.169 >10.0 1.345 0.06075 1.347
Publication Forum (2015): 2
Scopus rating (2014): 2.258 1.847
Web of Science (2014): 4.36 4.064 9.6 1.131 0.06662 1.271
Publication Forum (2014): 2
Scopus rating (2013): 2.25 1.807
Publication Forum (2013): 2
Determination of the functionality of monolayers of aminopropyl trimethoxy silane and mercaptopropyl trimethoxy silane on stainless steel with SR-PES and chemical derivatization

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Optoelectronics Research Centre, Research group: Surface Science
Authors: Vuori, L., Hannula, M., Hirsimäki, M., Tönisoo, A., Nömmiste, E., Valden, M.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Place of publication: Lund, Sweden
Publisher: MAX-LAB
Links:
https://www.maxlab.lu.se/node/1913

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-12-26
Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 1395
Research output: Scientific - peer-review › Article

Difference of gaussians revolved along elliptical paths for ultrasound fetal head segmentation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Signal and Image Restoration-RST, Department of Signal Processing, Signal Processing Research Community (SPRC)
Number of pages: 11
Pages: 774-784
Publication date: 2014

Bibliographical note
Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2014-12-15
Source: researchoutputwizard
Source-ID: 1771
Research output: Scientific › Chapter
Direct laser writing of microstructures for the growth guidance of human pluripotent stem cell derived neuronal cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Turunen, S., Käpylä, E., Lähteenmäki, M., Ylä-Outinen, L., Narkilahti, S., Kellomäki, M.
Number of pages: 8
Pages: 197-204
Publication date: 2014
Peer-reviewed: Yes
ASJC Scopus subject areas: Biomaterials

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-02-05<br/>Publisher name: Pergamon press
Source: researchoutputwizard
Source-ID: 309
Research output: Scientific - peer-review › Article
Direct laser writing of synthetic poly(amino acid) hydrogels and poly(ethylene glycol) diacylates by two-photon polymerization

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Käpylä, E., Sedlacík, T., Aydogan, D. B., Viitanen, J., Rypacek, F., Kellomäki, M.
Number of pages: 10
Pages: 280-289
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Materials Science and Engineering C: Materials for Biological Applications
Volume: 43
ISSN (Print): 0928-4931
Ratings:
DOT1L -HES8 fusion drives androgen independent growth in prostate cancer

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Prostate cancer research center (PCRC)
Authors: Annala, M., Kivinummi, K., Leinonen, K., Tuominen, J., Zhang, W., Visakorpi, T., Nykter, M.
Number of pages: 4
Pages: 1121-1123
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: EMBO Molecular Medicine
Volume: 6
ISSN (Print): 1757-4676
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 4.84 1.869
Publication Forum (2016): 2
Scopus rating (2015): 5.453 1.935
Web of Science (2015): 9.547 9.508 2.9 1.99 0.02328 3.723

Bibliographical note
Contribution: organisation=elt, FACT1=1
Portfolio EDEND: 2014-08-30
Publisher name: Elsevier S.A.
Source: researchoutputwizard
Source-ID: 658
Research output: Scientific - peer-review » Article
Early interim PET/CT predicts post-treatment response in diffuse large B-cell lymphoma
Effect of heart rate correction on pre- and post-exercise heart rate variability to predict risk of mortality—an experimental study on the FINCAVAS cohort

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA)
Authors: Pradhapan, P., Tarvainen, M. P., Nieminen, T., Lehtinen, R., Nikus, K., Lehtimäki, T., Kähönen, M., Viik, J.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Frontiers in Physiology
Volume: 5
Issue number: 208
ISSN (Print): 1664-042X
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.765 1.157
Scopus rating (2016): 1
Scopus rating (2015): 1.871 1.185
Web of Science (2015): 4.031 3.882 2.6 0.466 0.02622 1.235
Publication Forum (2015): 1
Scopus rating (2014): 1.517 1.049
Web of Science (2014): 3.534 3.461 2.2 0.749 0.0153 1.038
Publication Forum (2014): 1
Scopus rating (2013): 1.227 0.82
Publication Forum (2013): 1
Scopus rating (2012): 0.822 0.691
Publication Forum (2012): 1
Scopus rating (2011): 0.501 0.534
Original language: English
DOIs:
10.3389/fphys.2014.00208

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-05-30
Publisher name: Frontiers Research Foundation
Source: researchoutputwizard
Source-ID: 1304
Research output: Scientific - peer-review › Article
Effects of Radio Front-end PLL Phase Noise on GNSS Baseband Correlation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Wireless Communications and Positioning (WICO)
Authors: Thombre, S., Tchamov, N. N., Lohan, S., Valkama, M., Nurmi, J.
Number of pages: 9
Pages: 13-21
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Navigation
Volume: 61
Issue number: 1
ISSN (Print): 0028-1522
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.981 1.843
Publication Forum (2016): 1
Scopus rating (2015): 0.466 1.571
Publication Forum (2015): 1
Scopus rating (2014): 0.392 1.553
Publication Forum (2014): 2
Scopus rating (2013): 0.476 1.907
Publication Forum (2013): 2
Scopus rating (2012): 0.65 1.487
Publication Forum (2012): 2
Scopus rating (2011): 0.514 0.937
Scopus rating (2010): 0.361 0.874
Scopus rating (2009): 0.36 1.283
Scopus rating (2008): 0.498 1.231
Scopus rating (2007): 0.192 0.982
Scopus rating (2006): 0.328 1.396
Scopus rating (2005): 0.172 0.749
Scopus rating (2004): 0.273 1.264
Scopus rating (2003): 0.298 0.993
Scopus rating (2002): 0.352 0.635
Scopus rating (2001): 0.243 0.55
Scopus rating (2000): 0.18 0.15
Scopus rating (1999): 0.182
Original language: English
DOIs:
10.1002/NAVI.54

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-04-29
Publisher name: Wiley-Blackwell Publishing
Source: researchoutputwizard
Source-ID: 1624
Research output: Scientific - peer-review › Article

Electrostatic Threats in Hospital Environment
Uncontrolled electrostatic discharge (ESD) sources may cause unpleasant experiences as well as more serious hazards to health. We have observed surprisingly high energy ESD sources in the hospital environment. These findings are analyzed and discussed in this article. In addition, electrostatic attraction and charge relaxation of materials for medical purposes are studied and solutions are proposed.
Enzymatic oxidation of cholesterol: Properties and functional effects of cholestenone in cell membranes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Neuvonen, M., Manna, M., Mokkila, S., Javanainen, M., Rog, T., Liu, Z., Bittman, R., Vattulainen, I., Ikonen, E.
Number of pages: 13
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS One
Volume: 9
Issue number: 8
Article number: e103743
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Scopus rating (2015): 1.414 1.131
Web of Science (2015): 3.057 3.535 3.1 0.396 1.81924 1.139
Publication Forum (2015): 1
Scopus rating (2014): 1.545 1.141
Web of Science (2014): 3.234 3.702 2.7 0.489 1.53341 1.209
Publication Forum (2014): 2
Scopus rating (2013): 1.74 1.147
Publication Forum (2013): 2
Scopus rating (2012): 1.945 1.142
Publication Forum (2012): 2
Scopus rating (2011): 2.369 1.23
Scopus rating (2010): 2.631 1.161
Scopus rating (2009): 2.473 0.985
Scopus rating (2008): 2.323 0.96
Scopus rating (2007): 1.289 0.525
Original language: English
DOIs:
10.1371/journal.pone.0103743
Evaluation of analytical reconstruction with a new gap-filling method in comparison to iterative reconstruction in [11C]-raclopride PET studies

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: M2oBSI
Authors: Tuna, U., Johansson, J., Ruotsalainen, U.
Number of pages: 13
Pages: 417-429
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Annals of Nuclear Medicine
Volume: 28
Issue number: 5
ISSN (Print): 0914-7187
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.576 0.798
Publication Forum (2016): 1
Scopus rating (2015): 0.676 0.882
Web of Science (2015): 1.467 1.535 6.1 0.313 0.00368 0.44
Publication Forum (2015): 1
Scopus rating (2014): 0.73 0.998
Web of Science (2014): 1.677 1.637 5.9 0.24 0.00423 0.491
Publication Forum (2014): 1
Scopus rating (2013): 0.767 0.91
Publication Forum (2013): 1
Scopus rating (2012): 0.657 0.906
Publication Forum (2012): 1
Scopus rating (2011): 0.553 0.945
Scopus rating (2010): 0.51 0.716
Scopus rating (2009): 0.408 0.707
Scopus rating (2008): 0.423 0.625
Scopus rating (2007): 0.612 0.815
Scopus rating (2006): 0.411 0.622
Scopus rating (2005): 0.402 0.675
Scopus rating (2004): 0.345 0.638
Scopus rating (2003): 0.284 0.649
Scopus rating (2002): 0.346 0.512
Scopus rating (2001): 0.316 0.463
Scopus rating (2000): 0.32 0.518
Scopus rating (1999): 0.377 0.509
Original language: English
DOIs: 10.1007/s12149-014-0832-y

Bibliographical note
Contribution: organisation=sgn,FACT1=1
Portfolio EDEND: 2014-10-30
Publisher name: Springer Japan KK; Japanese Society of Nuclear Medicine
Source: researchoutputwizard
Evaluation of thermal Comfort Properties of Prototype Uniforms for Rescue Team Workers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Varheenmaa, M.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Title of host publication: Ambience14&10i3m, Tampere Hall, Tampere, Finland 7-9 September 2014
Editor: Varheenmaa, M.

Publication series
Name: Proceedings of Ambience, Scientific Conference for Smart Textiles
No.: 1
ISSN (Print): 2342-4540

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-09-23
Source: researchoutputwizard
Source-ID: 1704
Research output: Scientific - peer-review › Conference contribution

Evaluation of Wearable Consumer Heart Rate Monitors Based on Photoplethysmography
Wearable monitoring of heart rate (HR) during physical activity and exercising allows real time control of exercise intensity and training effect. Recently, technologies based on pulse plethysmography (PPG) have become available for personal health management for consumers. However, the accuracy of these monitors is poorly known which limits their application. In this study, we evaluated accuracy of two PPG based (wrist i.e. Mio Alpha vs forearm i.e. Schosche Rhythm) commercially available HR monitors during exercise. 21 healthy volunteers (15 male and 6 female) completed an exercise protocol which included sitting, lying, walking, running, cycling, and some daily activities involving hand movements. HR estimation was compared against values from the reference electrocardiogram (ECG) signal. The heart rate estimation reliability scores for

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Parak, J., Korhonen, I.
Number of pages: 4
Pages: 3670-3673
Publication date: 2014

Host publication information
Place of publication: Piscataway
Publisher: IEEE
ISBN (Print): 978-1-4244-7929-0

Publication series
Name: IEEE Engineering in Medicine and Biology Society Conference Proceedings
Publisher: IEEE
ISSN (Print): 1557-170X
DOIs:
10.1109/EMBC.2014.6944419

Bibliographical note
Example measurements of exposure to ELF magnetic fields on the metro station in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Lähdetie, A., Amundin, Å., Piippo, H., Sydänheimo, L.
Number of pages: 4
Pages: 338-341
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria
Links:

Bibliographical note

Examples of the Teaching of the Health Issues of Electromagnetic Fields at Tampere University of Technology in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: EHE2014, 5th International Conference on Electromagnetic Fields, Health and Environment, Porto, Portugal, 24th - 26th April, 2014
Publisher: Portuguese Association for the Development of Electrical Engineering
Article number: PS.20

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-05-25
Source: researchoutputwizard
Source-ID: 770
Research output: Scientific - peer-review › Conference contribution

Examples se desures de l'exposition aux champs magnétiques ELF dans une station de métro en Finlande

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Lähdetie, A., Amundin, Å., Piippo, H., Sydänheimo, L.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Title of host publication: Effets biologiques et sanitaires des rayonnements non ionisants, Limoges, 16 octobre 2014
Exposure to EMF and health issues

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Gobba, F., Korpinen, L.
Number of pages: 2
Publication date: 2014

Host publication information
Place of publication: Paris
Publisher: International Commission on Occupational Health - ICOH, Commission Internationale de la Sante au Travail - CIST

Exposure to RF fields during the remote readings of the smart meter in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 2
Pages: 94-96
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria
Links:

Finite element analysis of customized reconstruction plates for mandibular continuity defect therapy

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Narra, N., Valasek, J., Hannula, M., Marcian, P., Sandor, G. K., Hyttinen, J., Wolff, J.
Flexor tendon healing within the tendon sheath using bioabsorbable poly-l/d-lactide 96/4 suture. A histological in vivo study with rabbits
Free radical scavenging and formation by multi-walled carbon nanotubes in cell free conditions and in human bronchial epithelial cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Number of pages: 18
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Science: Materials in Medicine
Volume: 25
Issue number: 5
ISSN (Print): 0957-4530
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.533 0.739
Publication Forum (2016): 1
Scopus rating (2015): 0.738 0.952
Web of Science (2015): 2.272 2.592 7.2 0.401 0.01207 0.557
Publication Forum (2015): 1
Scopus rating (2014): 0.739 1.348
Web of Science (2014): 2.587 2.831 6.6 0.466 0.01394 0.585
Publication Forum (2014): 1
Scopus rating (2013): 0.825 1.349
Publication Forum (2013): 1
Scopus rating (2012): 0.861 1.305
Publication Forum (2012): 1
Scopus rating (2011): 1.006 1.228
Scopus rating (2010): 0.949 1.06
Scopus rating (2009): 0.817 0.996
Scopus rating (2008): 0.686 0.997
Scopus rating (2007): 0.803 0.979
Scopus rating (2006): 0.724 1.034
Scopus rating (2005): 0.548 1.046
Scopus rating (2004): 0.465 0.955
Scopus rating (2003): 1.109 0.808
Scopus rating (2002): 0.923 1.072
Scopus rating (2001): 0.755 1.378
Scopus rating (2000): 0.707 1.048
Scopus rating (1999): 0.66 1.078
Original language: English
DOIs:
10.1007/s10856-014-5160-1

Bibliographical note
Contribution: organisation=elt.FACT1=1
Portfolio EDEND: 2014-04-30
Publisher name: Springer New York
Source: researchoutputwizard
Source-ID: 1734
Research output: Scientific - peer-review › Article
Fusion of Edge Enhancing Algorithms for Atherosclerotic Carotid Wall Contour Detection in Computed Tomography Angiography

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Santos, F. L. C. D., Joutsen, A., Salenius, J., Eskola, H.
Number of pages: 4
Pages: 925-928
Publication date: 2014

Host publication information
Title of host publication: Computing in cardiology 2014
Publisher: Computing in Cardiology
ISBN (Print): 978-1-4799-4346-3
ISBN (Electronic): 978-1-4799-4347-0
Links:

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-12-09<br/>Publisher name: Computing in Cardiology
Source: researchoutputwizard
Source-ID: 1457
Research output: Scientific - peer-review › Conference contribution
Habit change as a learning Process: Design framework for Mobile Interventions

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Vainio, J., Kaipainen, K., Korhonen, I.
Number of pages: 4
Pages: 801-804
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE-EMBS International Conference on Biomedical and Health Informatics, BHI, Valencia, Spain, June 1-4, 2014
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers
ISBN (Print): 978-1-4799-2132-4
DOIs: 10.1109/BHI.2014.6864485

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-12-07
Source: researchoutputwizard
Source-ID: 1687
Research output: Scientific - peer-review › Conference contribution

Health coaching in Finland - a market study

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Hiekkanen, A., Nieminen, H., Korhonen, I.
Number of pages: 4
Pages: 805-808
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), 1-4 June 2014, Valencia, Spain
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-2131-7
DOIs: 10.1109/BHI.2014.6864486

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-09-24<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 471
Research output: Scientific - peer-review › Conference contribution

Health surveillance according to the new EU directive 2013/35/EU: possible criteria

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Gobba, F., Korpinen, L.
Number of pages: 3
Heart rate variability evaluation of Emfit sleep mattress breathing categories in NREM sleep

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE)
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Clinical Neurophysiology
ISSN (Print): 1388-2457
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.379 1.394
Publication Forum (2016): 1
Web of Science (2015): 3.426 3.477 8.6 1.143 0.02173 1.056
Publication Forum (2015): 1
Scopus rating (2014): 1.405 1.363
Web of Science (2014): 3.097 3.356 8.0 1.064 0.02149 1.003
Publication Forum (2014): 2
Scopus rating (2013): 1.523 1.468
Publication Forum (2013): 2
Scopus rating (2012): 1.553 1.403
Publication Forum (2012): 2
Scopus rating (2011): 1.713 1.678
Scopus rating (2010): 1.511 1.481
Scopus rating (2009): 1.601 1.467
Scopus rating (2008): 1.374 1.293
Scopus rating (2007): 1.369 1.441
Scopus rating (2006): 1.385 1.483
Scopus rating (2005): 1.343 1.474
Scopus rating (2004): 1.256 1.435
Scopus rating (2003): 1.293 1.32
Scopus rating (2002): 1.129 1.088
Scopus rating (2001): 0.791 1.169
Scopus rating (2000): 0.594 1.009
Original language: English
DOIs:
10.1016/j.clinph.2014.08.012
Histogram-based classification of iPSC colony images using machine learning methods

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Joutsijoki, H., Haponen, M., Baldin, I., Rasku, J., Gizatdinova, Y., Paci, M., Hyttinen, J., Aalto-Setälä, K., Juhola, M.
Number of pages: 7
Pages: 2641-2647
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE International Conference on Systems, Man, and Cybernetics, October 5-8, 2014, San Diego, CA, USA
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-3840-7

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-11-30
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 613
Research output: Scientific - peer-review › Conference contribution

Hiukkaspäästöt suurenneuslasin alla

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Research area: Aerosol Physics, Department of Physics
Authors: Rönkkö, T., saarikoski, S.
Number of pages: 2
Pages: 16-17
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Automaatioväylä
Issue number: 3
ISSN (Print): 0784-6428
Original language: Finnish

Bibliographical note
Contribution: organisation=fys,FACT1=1
Portfolio EDEND: 2014-12-16
Source: researchoutputwizard
Source-ID: 1403
Research output: Professional › Article

How Anacetrapib Inhibits the Activity of the Cholesteryl Ester Transfer Protein? Perspective through Atomistic Simulations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Äijänen, T., Koivuniemi, A., Javanainen, M., Rissanen, S., Rog, T., Vattulainen, I.
Hybrid and Rogue Kinases Encoded in the Genomes of Model Eukaryotes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing
Authors: Rakshambikai, R., Mutharasu, G., Srnivasan, N.
Number of pages: 9
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS One
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Impedance Considerations on MEA - the Effect of Electrode Materials and Coatings

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: Ryynänen, T., Sivasubramaniam, M., Peltola, M., Narkilahti, S., Lekkala, J.
Number of pages: 2
Pages: 268-269
Publication date: 2014

Host publication information
Title of host publication: MEA Meeting 2014, Conference Proceedings of the 9th International Meeting on Substrate-Integrated Microelectrode Arrays; Tübingen Neurotech 2014, 1st Tübingen Symposium on Current Topics in Neurotechnology, July 1 - July 4, 2014, Reutlingen, Germany
Links:

Bibliographical note
MEA Meeting 2014, Tübingen Neurotech 2014
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-12-02
Source: researchoutputwizard
Source-ID: 1416
Research output: Scientific › Conference contribution

Impedance spectroscopy of changes in skin-electrode impedance induced by motion

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cömert, A., Hyttinen, J.
Number of pages: 19
Pages: 1-19
**Publication information**

**Journal:** Biomedical Engineering Online  
**Volume:** 13  
**Issue number:** 1  
**Article number:** 149  
**ISSN (Print):** 1475-925X  
**Ratings:**  
- Publication Forum (2017): 1  
- Scopus rating (2016): 0.487 1.048  
- Publication Forum (2016): 1  
- Scopus rating (2015): 0.521 0.84  
- Web of Science (2015): 1.382 1.814 4.8 0.242 0.00438 0.496  
- Publication Forum (2015): 1  
- Scopus rating (2014): 0.517 1.133  
- Web of Science (2014): 1.427 1.989 4.4 0.213 0.00373 0.526  
- Publication Forum (2014): 2  
- Scopus rating (2013): 0.577 1.007  
- Publication Forum (2013): 2  
- Scopus rating (2012): 0.443 1.059  
- Publication Forum (2012): 2  
- Scopus rating (2011): 0.401 1.054  
- Scopus rating (2010): 0.428 1.102  
- Scopus rating (2009): 0.521 1.408  
- Scopus rating (2008): 0.537 0.97  
- Scopus rating (2007): 0.453 1.205  
- Scopus rating (2006): 0.622 1.282  
- Scopus rating (2005): 0.502 0.947  
- Scopus rating (2004): 0.404 1.181  
- Scopus rating (2003): 0.151 0.313  
**Original language:** English  
**DOIs:**  
10.1186/1475-925X-13-149

**Bibliographical note**

**Contribution:** organisation=elt,FAC1=1<br/>Portfolio EDEND: 2014-11-30<br/>Publisher name: BioMed Central  
**Source:** researchoutputwizard  
**Source-ID:** 239  
**Research output:** Scientific - peer-review › Article

**Implantable Cardioverter Defibrillators in Electric and Magnetic Fields of 400 kV Power Lines**

**General information**

**State:** Published  
**Ministry of Education publication type:** A1 Journal article-refereed  
**Organisations:** Department of Electronics and Communications Engineering  
**Authors:** Korpinen, L., Kuisti, H., Elovaara, J., Virtanen, V.  
**Number of pages:** 7  
**Pages:** 297-303  
**Publication date:** 2014  
**Peer-reviewed:** Yes

**Publication information**

**Journal:** PACE: Pacing and Clinical Electrophysiology  
**Volume:** 37  
**Issue number:** 3  
**ISSN (Print):** 0147-8389  
**Ratings:**
Implantable Cardioverter Defibrillators in Magnetic Fields of a 400 kV Substation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Environmental Health
Authors: Korpinen, L., Kuisti, H., Tarao, H., Elovaara, J., Virtanen, V.
Number of pages: 9
Pages: 205-213
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Progress In Electromagnetics Research M
Volume: 40
ISSN (Print): 1937-8726
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.813 0.695
Publication Forum (2016): 1
Scopus rating (2015): 0.716 0.636
Web of Science (2015): 1.156 1.234 8.8 0.35 0.00859 0.459
Publication Forum (2015): 1
Scopus rating (2014): 0.823 0.715
Web of Science (2014): 1.129 1.3 8.5 0.285 0.01048 0.492
Publication Forum (2014): 1
Scopus rating (2013): 0.939 0.764
Publication Forum (2013): 1
Scopus rating (2012): 1.151 0.862
Publication Forum (2012): 1
Scopus rating (2011): 0.936 0.782
Scopus rating (2010): 0.89 0.768
Scopus rating (2009): 0.895 0.951
Scopus rating (2008): 0.833 0.88
Scopus rating (2007): 1.111 0.966
Scopus rating (2006): 0.865 0.788
Scopus rating (2005): 0.743 0.834
Scopus rating (2004): 0.711 0.822
Scopus rating (2003): 0.668 0.89
Scopus rating (2002): 0.687 0.785
Scopus rating (2001): 0.869 0.8
Scopus rating (2000): 0.888 0.895
Scopus rating (1999): 0.805 0.888
Original language: English
DOIs: 10.1111/pace.12270
Implants cardiaques et champs électromagnétiques : comparaison de résultats en France et en Finlande

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Magne, I., Souques, M., Korpinen, L.
Number of pages: 2
Pages: 1-2
Publication date: 2014

Host publication information
Title of host publication: Effets biologiques et sanitaires des rayonnements non ionisants, Limoges, 16 octobre 2014
Publisher: SFRP

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-11-19<br/>Publisher name: SFRP
Source-ID: 990
Research output: Scientific - peer-review › Conference contribution

Influence of exercise loading on magnetic resonance image texture of thigh soft tissues

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Sikiö, M., Harrison, L. C., Nikander, R., Ryymin, P., Dastidar, P., Eskola, H. J., Sievänen, H.
Number of pages: 7
Pages: 370-376
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Clinical Physiology and Functional Imaging
Volume: 34
Issue number: 5
ISSN (Print): 1475-0961
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.635 0.778
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.668
Inhalation or rod-like carbon nanotubes causes unconventional allergic airway inflammation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Number of pages: 17
Pages: 1-17
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Particle and Fibre Toxicology
Volume: 11
Issue number: 48
ISSN (Print): 1743-8977
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.742 2.165
Publication Forum (2016): 1
Scopus rating (2015): 3.0 2.013
Web of Science (2015): 8.649 9.618 4.3 0.312 0.0916 2.41
Publication Forum (2015): 1
Innovatiiviset materiaali- ja rakenneratkaisut hyttystorjunnassa

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Materials Science
Authors: Jylhä, K.
Number of pages: 1
Pages: 13-13
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Tekstiililehti
Issue number: 2
ISSN (Print): 0040-2370
Original language: Finnish
Links:
http://www.tekstiililehti.fi/binary/file/-/id/12/fid/337/

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-05-27<br/>Publisher name: Suomen tekstiiliteknillinen liitto
Source: researchoutputwizard
Source-ID: 626
Research output: Professional › Article

Integrated microfluidic culture environments for in vitro cell studies

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: Kreutzer, J., Kallio, P.
Number of pages: 5
Integration of inkjet and RF SoC technologies to fabricate wireless physiological monitoring system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Sillanpää, H., Vehkaoja, A., Vorobiev, D., Nurmentaus, S., Lekkala, J., Mäntysalo, M.
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: 2014 Electronics System-Integration Technology Conference (ESTC), 16-18 September 2014, Helsinki, Finland
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-4026-4
DOIs: 10.1109/ESTC.2014.6962739

Bibliographical note
Contribution: organisation=elt,FACT1=0.8<br/>Contribution: organisation=ase,FACT2=0.2<br/>Portfolio EDEND: 2014-12-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 1511
Research output: Scientific - peer-review » Conference contribution

Integrative genomics and transcriptomics analysis of human embryonic and induced pluripotent stem cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing
Authors: Laurila, K., Autio, R., Kong, L., Närväs, E., Hussein, S., Otonkoski, T., Lahesmaa, R., Lähdesmäki, H.
Number of pages: 24
Pages: 1-24
Publication date: 2014
Peek-reviewed: Yes

Publication information
Journal: BioData Mining
ISSN (Print): 1756-0381
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.833 0.652
Publication Forum (2016): 1
Scopus rating (2015): 1.141 0.689
Web of Science (2015): 1.64 1.788 3.6 0.071 0.00105 0.664
Investigating local spatially-enhanced structural and textural descriptors for classification of iPSC colony images

Aims: This study describes the potential of real-time bioluminescence imaging in evaluating the antibiotic efficiency of two cylinder-shaped bioabsorbable antibiotic-releasing composites by in vitro inhibition zone tests. The bacterial infections of bone tissue can cause extensive hard and soft tissue damage and decrease the efficiency of oral antibiotic therapy due to the poor blood circulation in the infected area. To overcome this problem, new, locally antibiotic-releasing biodegradable composites have been developed. Study Design & Methodology: The two composites evaluated in this study were composed of poly(L-lactide-co-ε-caprolactone) matrix, β-tricalcium phosphate ceramic and either ciprofloxacin or rifampicin antibiotic. The composites were tested with genetically modified model pathogens of osteomyelitis (Pseudomonas aeruginosa and Staphylococcus epidermidis) in vitro in inhibition zone tests using a method of real-time bioluminescence. Results: The first signs of the effect of the released ciprofloxacin or rifampicin became visible after four hours of incubation and were seen as changed bioluminescence around the composite pellet on a culture dish. Both of the composite types showed excellent effects against the sensor bacteria within the diffusion area. Bioluminescence measurements suggested that no survivor bacteria capable of evolving resistant strains were left inside the inhibition zones. The S. epidermidis bacterial strain was an inhibition sensor and P. aeruginosa was a stress sensor. Conclusion: These results highlight the potential of the composite materials against the pathogens of osteomyelitis. The approach
allows continuous visual inspection of the efficacy of the antibiotics against the bacteria.

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Department of Chemistry and Bioengineering

Authors: Männistö, N. M., Ahola, N., Karp, M. T., Veiranto, M., Kellomäki, M.

Number of pages: 20

Pages: 235-254

Publication date: 2014

Peer-reviewed: Yes

**Publication information**

Journal: British Microbiology Research Journal

Volume: 4

Issue number: 2

ISSN (Print): 2231-0886

Ratings:

Publication Forum (2017): 0

Publication Forum (2016): 0

Publication Forum (2015): 0

Publication Forum (2014): 1

Original language: English

Electronic versions:

mannisto_in_vitro_bioluminescence_used_as_a_method.pdf

DOIs:

10.9734/BMRJ/2014/6661

Links:

http://urn.fi/URN:NBN:fi:tty-201401301069

**Bibliographical note**

Contribution: organisation=keb,FACT1=0.5<br/>Contribution: organisation=elt,FACT2=0.5<br/>Portfolio EDEND: 2014-02-15<br/>Publisher name: Sciedomain International

Source: researchoutputwizard

Source-ID: 1026

Research output: Scientific - peer-review › Article

**In Vivo Transcription Kinetics of a Synthetic Gene Uninvolved in Stress-Response Pathways in Stressed Escherichia coli Cells**

**General information**

State: Published

Ministry of Education publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM)

Authors: Muthukrishnan, A., Martikainen, A., Neeli-Venkata, R., S. Ribeiro, A.

Number of pages: 9

Pages: 1-9

Publication date: 2014

Peer-reviewed: Yes

**Publication information**

Journal: PLoS One

ISSN (Print): 1932-6203

Ratings:

Publication Forum (2017): 1

Scopus rating (2016): 1.201 1.092

Publication Forum (2016): 1

Scopus rating (2015): 1.414 1.131

Web of Science (2015): 3.057 3.535 3.1 0.396 1.81924 1.139

Publication Forum (2015): 1

Scopus rating (2014): 1.545 1.141
Learning healthy habits with a mobile self-intervention

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D)
Authors: Vainio, J., Korhonen, I., Kenttä, O., Järvinen, J., Kaipainen, K.
Number of pages: 8
Pages: 150-157
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 8th International Conference on Pervasive Computing Technologies for Healthcare, Pervasive Health 2014, 20-23 May 2014, OFFIS Oldenburg, Germany
Place of publication: Brussels
Publisher: ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering
Editors: Boll, S., Köhler, F.
DOIs:
10.4108/icst.pervasivehealth.2014.254951

Bibliographical note
Contribution: organisation=sgn,FACCT1=1<br/>Portfolio EDEND: 2014-10-30<br/>Publisher name: Public Library of Science
Source: researchoutputwizard
Source-ID: 1115
Research output: Scientific - peer-review › Article

L’enseignement sur « questions sur la santé et exposition aux champs électromagnétiques » à l’université de technologie de Tampere en Finlande

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L.
Number of pages: 2
Publication date: 2014

Host publication information

Bibliographical note
Contribution: organisation=sgn,FACCT1=1<br/>Portfolio EDEND: 2014-12-08
Source: researchoutputwizard
Source-ID: 1688
Research output: Scientific - peer-review › Conference contribution
Measurements of magnetic fields and contact currents produced by domestic induction hobs

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Tarao, H., Korpinen, L., Hayashi, N., Isaka, K.
Number of pages: 2
Pages: 138-139
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-11-15
Source: researchoutputwizard
Source-ID: 1606
Research output: Scientific - peer-review › Conference contribution

Mesures préliminaires des émissions de champ électromagnétique (50-100kHz) d’un compteur intelligent en Finlande

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: Effets biologiques et sanitaires des rayonnements non ionisants, Limoges, 16 octobre 2014
Publisher: SFRP

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-10-19<br/>Publisher name: SFRP
Source: researchoutputwizard
Source-ID: 1209
Research output: Scientific - peer-review › Conference contribution

Mixing and segregation of ring polymers: spatial confinement and molecular crowding effects

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics
Authors: Shin, J., Cherstvy, A., Metzler, R.
Number of pages: 19
Pages: 1-19
Publication date: 2014
Modeling Drug Delivery in Gravity-Driven Microfluidic System

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Mäki, A., Kreutzer, J., Kallio, P.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the ASME 2014 4th Joint US-European Fluids Engineering Division Summer Meeting and 12th International Conference on Nanochannels, Microchannels, and Minichannels, FEDSM2014, August 3-
Molecular Dynamics Simulation of Inverse-Phosphocholine Lipids

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Magarkar, A., Rog, T., Bunker, A.
Number of pages: 6
Pages: 19444-19449
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 33
ISSN (Print): 1932-7447
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.948 1.181
Publication Forum (2016): 1
Scopus rating (2015): 1.917 1.268
Web of Science (2015): 4.509 4.919 4.7 0.829 0.28449 1.171
Publication Forum (2015): 1
Scopus rating (2014): 2.027 1.448
Web of Science (2014): 4.772 5.295 4.3 0.768 0.30727 1.234
Publication Forum (2014): 3
Scopus rating (2013): 2.134 1.439
Publication Forum (2013): 3
Scopus rating (2012): 2.514 1.46
Publication Forum (2012): 3
Scopus rating (2011): 2.32 1.457
Scopus rating (2010): 2.438 1.356
Scopus rating (2009): 2.128 1.417
Scopus rating (2008): 1.856 1.033
Original language: English
DOIs:
10.1021/jp505633y

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 984
Research output: Scientific - peer-review › Article
Molecular Dynamics Simulation of PEGylated Membranes with Cholesterol: Building Toward the DOXIL Formulation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Magarkar, A., Rog, T., Bunker, A.
Number of pages: 9
Pages: 15541-15549
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 28
ISSN (Print): 1932-7447
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.948 1.181
Publication Forum (2016): 1
Scopus rating (2015): 1.917 1.268
Web of Science (2015): 4.509 4.919 4.7 0.829 0.28449 1.171
Publication Forum (2015): 1
Scopus rating (2014): 2.027 1.448
Web of Science (2014): 4.772 5.295 4.3 0.768 0.30727 1.234
Publication Forum (2014): 3
Scopus rating (2013): 2.134 1.439
Publication Forum (2013): 3
Scopus rating (2012): 2.514 1.46
Publication Forum (2012): 3
Scopus rating (2011): 2.32 1.457
Scopus rating (2010): 2.438 1.356
Scopus rating (2009): 2.128 1.417
Scopus rating (2008): 1.856 1.033
Original language: English
DOI:
10.1021/jp504962m

Bibliographical note
Contribution: organisation=fys,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 986
Research output: Scientific - peer-review › Article

Monitoring Arterial Pulse Waves With Synchronous Body Sensor Network

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Peltokangas, M., Vehkaoja, A., Verho, J., Huotari, M., Röning, J., Lekkala, J.
Number of pages: 7
Pages: 1781-1787
Publication date: 2014
Peer-reviewed: Yes

Publication information
Morphological and Texture Features for HEp-2 Cells Classification

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Nanni, L., Paci, M., Santos, F. L. C. D., Hyttinen, J.
Number of pages: 4
Pages: 45-48
Publication date: 2014

Host publication information
Title of host publication: 2014 1st Workshop on Pattern Recognition Techniques for Indirect Immunofluorescence Images (I3A), 24-24 August 2014, Stockholm, Sweden
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-4252-7
DOIs: 10.1109/I3A.2014.11
Motion Analysis Method for Determining Cardiomyocyte Beating Properties Based on Digital Image Correlation and Templates

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Ahola, A., Pradhapan, P., Laurila, E., Aalto-Setälä, K., Hyttinen, J.
Number of pages: 4
Pages: 1137-1140
Publication date: 2014

Host publication information
Title of host publication: Computing in cardiology 2014
Publisher: Computing in Cardiology
ISBN (Print): 978-1-4799-4346-3

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-12-19
Publisher name: Computing in Cardiology
Source-ID: 64
Research output: Scientific - peer-review › Conference contribution

MRI based dementia classification using semi-supervised learning and domain adaption

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Vision
Authors: Moradi, E., Gaser, C., Huttunen, H., Tohka, J., Alzheimer's, D. N. I.
Number of pages: 9
Pages: 65-73
Publication date: 2014

Host publication information
Title of host publication: MICCAI 2014 Workshop Proceedings, Challenge on Computer-Aided Diagnosis of Dementia, based on Structural MRI Data September 14-18 2014, Boston, USA
Links: http://caddementia.grand-challenge.org/workshop/

Bibliographical note
Contribution: organisation=sgn,FACT1=1
Portfolio EDEND: 2014-12-11
Source-ID: 1099
Research output: Scientific - peer-review › Conference contribution

Murein lytic enzyme TgaA of Bifidobacterium bifidum MIMBb75 modulates dendritic cell maturation through its cysteine- and histidine-dependent amidohydrolase/peptidase (CHAP) amidase domain

Bifidobacteria are Gram-positive inhabitants of the human gastrointestinal tract that have evolved close interaction with their host and especially with the host's immune system. The molecular mechanisms underlying such interactions, however, are largely unidentified. In this study, we investigated the immunomodulatory potential of Bifidobacterium bifidum MIMBb75, a bacterium of human intestinal origin commercially used as a probiotic. Particularly, we focused our attention on TgaA, a protein expressed on the outer surface of MIMBb75's cells and homologous to other known bacterial immunomodulatory proteins. TgaA is a peptidoglycan lytic enzyme containing two active domains: lytic murein transglycosylase (LT) and cysteine- and histidine-dependent amidohydrolase/peptidase (CHAP). We ran immunological experiments
stimulating dendritic cells (DCs) with the B. bifidum MIMBb75 and TgaA, with the result that both the bacterium and the protein activated DCs and triggered interleukin-2 (IL-2) production. In addition, we observed that the heterologous expression of TgaA in Bifidobacterium longum transferred to the bacterium the ability to induce IL-2. Subsequently, immunological experiments performed using two purified recombinant proteins corresponding to the single domains LT and CHAP demonstrated that the CHAP domain is the immune-reactive region of TgaA. Finally, we also showed that TgaA-dependent activation of DCs requires the protein CD14, marginally involves TRIF, and is independent of Toll-like receptor 4 (TLR4) and MyD88. In conclusion, our study suggests that the bacterial CHAP domain is a novel microbe-associated molecular pattern actively participating in the cross talk mechanisms between bifidobacteria and the host's immune system. © 2014, American Society for Microbiology.
Nonergodicity, fluctuations, and criticality in heterogeneous diffusion processes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics
Authors: Cherstvy, A., Metzler, R.
Number of pages: 12
Pages: 1-12
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Physical Review E
Volume: 90
Issue number: 1
Article number: 012134
ISSN (Print): 1539-3755
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.993 0.896
Publication Forum (2016): 1
Scopus rating (2015): 1.047 0.978
Publication Forum (2015): 1
Scopus rating (2014): 1.22 1.123
Web of Science (2014): 2.288 2.269 8.5 0.595 0.16687 0.859
Publication Forum (2014): 2
Scopus rating (2013): 1.311 1.239
Publication Forum (2013): 2
Scopus rating (2012): 1.42 1.226
Publication Forum (2012): 2
Scopus rating (2011): 1.485 1.225
Scopus rating (2010): 1.69 1.215
Scopus rating (2009): 1.694 1.259
Scopus rating (2008): 1.96 1.314
Scopus rating (2007): 1.926 1.332
Scopus rating (2006): 1.787 1.324
Scopus rating (2005): 1.71 1.302
Scopus rating (2004): 1.672 1.214
Scopus rating (2003): 1.303 1.166
Scopus rating (2002): 0.936 1.241
Scopus rating (2001): 0.709 1.429
Scopus rating (2000): 0.299 1.252
Scopus rating (1999): 0.381 1.232
Original language: English
DOIs: 10.1103/PhysRevE.90.012134
Non-invasive System for Mechanical Arterial Pulse Wave Measurements

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Peltokangas, M., Verho, J., Salpavaara, T., Vehkaoja, A.
Number of pages: 4
Pages: 1493-1496
Publication date: 2014

Host publication information
Title of host publication: XIII Mediterranean Conference on Medical and Biological Engineering and Computing 2013, MEDICON 2013, 25 - 28 September 2013, Seville, Spain. IFMB Proceedings Volume 41
Publisher: Springer
Editor: Roa Romero, L. M.
ISBN (Print): 978-3-319-00845-5
ISBN (Electronic): 978-3-319-00846-2

Publication series
Name: IFMBE Proceedings
ISSN (Print): 1680-0737
DOIs: 10.1007/978-3-319-00846-2_369

Bibliographical note

Objectively measured physical activity in Finnish employees: a cross-sectional study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI
Authors: Mutikainen, S., Helander, E., Pietilä, J., Korhonen, I., Kujala, U. M.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: BMJ Open
Volume: 4
Issue number: 12
Article number: e005927
ISSN (Print): 2044-6055
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.446 1.252
Publication Forum (2016): 1
Scopus rating (2015): 1.545 1.308
Web of Science (2015): 2.562 2.669 2.5 0.287 0.04417 1.027
Publication Forum (2015): 1
Scopus rating (2014): 1.371 1.163
Occupational and environmental exposure to extremely low frequency-magnetic fields in a large group of workers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Gobba, F., Rossi, P., Bravo, G., Contessa, G. M., Korpinen, L.
Number of pages: 3
Pages: 284-286
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria

Optical projection tomography as a tool for 3D imaging of hydrogels

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 7
Pages: 3443-3449
Publication date: 2014
Peer-reviewed: Yes
Optical projection tomography can be used to investigate spatial distribution of chondrocytes in three-dimensional biomaterial scaffolds for cartilage tissue engineering

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Järvinen, E., Muhonen, V., Haaparanta, A., Kellomäki, M., Kiviranta, I.
Number of pages: 5
Pages: 1549-1553
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Bio-Medical Materials and Engineering
Volume: 24
Issue number: 3
ISSN (Print): 0959-2989
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.254 0.415
Publication Forum (2016): 1
Scopus rating (2015): 0.334 0.754
Web of Science (2015): 0.988 1.062 5.5 0.061 0.0017 0.189
Publication Forum (2015): 1
Scopus rating (2014): 0.284 0.486
Web of Science (2014): 1.091 1.28 7.2 0.493 9.2E-4 0.279
Publication Forum (2014): 1
Scopus rating (2013): 0.349 0.55
Publication Forum (2013): 1
Scopus rating (2012): 0.434 0.73
Publication Forum (2012): 1
Scopus rating (2011): 0.424 0.584
Scopus rating (2010): 0.403 0.328
Scopus rating (2009): 0.367 0.434

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-09-10<br/>Publisher name: Optical Society of America
Source: researchoutputwizard
Source-ID: 298
Research output: Scientific - peer-review › Article
Ormocomp-Modified Glass Increases Collagen Binding and Promotes the Adherence and Maturation of Human Embryonic Stem Cell-Derived Retinal Pigment Epithelial Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Optoelectronics Research Centre, Research group: Surface Science, Frontier Photonics, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Käpylä, E., Sorkio, A., Teymouri, S., Lahtonen, K., Vuori, L., Valden, M., Skottman, H., Kellomäki, M., Juutti-Uusitalo, K.
Number of pages: 11
Pages: 1-11
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Langmuir
ISSN (Print): 0743-7463
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.55 1.188
Publication Forum (2016): 2
Scopus rating (2015): 1.686 1.308
Web of Science (2015): 3.993 4.21 7.6 0.67 0.16509 1.043
Publication Forum (2015): 2
Scopus rating (2014): 1.816 1.391
Web of Science (2014): 4.457 4.543 7.2 0.682 0.18462 1.096
Publication Forum (2014): 3
Scopus rating (2013): 1.895 1.356
Publication Forum (2013): 3
Scopus rating (2012): 2.177 1.382
Publication Forum (2012): 3
Scopus rating (2011): 2.051 1.357
Scopus rating (2010): 2.148 1.4
Scopus rating (2009): 2.156 1.351
Scopus rating (2008): 2.383 1.34
Scopus rating (2007): 2.449 1.434
Scopus rating (2006): 2.375 1.428
Overexpression of SNORD114-3 marks acute promyelocytic leukemia

General information
State: Published
Ministry of Education publication type: B1 Article in a scientific magazine
Organisations: Department of Signal Processing, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Liukšišalas, T., Teittinen, K., Granberg, K., Heinäniemi, M., Annala, M., Mäki, M., Nykter, M., Lohi, O.
Number of pages: 3
Pages: 233-236
Publication date: 2014
Peer-reviewed: No

Publication information
Journal: Leukemia
Volume: 28
ISSN (Print): 0887-6924
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 4.929 2.213
Publication Forum (2016): 3
Scopus rating (2015): 5.148 2.276
Scopus rating (2014): 4.66 1.968
Publication Forum (2014): 3
Scopus rating (2013): 4.643 1.744
Publication Forum (2013): 3
Scopus rating (2012): 4.273 1.796
Publication Forum (2012): 3
Scopus rating (2011): 4.595 1.756
Scopus rating (2010): 3.878 1.668
Scopus rating (2008): 3.117 1.566
Scopus rating (2007): 2.606 1.309
Scopus rating (2006): 2.434 1.396
Scopus rating (2005): 2.117 1.296
Scopus rating (2004): 1.88 1.141
Scopus rating (2003): 1.851 1.204
Scopus rating (2002): 1.656 1.16
Partial volume effect modeling for segmentation and tissue classification of brain magnetic resonance images: A review

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Signal Processing
Authors: Tohka, J.
Number of pages: 9
Pages: 855-864
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: World journal of radiology
Volume: 28
Issue number: 6
Article number: 11
ISSN (Print): 1949-8470
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: English

Bibliographical note
Letter to the Editor: published online 20 September 2013
Contribution: organisation=sgn,FACT1=1
EDEND: 2013-12-29
Publisher name: Nature Publishing Group
Source: researchoutputwizard
Source-ID: 959
Research output: Scientific › Article

Physicochemical characterization of segmented polyurethanes prepared with glutamine or ascorbic acid as chain extenders and their hydroxyapatite composites

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Cetina-Diaz, S., Chan-Chan, L., Vargas-Coronado, R., Cervantes-Uc, J., Quintana-Owen, P., Paakinaho, K., Kellomäki, M., Di Silvio, L., Deb, S., Cauich-Rodriguez, J.
Number of pages: 11
Pages: 1966-1976
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Materials Chemistry B
Volume: 2
Plantar shear stress measurements - A review

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Rajala, S., Lekkala, J.
Number of pages: 9
Pages: 475-483
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Clinical Biomechanics
Volume: 29
Issue number: 5
ISSN (Print): 0268-0033
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Web of Science (2015): 1.636 2.214 9.6 0.26 0.00984 0.784
Publication Forum (2015): 1
Web of Science (2014): 1.97 2.49 8.9 0.254 0.00979 0.79
Publication Forum (2014): 2
Publication Forum (2013): 2
Publication Forum (2012): 2
Original language: English
DOIs:
10.1016/j.clinbiomech.2014.04.009

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-04-29<br/>Publisher name: RSC Publications
Source: researchoutputwizard
Source-ID: 213
Research output: Scientific - peer-review › Article
Pneumatic cell stretching system for cardiac differentiation and culture

This paper introduces a compact mechanical stimulation device suitable for applications to study cellular mechanobiology. The pneumatically controlled device provides equiaxial strain for cells on a coated polydimethylsiloxane (PDMS) membrane and enables real time observation of cells with an inverted microscope. This study presents the implementation and operation principles of the device and characterizes membrane stretching. Different coating materials are also analyzed on an unstretched membrane to optimize the cell attachment on PDMS. As a result, gelatin coating was selected for further experiments to demonstrate the function of the device and evaluate the effect of long-term cyclic equiaxial stretching on human pluripotent stem cells (hPSCs). Cardiac differentiation was induced with mouse visceral endoderm-like (END-2) cells, either on an unstretched membrane or with mechanical stretching. In conclusion, hPSCs grew well on the stretching platform and cardiac differentiation was induced. Thus, the platform provides a new possibility to study the effect of stretching on cellular properties including differentiation and stress induced cardiac diseases.
Polymer translocation: the first two decades and the recent diversification

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics
Authors: Palyulin, V. V., Ala-Nissilä, T., Metzler, R.
Pages: 9016-9037
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Soft Matter
Volume: 10
Issue number: 45
ISSN (Print): 1744-683X
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.573 1.219
Publication Forum (2016): 2
Scopus rating (2015): 1.67 1.33
Web of Science (2015): 3.798 4.001 4.0 0.949 0.10203 1.206
Publication Forum (2015): 2
Scopus rating (2014): 1.751 1.267
Web of Science (2014): 4.029 4.289 3.4 1.105 0.10152 1.227
Publication Forum (2014): 3
Scopus rating (2013): 1.745 1.208
Publication Forum (2013): 3
Scopus rating (2012): 1.898 1.155
Publication Forum (2012): 3
Scopus rating (2011): 2.006 1.314
Scopus rating (2010): 2.165 1.376
Scopus rating (2009): 2.516 1.534
Scopus rating (2008): 2.562 1.392
Scopus rating (2007): 2.482 1.458
Scopus rating (2006): 1.899 0.981
Original language: English
DOIs:
10.1039/c4sm01819b

Possibility to decreasing the 50 Hz electric field exposure with different jackets

General information
State: Published
Possible criteria for health surveillance based on the new directive

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Gobba, F., Korpinen, L.
Number of pages: 2
Publication date: 2014

Host publication information
Place of publication: Paris
Publisher: International Commission on Occupational Health - ICOH, Commission Internationale de la Sante au Travail - CIST

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-05-25<br/>Publisher name: International Commission on Occupational Health - ICOH, Commission Internationale de la Sante au Travail - CIST
Source: researchoutputwizard
Source-ID: 354
Research output: Scientific - peer-review › Conference contribution

Prediction of Passive Drug Permeability Across the Blood-Retinal Barrier

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Research group: Computational Biophysics and Imaging Group, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Tervonen, A., Vainio, I., Nymark, S., Hyttinen, J.
Number of pages: 15
Pages: 2297-2311
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Pharmaceutical Research
Volume: 31
Issue number: 9
ISSN (Print): 0724-8741
Ratings:
Publication Forum (2017): 2
Preliminary measurements of smart meter electromagnetic field (50-100 kHz) emissions in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Pääkkönen, R., Lundström, M., Mustaparta, J., Korpinen, L.
Number of pages: 4
Pages: 90-93
Publication date: 2014

Host publication information
Title of host publication: 8th International Workshop on Biological Effects of Electromagnetic Fields, 21-26 September, 2014, Golden Sands, Varna, Bulgaria
Links:

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-11-15
Source: researchoutputwizard
Source-ID: 1210
Research output: Scientific - peer-review › Conference contribution
Prognostic capacity of a clinically indicated exercise test for cardiovascular mortality is enhanced by combined analysis of exercise capacity, heart rate recovery and T-wave alternans

Background Exercise capacity, heart rate recovery and T-wave alternans are independent predictors of cardiovascular mortality. We tested whether these parameters contain supplementary prognostic information. Methods A total of 3609 consecutive patients (2157 men) referred for a routine, clinically indicated bicycle exercise test were enrolled in the Finnish Cardiovascular Study (FINCAVAS). Exercise capacity was measured in metabolic equivalents, heart rate recovery as the decrease in heart rate from maximum to one minute post-exercise, and T-wave alternans by time-domain Modified Moving Average method. Results During 57-month median follow-up (interquartile range 35-78 months), 96 patients died of cardiovascular causes (primary endpoint) and 233 from any cause. All three parameters were independent predictors of cardiovascular mortality when analysed as continuous variables. Adding metabolic equivalents (p < 0.001), heart rate recovery (p = 0.002) or T-wave alternans (p = 0.01) to the linear model improved its predictive power for cardiovascular mortality. The combination of low exercise capacity (<6 metabolic equivalents), reduced heart rate recovery (≤12 beats/min) and elevated T-wave alternans (≥60μV) yielded the highest hazard ratio for cardiovascular mortality of 16.5 (95% confidence interval 4.0-67.7, p < 0.001). Harrell's C index was 0.719 (confidence interval 0.665-0.772) for cardiovascular mortality with previously defined cutpoints (<8 units for metabolic equivalents≤18 beats/min for heart rate recovery and≥60μV for T-wave alternans). Conclusion The prognostic capacity of the clinical exercise test is enhanced by combined analysis of exercise capacity, heart rate recovery and T-wave alternans.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA)
Authors: Minkkinen, M., Nieminen, T., Verrier, R. L., Leino, J., Lehtimäki, T., Viik, J., Lehtinen, R., Nikus, K., Kööbi, T., Turjanmaa, V., Kähönen, M.
Number of pages: 9
Pages: 1162-1170
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: European Journal of Preventive Cardiology
Volume: 22
Issue number: 9
ISSN (Print): 2047-4873
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.598 1.194
Publication Forum (2016): 1
Scopus rating (2015): 1.651 1.428
Web of Science (2015): 3.361 3.545 2.5 0.838 0.00749 1.092
Publication Forum (2015): 1
Scopus rating (2014): 1.61 1.402
Web of Science (2014): 3.319 3.38 2.1 0.703 0.00479 1.092
Publication Forum (2014): 2
Scopus rating (2013): 1.608 1.38
Publication Forum (2013): 2
Scopus rating (2012): 1.773 1.695
Publication Forum (2012): 2
Scopus rating (2011): 1.415 1.305
Scopus rating (2010): 1.835 1.493
Scopus rating (2009): 1.518 1.213
Scopus rating (2008): 1.287 1.089
Scopus rating (2007): 1.078 0.886
Scopus rating (2006): 1.115 0.96
Scopus rating (2005): 1.038 0.8
Scopus rating (2004): 1.022 0.693
Scopus rating (2003): 0.654 0.468
Scopus rating (2002): 0.472 0.334
Scopus rating (2001): 0.491 0.332
Scopus rating (2000): 0.546 0.343
Protein-protein interaction and coarse grained simulation study of Glioblastoma Multiforme reveals novel pathways of GPR17

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: Computational Systems Biology, Department of Signal Processing, Research group: Molecular Signaling Lab
Authors: Mutharasu, G., Yli-harja, O., Kandhavelu, M.
Keywords: (coarse-grain,glioblastoma multiforme,pathways,rna -seq,signaling networks)
Number of pages: 5
Pages: 321-325
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: TASK Quarterly
Volume: 18
Issue number: 4
ISSN (Print): 1428-6394
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Original language: English
Source: Bibtext
Source-ID: urn:a994dbb12fdefa5acc8b96d5e39fabd7
Research output: Scientific - peer-review › Article

Quantitative analysis of colony morphology in yeast

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Systems Biology, Prostate cancer research center (PCRC)
Authors: Ruusuvuori, P., Lin, J., Scott, A., Tan, Z., Sorsa, S., Kallio, A., Nykter, M., Yli-Harja, O., Shmulevich, I., Dudley, A.
Number of pages: 7
Pages: 18-27
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: BioTechniques
Volume: 56
Issue number: 1
ISSN (Print): 0736-6205
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.123 0.578
Publication Forum (2016): 1
Scopus rating (2015): 1.112 0.746
Web of Science (2015): 2.298 2.935 >10.0 0.3 0.00572 1.121
Rapid and Accurate Detection of Urinary Pathogens by Mobile IMS-Based Electronic Nose: A Proof-of-Principle Study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), Prostate cancer research center (PCRC)
Number of pages: 11
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS One
ISSN (Print): 1932-6203
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.201 1.092
Publication Forum (2016): 1
Scopus rating (2015): 1.414 1.131
Web of Science (2015): 3.057 3.535 3.1 0.396 1.81924 1.139
Publication Forum (2015): 1
Scopus rating (2014): 1.545 1.141
Web of Science (2014): 3.234 3.702 2.7 0.489 1.53341 1.209
Publication Forum (2014): 2
Scopus rating (2013): 1.74 1.147
Recurrent LPR1-SNRNP25 and KCNMB5_CCND3 fusion genes promote tumor cell motility in human osteosarcoma

**General information**
- **State:** Published
- **Ministry of Education publication type:** A2 Review article in a scientific journal
- **Organisations:** Department of Signal Processing, Multi-scaled biodata analysis and modelling (MultiBAM)
- **Number of pages:** 5
- **Pages:** 1-5
- **Publication date:** 2014
- **Peer-reviewed:** Yes

**Publication information**
- **Journal:** Journal of Hematology & Oncology
- **Volume:** 7
- **Issue number:** 76
- **ISSN (Print):** 1756-8722
- **Ratings:**
  - Publication Forum (2017): 1
  - Scopus rating (2016): 2.261 1.519
  - Publication Forum (2016): 1
  - Scopus rating (2015): 2.206 1.642
  - Web of Science (2015): 6.263 5.384 2.8 0.737 0.00679 1.304
  - Publication Forum (2015): 1
  - Scopus rating (2014): 1.716 1.418
  - Web of Science (2014): 4.812 4.417 2.7 0.784 0.00552 1.132
  - Scopus rating (2013): 1.842 1.555
  - Scopus rating (2012): 1.569 1.442
  - Scopus rating (2011): 1.681 1.119
  - Scopus rating (2010): 0.958 0.858
  - Scopus rating (2009): 0.627 0.437
- **Original language:** English
- **DOIs:** 10.1186/s13045-014-0076-2

**Bibliographical note**
- **Contribution:** organisation=sgn,FACT1=1
- **Portfolio EDEND:** 2014-10-30
- **Publisher name:** BioMed Central
- **Source:** researchoutputwizard
- **Source-ID:** 1824
- **Research output:** Scientific - peer-review » Review Article
Refined OPLS All-Atom Force Field for Saturated Phosphatidylycholine Bilayers at Full Hydration

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX), Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Maciejewski, A., Pasenkiewicz-Gierula, M., Cramariuc, O., Vattulainen, I., Rog, T.
Number of pages: 11
Pages: 4571-4581
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Physical Chemistry C
Volume: 118
Issue number: 17
ISSN (Print): 1932-7447
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.948 1.181
Publication Forum (2016): 1
Scopus rating (2015): 1.917 1.268
Web of Science (2015): 4.509 4.919 4.7 0.829 0.28449 1.171
Publication Forum (2015): 1
Scopus rating (2014): 2.027 1.448
Web of Science (2014): 4.772 5.295 4.3 0.768 0.30727 1.234
Publication Forum (2014): 3
Scopus rating (2013): 2.134 1.439
Publication Forum (2013): 3
Scopus rating (2012): 2.514 1.46
Publication Forum (2012): 3
Scopus rating (2011): 2.32 1.457
Scopus rating (2010): 2.438 1.356
Scopus rating (2009): 2.128 1.417
Scopus rating (2008): 1.856 1.033
Original language: English
DOIs: 10.1021/jp5016627

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 983
Research output: Scientific - peer-review › Article

Releasing tool-adhered natural fibrous microscale objects with vacuum system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Lai, Y., Cervinka, T., Kallio, P.
Number of pages: 6
Pages: 378-383
Publication date: 2014

Host publication information
Requirements for Successful Self-care Technology Products for the Elderly

**General information**

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing
Authors: Värri, A.
Number of pages: 5
Pages: 86-90
Publication date: 2014

**Host publication information**

Title of host publication: RCITD 2014, Proceedings in research conference in technical disciplines, November 17-21, 2014, Zilina, Slovakia
Publisher: EDIS - Publishing Institution of the University of Zilina
Editors: Mokrys, M., Badura, S.
ISBN (Print): 978-80-554-0948-1

**Bibliographical note**

Contribution: organisation=sgn,FACT1=1
Portfolio EDEND: 2015-02-02
Source: researchoutputwizard
Source-ID: 1707
Research output: Scientific - peer-review › Conference contribution

Rhythm-based Accuracy Improvement of Heart Beat Detection Algorithms

**General information**

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing
Authors: Gilian, Z., Kovacs, P., Samiee, K.
Number of pages: 3
Pages: 269-272
Publication date: 2014

**Host publication information**

Title of host publication: Computing in Cardiology - 41st Annual Conference, September 7-10, 2014, Boston, Massachusetts, USA
Place of publication: Boston, Massachusetts
Publisher: Computing in Cardiology
ISBN (Print): 978-1-4799-4346-3
ISBN (Electronic): 978-1-4799-4347-0
Links:

**Bibliographical note**

Contribution: organisation=sgn,FACT1=1
Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 347
Research output: Scientific - peer-review › Conference contribution
Screen for mitochondrial DNA copy number maintenance genes reveals essential role for ATP synthase

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM)
Authors: Fukuoh, A., Cannino, G., Gerards, M., Buckley, S., Kazancioglu, S., Scialo, F., Lihavainen, E., Ribeiro, A., Dufour, E., Jacobs, H. T.
Number of pages: 21
Pages: 1-21
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Molecular Systems Biology
Volume: 10
Issue number: 734
ISSN (Print): 1744-4292
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 8.366 2.15
Publication Forum (2016): 3
Scopus rating (2015): 8.731 2.395
Web of Science (2015): 10.581 12.339 5.0 1.5 0.03634 6.349
Scopus rating (2014): 10.072 3.505
Web of Science (2014): 10.872 12.019 4.6 1.438 0.03887 5.857
Publication Forum (2014): 3
Scopus rating (2013): 9.637 2.875
Publication Forum (2013): 3
Scopus rating (2012): 7.904 2.417
Publication Forum (2012): 3
Scopus rating (2011): 7.481 2.306
Scopus rating (2010): 6.293 2.45
Scopus rating (2009): 6.386 2.602
Scopus rating (2008): 5.206 2.307
Scopus rating (2007): 3.243 1.572
Scopus rating (2006): 2.24
Original language: English
DOIs:
10.15252/msb.20145117

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-09-15<br/>Publisher name: Nature Publishing Group
Source: researchoutputwizard
Source-ID: 324
Research output: Scientific - peer-review › Article

Silane-modified substratum improves cell attachment of human embryonic stem cell-derived retinal pigment epithelial cells

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Electronics and Communications Engineering, Research group: Biomaterials and Tissue Engineering Group, Optoelectronics Research Centre, Research group: Surface Science, Univ Tampere, University of Tampere, BioMediTech, BMT FM5, BioMediTech
Authors: Juuti-Uusitalo, K., Sorkio, A. E., Käpylä, E. M. K., Teymouri, S., Lahtonen, K. T., Vuori, A. M., Valden, M. O., Skottman, H., Kellomäki, M. A. E.
Simulation of hPSC Derived Neuronal Networks with Short and Long Reaching Axons

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Electronics and Communications Engineering
Authors: Lenk, K., Ylä-Outinen, L., Tietz, L., Narkilahti, S., Hyttinen, J.
Pages: 218-219
Publication date: 2014

Host publication information
Title of host publication: MEA Meeting 2014. July 1 - July 4, 2014, Reutlingen, Germany. 9th International Meeting on Substrate-Integrated Microelectrode Arrays

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-10-20
Source: researchoutputwizard
Source-ID: 920
Research output: Scientific › Conference contribution

Single Lipid Extraction: The Anchoring Strength of Cholesterol in Liquid-Ordered and Liquid-Disordered Phases

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Stetter, F., Cwiklic, L., Jungwirth, P., Hugel, T.
Number of pages: 9
Pages: 1167-1175
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Biophysical Journal
Volume: 107
Issue number: 5
ISSN (Print): 0006-3495
Ratings:
Scopus rating (2017): 2
Scopus rating (2016): 1.946 1.018
Scopus rating (2015): 2.145 1.173
Surface Modifications and Analysis Methods at Molecular Level

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Research group: Surface Science, Department of Physics, Research group: Ultrafast and intense lasers, Research group: Nanophotonics
Publication date: 2014

Host publication information
Title of host publication: Abstracts of the 28th International Conference on Surface Modification Technologies, STM28, Tampere University of Technology, Tampere, Finland, June 16-18, 2014
Place of publication: Tampere
Publisher: Tampere University of Technology
Links:

Sympathetic activity-associated periodic repolarization dynamics predict mortality following myocardial infarction

General information
The challenges of understanding glycolipid functions: An open outlook based on molecular simulations

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics, Computational Science X (CompX)
Authors: Manna, M., Rog, T., Vattulainen, I.
Number of pages: 16
Pages: 1130-1145
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Biochimica et Biophysica Acta: Molecular and Cell Biology of Lipids
Volume: 1841
Issue number: 8
ISSN (Print): 1388-1981
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.59 1.445
Publication Forum (2016): 1
Scopus rating (2015): 2.53 1.316
Web of Science (2015): 4.779 4.541 5.8 1.993 0.01842 1.523
Publication Forum (2015): 1
Scopus rating (2014): 2.408 1.282
Web of Science (2014): 5.162 4.904 5.6 1.265 0.02062 1.711
Publication Forum (2014): 2
Scopus rating (2013): 2.181 1.313
Publication Forum (2013): 2
Scopus rating (2012): 2.17 1.297
Publication Forum (2012): 2
Scopus rating (2011): 2.51 1.315
Scopus rating (2010): 2.471 1.338
Scopus rating (2009): 2.506 1.25
Scopus rating (2008): 2.487 1.03
Scopus rating (2007): 2.03 0.906
Scopus rating (2006): 1.475 0.91
Scopus rating (2005): 2.102 1.086
Scopus rating (2004): 2.18 1.068
Scopus rating (2003): 2.418 1.376
The New Directive 2013/15/EU on Occupational Exposure to Electromagnetic Fields and Electrical Workers Exposure at 100kV Substations in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Pääkkönen, R.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: EHE2014, 5th International Conference on Electromagnetic Fields, Health and Environment, Porto, Portugal, 24th - 26th April, 2014
Publisher: Portuguese Association for the Development of Electrical Engineering
Article number: PS.19
ISBN (Print): 978-972-8822-28-6

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-05-25<br/>Publisher name: Portuguese Association for the Development of Electrical Engineering
Source: researchoutputwizard
Source-ID: 771
Research output: Scientific - peer-review › Conference contribution

The new directive 2013/35/EU on occupational exposure to electric fields and electrical workers’ use of implantable cardioverter defibrillators (ICDs)

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Pääkkönen, R., Souques, M., Virtanen, V.
Number of pages: 5
Pages: 45-49
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 2nd International Congress on Cardiovascular Technologies, CARDIOTECHNIX, Rome, Italy, 25-26 October, 2014
Publisher: SCITEPRESS
ISBN (Print): 978-989-758-055-0
DOIs: 10.5220/0005142500450049

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-11-03<br/>Publisher name: SCITEPRESS
Source: researchoutputwizard
Source-ID: 783
Research output: Scientific - peer-review › Conference contribution
The New Directive 2013/35/EU on Occupational Exposure to Electromagnetic Fields and Electrical Workers’ Use of Cardiac Pacemakers

**General information**
- State: Published
- Ministry of Education publication type: A4 Article in a conference publication
- Organisations: Department of Electronics and Communications Engineering
- Authors: Korpinen, L., Pääkkönen, R., Souques, M., Virtanen, V.
- Number of pages: 4
- Pages: 249-252
- Publication date: 2014

**Host publication information**
- Title of host publication: Proceedings of the International Conference on Biomedical Electronics and Devices, BIODEVICES 2014, 3-6 March 2014, Eseo, France
- Publisher: SCITEPRESS
- Article number: 66
- DOIs: 10.5220/0004913602490252

**Bibliographical note**
- Contribution: organisation=elt,FACT1=1<br/>
- Portfolio EDEND: 2014-04-29<br/>
- Publisher name: SCITEPRESS
- Source: researchoutputwizard
- Source-ID: 784
- Research output: Scientific - peer-review › Conference contribution

Thermal spray coating processes

**General information**
- State: Published
- Ministry of Education publication type: A3 Part of a book or another research book
- Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
- Authors: Vuoristo, P.
- Number of pages: 47
- Pages: 229-276
- Publication date: 2014

**Host publication information**
- Title of host publication: Comprehensive materials processing, 1st edition Volume 4: Coatings and films
- Publisher: Elsevier
- Editor: Cameron, D.
- ISBN (Print): 978-0-08-096532-1

**Bibliographical note**
- Contribution: organisation=mol,FACT1=1<br/>
- Portfolio EDEND: 2014-05-27
- Source: researchoutputwizard
- Source-ID: 1779
- Research output: Scientific - peer-review › Chapter

The Use and Know-how of ICT-technology in Different Age Groups

**General information**
- State: Published
- Ministry of Education publication type: A4 Article in a conference publication
- Organisations: Department of Electronics and Communications Engineering
- Authors: Korpinen, L., Pääkkönen, R., Gobba, F.
- Number of pages: 4
- Pages: 56-60
- Publication date: 2014

**Host publication information**
The Use of Computers in Different Age Groups and their Self-reported Neck Symptoms

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Pääkkönen, R., Gobba, F.
Number of pages: 4
Pages: 496-499
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the International Conference on Health Informatics, HEALTHINF 2014, 3-6 March 2014, Eseo, France
Publisher: SCITEPRESS
Article number: 112
ISBN (Print): 978-989-758-010-9
DOIs:
10.5220/0004913104960499

Topically applied ZnO nanoparticles suppress allergen induced skin inflammation but induce vigorous IgE production in the atopic dermatitis mouse model

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Engineering materials science and solutions (EMASS)
Authors: Ilves, M., Palomäki, J., Vippola, M., Lehto, M., Savolainen, K., Savinko, T., Alenius, H.
Number of pages: 12
Pages: 1-12
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Particle and Fibre Toxicology
Volume: 11
Issue number: 38
ISSN (Print): 1743-8977
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.742 2.165
Publication Forum (2016): 1
Scopus rating (2015): 3.0 2.013
Web of Science (2015): 8.649 9.618 4.3 0.312 0.00916 2.41
Publication Forum (2015): 1
Scopus rating (2014): 2.359 1.81
Unconstrained Night-Time Heart Rate Monitoring with Capacitive Electrodes
Universal Method for Embedding Proteins into Complex Lipid Bilayers for Molecular Dynamics Simulations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Computational Physics, Research group: Biological Physics and Soft Matter, Department of Physics
Authors: Javanainen, M.
Number of pages: 6
Pages: 2577-2582
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Chemical Theory and Computation
Volume: 10
Issue number: 6
ISSN (Print): 1549-9618
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.801 1.589
Publication Forum (2016): 2
Scopus rating (2015): 2.795 1.748
Web of Science (2015): 5.301 5.756 4.3 1.134 0.0635 1.768
Publication Forum (2015): 2
Scopus rating (2014): 2.777 1.603
Web of Science (2014): 5.498 5.76 3.9 1.195 0.05994 1.761
Publication Forum (2014): 2
Scopus rating (2013): 2.409 1.578
Publication Forum (2013): 2
Scopus rating (2012): 2.744 1.608
Publication Forum (2012): 2
Scopus rating (2011): 2.742 1.815
Scopus rating (2010): 2.372 1.46
Scopus rating (2009): 2.616 1.273
Scopus rating (2008): 2.367 1.173
Scopus rating (2007): 2.3 1.401
Scopus rating (2006): 1.77 1.062
Original language: English
DOIs:
10.1021/ct500046e

Bibliographical note
Contribution: organisation=fys,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: American Chemical Society
Source: researchoutputwizard
Source-ID: 593
Research output: Scientific - peer-review › Article

Upper limb musculoskeletal disorders in healthcare personnel

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering
Authors: Occhionero, V., Korpinen, L., Gobba, F.
Number of pages: 26
Pages: 1166-1191
Publication date: 2014
Peer-reviewed: Yes
Video image-based analysis of single human induced pluripotent stem cell derived cardiomyocyte beating dynamics using digital image correlation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 18
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Biomedical Engineering Online
Volume: 13
Issue number: 1
DOI: 10.1080/00140139.2014.917205
W2E - Wellness Warehouse Engine for semantic interoperability of consumer health data

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Pervasive Computing, Department of Signal Processing, Research group: Personal Health Informatics-PHI, Research Community on Data-to-Decision (D2D), Managing digital industrial transformation (mDIT)
Authors: Saaranen, M., Parak, J., Honko, H., Aaltonen, T., Korhonen, I.
Number of pages: 5
Pages: 350-354
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), 1-4 June 2014, Valencia, Spain
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-2131-7
DOIs: 10.1109/BHI.2014.6864375

Bibliographical note
Portfolio EDEND: 2014-09-24<Publisher name: Institute of Electrical and Electronics Engineers IEEE

ORG=tie,0.5
ORG=sgn,0.5
Workers at particular risk: the case of medical implants

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L., Souques, M.
Number of pages: 2
Publication date: 2014

Host publication information
Place of publication: Paris
Publisher: International Commission on Occupational Health - ICOH, Commission Internationale de la Sante au Travail - CIST

Bibliographical note
Contribution: organisation=elt,FACT1=1<br/>Portfolio EDEND: 2014-05-25<br/>Publisher name: International Commission on Occupational Health - ICOH, Commission Internationale de la Sante au Travail - CIST
Source: researchoutputwizard
Source-ID: 785
Research output: Scientific - peer-review › Conference contribution

Yarn to Fabric: Intelligent Textiles

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Materials Science
Authors: Mattila, H.
Number of pages: 22
Pages: 355-376
Publication date: 2014

Host publication information
Title of host publication: Textiles and Fashion, Materials, Design and Technology
Publisher: Woodhead Publishing
Editor: Sinclair, R.
ISBN (Print): 978-1-84569-931-4

Publication series
Name: Woodhead Publishing Series in Textiles
Publisher: Woodhead Publishing
DOIs: 10.1016/B978-1-84569-931-4.00015-5

Bibliographical note
Available online 19 November 2014<br/>Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1055
Research output: Scientific - peer-review › Chapter

A comparison of magnetic fields inside and outside high-voltage urban 110-kV power substations with the exposure recommendations of the Ukrainian regulatory authorities

General information
State: Published
Analysis of nonlinear dynamics of healthy and epileptic EEG signals using recurrence based complex network approach

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Subramaniam, N., Hyttinen, J.
Analysis of Textural Features for Face Biometric Anti-Spoofing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D)
Authors: Waris, M., Zhang, H., Ahmad, I., Kiranyaz, S., Gabbouj, M.
Number of pages: 5
Pages: 1-5
Publication date: 2013

Host publication information
Title of host publication: 21st European Signal Processing Conference, EUSIPCO 2013, 9 -13 September 2013, Marrakech, Morocco
Publisher: European Association for Signal Processing EURASIP

Publication series
Name: European Signal Processing Conference
ISSN (Print): 2219-5491
Links:

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: European Association for Signal Processing EURASIP
Source-ID: 3736
Research output: Scientific - peer-review › Conference contribution

Analysis of Wireless Powering of mm-Size Neural Recording Tags in RFID-inspired Wireless Brain-Machine Interface Systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Sensing Systems for Wireless Medicine (MediSense)
Authors: Moradi, E., Björninen, T., Sydänheimo, L., Ukkonen, L., Rabaey, J. M.
Number of pages: 8
Pages: 8-15
Publication date: 2013
A Novel Adaptive Calibration Scheme for Frequency-Selective I/Q Imbalance in Broadband Direct-Conversion Transmitters

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Wireless Communications and Positioning (WICO)
Authors: Luo, J., Kortke, A., Keusgen, W., Valkama, M.
Number of pages: 5
Pages: 61-65
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 60
Issue number: 2
ISSN (Print): 1549-7747
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.626 1.458
Publication Forum (2016): 2
Scopus rating (2015): 0.715 1.412
Web of Science (2015): 1.136 1.424 8.0 0.211 0.01067 0.75
Publication Forum (2015): 2
Scopus rating (2014): 0.688 1.551
Web of Science (2014): 1.234 1.546 7.8 0.131 0.01104 0.751
Publication Forum (2014): 2
Scopus rating (2013): 0.855 1.805
Publication Forum (2013): 2
Scopus rating (2012): 0.801 1.628
Publication Forum (2012): 2
Scopus rating (2011): 0.794 1.484
Scopus rating (2010): 0.651 1.481
Scopus rating (2009): 0.91 1.479
Scopus rating (2008): 1.266 1.716
Scopus rating (2007): 1.074 1.658
Scopus rating (2006): 0.604 1.341
Scopus rating (2005): 0.347 1.592
Scopus rating (2004): 0.122 0.0
Original language: English
DOIs:
10.1109/TCSII.2012.2235735
Aquaporin Expression and Function in Human Pluripotent Stem Cell-Derived Retinal Pigmented Epithelial Cells

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 10
Pages: 3510-3519
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Investigative Ophthalmology and Visual Science
Volume: 54
Issue number: 5
ISSN (Print): 0146-0404
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.836 1.283
Publication Forum (2016): 2
Scopus rating (2015): 2.041.408
Web of Science (2015): 3.427 3.732 7.7 0.576 0.08427 1.107
Publication Forum (2015): 2
Scopus rating (2014): 2.073 1.46
Web of Science (2014): 3.404 3.673 7.6 0.617 0.07624 0.996
Publication Forum (2014): 3
Scopus rating (2013): 2.133 1.497
Publication Forum (2013): 3
Scopus rating (2012): 2.222 1.409
Publication Forum (2012): 3
Scopus rating (2011): 1.998 1.499
Scopus rating (2010): 1.99 1.363
Scopus rating (2009): 1.861 1.4
Scopus rating (2008): 1.939 1.424
Scopus rating (2007): 1.916 1.441
Scopus rating (2006): 2.077 1.49
Scopus rating (2005): 1.943 1.536
Scopus rating (2004): 1.916 1.514
Scopus rating (2003): 1.854 1.607
Scopus rating (2002): 1.974 1.478
Scopus rating (2001): 1.719 1.322
Scopus rating (2000): 0.545 1.47
Scopus rating (1999): 0.345 1.469
Original language: English
DOIs:
10.1167/iovs.13-11800

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2013-06-29
Publisher name: Association for Research in Vision and Ophthalmology
Arterial pulse waves measured with EMFi and PPG sensors and comparison of the pulse waveform spectral and decomposition analysis in healthy young and elderly subjects

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Huotari, M., Vehkaoja, A., Määttä, K., Röning, J.
Number of pages: 10
Pages: 57-66
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Finnish Journal of eHealth and eWelfare
Volume: 5
Issue number: 2-3
ISSN (Print): 1798-0798
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
Links:
http://ojs.tsv.fi/index.php/stty

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Sosiaali- ja Terveyshuollon Tietojenkäsittely
Source: researchoutputwizard
Source-ID: 2334
Research output: Scientific - peer-review › Article

Capacitive facial activity measurement
A wide range of applications can benefit from the measurement of facial activity. The current study presents a method that can be used to detect and classify the movements of different parts of the face and the expressions the movements form. The method is based on capacitive measurement of facial movements. It uses principal component analysis on the measured data to identify active areas of the face in offline analysis, and hierarchical clustering as a basis for classifying the movements offline and in real-time. Experiments involving a set of voluntary facial movements were carried out with 10 participants. The results show that the principal component analysis of the measured data could be applied with almost perfect performance to offline mapping of the vertical location of the facial activity of movements such as raising and lowering eyebrows, opening mouth, raising mouth corners, and lowering mouth corners. The presented classification method also performed very well in classifying the same movements both with the offline and the real-time implementations.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Number of pages: 8
Pages: 78-85
Publication date: 2013
Peer-reviewed: Yes
Capacitive Measurement of Facial Activity Intensity

The measurement of the intensity of facial muscle activity can be used in several applications such as human–computer interaction and behavioural science. A new method for the intensity measurement is presented. It is based on a contactless, capacitive measurement of the movements that the facial activity produces. The muscles responsible for raising the eyebrows, lowering the eyebrows, raising the mouth corners, and pulling down the mouth corners were measured simultaneously with the capacitive method and electromyography (EMG) during controlled experiments. Each muscle was activated by 10 participants at three different intensity levels (low, medium, and high), 10 repetitions at each level. The capacitive intensity values were in good agreement with the ones registered with the EMG: average mean absolute errors were between 7–12% of the observed intensity range. However, compared to the EMG, the capacitive intensity values were noticed to have offsets that may be partly caused by the measurement itself and partly by the EMG reference. As a result, the measurement may require a calibration for more intensity values than just the maximum. In the case of the capacitive method it is also required to distinguish between the muscle activations originating from the same facial regions to determine which activation is taking place. This was done with an almost perfect performance by using hierarchical clustering to cluster the intensity values.
Combining the Information of Unconstrained Electrocardiography and Ballistography in the Detection of Night-Time Heart Rate and Respiration Rate

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Vehkaoja, A., Peltokangas, M., Verho, J., Lekkala, J.
Number of pages: 16
Pages: 52-67
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: International Journal of Monitoring and Surveillance Technologies Research
Volume: 1
Issue number: 3
ISSN (Print): 2166-7241
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: English
DOIs:
Comparison of different MRI sequences in lesion detection and early response evaluation of diffuse large B-cell lymphoma - a whole-body MRI and diffusion-Weighted imaging study

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Number of pages: 9
Pages: 1186-1194
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: NMR in Biomedicine
Volume: 26
Issue number: 9
ISSN (Print): 0952-3480
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.42 1.038
Publication Forum (2016): 2
Scopus rating (2015): 1.604 1.009
Web of Science (2015): 2.983 3.372 6.8 0.486 0.01488 1.261
Publication Forum (2015): 2
Scopus rating (2014): 1.602 1.165
Web of Science (2014): 3.044 3.529 6.6 0.372 0.01527 1.325
Publication Forum (2014): 2
Scopus rating (2013): 1.63 1.311
Publication Forum (2013): 2
Scopus rating (2012): 1.594 1.242
Publication Forum (2012): 2
Scopus rating (2011): 1.347 1.351
Scopus rating (2010): 1.303 1.152
Scopus rating (2009): 1.567 1.551
Scopus rating (2008): 1.816 1.453
Scopus rating (2007): 1.709 1.421
Scopus rating (2006): 1.363 1.28
Scopus rating (2005): 1.633 1.572
Scopus rating (2004): 1.212 1.262
Scopus rating (2003): 1.738 1.224
Scopus rating (2002): 1.01 0.878
Scopus rating (2001): 1.024 0.962
Scopus rating (2000): 0.802 0.87
Scopus rating (1999): 1.045 1.111
Original language: English
DOIs:
10.1002/nbm.2933
Computational Models of Ventricular- and Atrial-Like Human Induced Pluripotent Stem Cell Derived Cardiomyocytes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Paci, M., Hyttinen, J., Aalto-Setälä, K., Severi, S.
Pages: 2334-2348
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Annals of Biomedical Engineering
Volume: 41
Issue number: 11
ISSN (Print): 0090-6964
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.054 1.221
Publication Forum (2016): 2
Scopus rating (2015): 1.179 1.355
Web of Science (2015): 2.887 3.038 6.8 0.582 0.01771 0.968
Publication Forum (2015): 2
Scopus rating (2014): 1.095 1.521
Web of Science (2014): 3.195 2.987 6.8 0.46 0.01834 0.951
Publication Forum (2014): 3
Scopus rating (2013): 1.257 1.451
Publication Forum (2013): 3
Scopus rating (2012): 0.926 1.242
Publication Forum (2012): 3
Scopus rating (2011): 0.863 1.135
Scopus rating (2010): 0.812 1.266
Scopus rating (2009): 0.892 1.337
Scopus rating (2008): 1.003 1.268
Scopus rating (2007): 1.073 1.322
Scopus rating (2006): 1.049 1.283
Scopus rating (2005): 0.802 1.111
Scopus rating (2004): 0.694 1.214
Scopus rating (2003): 0.355 1.069
Scopus rating (2002): 0.295 0.911
Scopus rating (2001): 0.282 1.276
Scopus rating (2000): 0.663 0.956
Scopus rating (1999): 0.524 0.984
Original language: English
DOIs:
10.1007/s10439-013-0833-3

Bibliographical note

Correlation approach for the detection of the heartbeat intervals using force sensors placed under the bed posts

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Vehkaoja, A., Rajala, S., Kumpulainen, P., Lekkala, J.
Number of pages: 7
Pages: 327-333
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Medical Engineering & Technology
Volume: 37
Issue number: 5
ISSN (Print): 0309-1902
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.253 0.476
Publication Forum (2016): 1
Scopus rating (2015): 0.342 0.707
Publication Forum (2015): 1
Scopus rating (2014): 0.313 0.796
Publication Forum (2014): 1
Scopus rating (2013): 0.253 0.706
Publication Forum (2013): 1
Scopus rating (2012): 0.282 0.563
Publication Forum (2012): 1
Scopus rating (2011): 0.27 0.75
Scopus rating (2010): 0.22 0.49
Scopus rating (2009): 0.249 0.813
Scopus rating (2008): 0.253 0.568
Scopus rating (2007): 0.216 0.669
Scopus rating (2006): 0.306 0.811
Scopus rating (2005): 0.35 0.89
Scopus rating (2004): 0.292 0.472
Scopus rating (2003): 0.291 0.501
Scopus rating (2002): 0.317 0.642
Scopus rating (2001): 0.239 0.579
Scopus rating (2000): 0.273 0.813
Scopus rating (1999): 0.237 0.498
Original language: English
DOIs:
10.3109/03091902.2013.807523
Links:

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: Informa Healthcare
Source: researchoutputwizard
Source-ID: 3662
Research output: Scientific - peer-review › Article

Current densities and total contact currents associated with 400kV power line tasks
Extracting the respiration cycle lengths from ECG signal recorded with bed sheet electrodes

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering (ITTE)
Research (ITTE)
Authors: Vehkaoja, A., Peitokangas, M., Lekkala, J.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
Title of host publication: 2013 Joint Imeko (International Measurement Confederation) Tc1-Tc7-Tc13 Symposium: Measurement Across Physical And Behavioural Sciences
Publisher: IOP Publishing
Face-hugging device for technology mediated human-human interaction

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Venesvirta, H., Surakka, V., Lylykangas, J., Rantanen, V., Spakov, O., Verho, J., Vetek, A., Lekkala, J.
Number of pages: 6
Pages: 346-351
Publication date: 2013

Host publication information
Place of publication: Berlin
Publisher: Technische Universität Berlin
Editors: Dittrich, E., Doria, L., Gross, A., Günzler, T., Smiesze, H.

Face Interface: Using voluntary gaze direction and facial muscle activations for human-computer interaction

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Tuisku, O., Surakka, V., Rantanen, V., Lekkala, J.
Number of pages: 5
Pages: 341-345
Publication date: 2013

Host publication information
Place of publication: Berlin
Publisher: Technische Universität Berlin
Femoral neck cross-sectional geometry and exercise loading

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Narra, N., Nikander, R., Viik, J., Hyttinen, J., Sievänen, H.
Number of pages: 9
Pages: 258-266
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Clinical Physiology and Functional Imaging
Volume: 33
Issue number: 4
ISSN (Print): 1475-0961
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.635 0.778
Publication Forum (2016): 1
Scopus rating (2015): 0.538 0.688
Web of Science (2015): 1.869 1.61 9.1 0.562 0.00262 0.481
Publication Forum (2015): 1
Scopus rating (2014): 0.589 0.837
Web of Science (2014): 1.438 1.457 >10.0 0.318 0.00241 0.42
Publication Forum (2014): 2
Scopus rating (2013): 0.595 0.684
Publication Forum (2013): 2
Scopus rating (2012): 0.464 0.909
Publication Forum (2012): 2
Scopus rating (2011): 0.512 0.71
Scopus rating (2010): 0.587 0.825
Scopus rating (2009): 0.444 0.707
Scopus rating (2008): 0.468 0.841
Scopus rating (2007): 0.435 0.703
Scopus rating (2006): 0.446 0.776
Scopus rating (2005): 0.505 0.715
Scopus rating (2004): 0.424 0.69
Scopus rating (2003): 0.519 0.791
Scopus rating (2002): 0.427 0.592
Scopus rating (2001): 0.393 0.796
Scopus rating (2000): 0.378 0.78
Scopus rating (1999): 0.264 0.634
Original language: English
DOIs:
Imaging Hydrogels 3D Structure For Tissue Engineering With OPT And SPIM

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Electronics and Communications Engineering
Authors: Soto de la Cruz, A. M., Hyttinen, J., Figueiras, E.
Number of pages: 2
Pages: 64-65
Publication date: 2013

Host publication information
Title of host publication: 1st EOS Topical Meeting on Frontiers in Optical Imaging (FOI2013), Murten, Switzerland, 16-18 September 2013
Publisher: European Optical Society
ISBN (Print): 978-1-63266-233-0

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2014-11-08
Publisher name: European Optical Society
Source: researchoutputwizard
Source-ID: 3453
Research output: Scientific › Conference contribution

Influence of relative humidity on analyzing electric field exposure using ELF electric field measurements

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering
Authors: Korpinen, L. H., Kuisti, H. A., Tarao, H., Elovaara, J. A.
Number of pages: 5
Pages: 414-418
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Bioelectromagnetics
Volume: 34
Issue number: 5
ISSN (Print): 0197-8462
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.572 1.1
Publication Forum (2016): 1
Scopus rating (2015): 0.599 1.079
Web of Science (2015): 1.583 1.788 9.7 0.305 0.00251 0.481
Publication Forum (2015): 1
Scopus rating (2014): 0.624 1.259
Web of Science (2014): 1.705 1.717 9.3 0.483 0.0023 0.401
Publication Forum (2014): 1
Scopus rating (2013): 0.68 1.341
Publication Forum (2013): 1
Integration of Microfluidic System with Silicon Nanowires Biosensor for Multiplexed Detection

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering
Research (ITTE)
Authors: Gao, A., Dai, P., Lu, N., Li, T., Wang, Y., Hemmilä, S., Kallio, P.
Number of pages: 4
Pages: 348-351
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the Third International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, 3M-NANO, Suzhou, China, 26-30 August, 2013

Publication series
Name: International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale
ISSN (Print): 1932-4510

Bibliographical note
Contribution: organisation=elt,FACT1=1
Portfolio EDEND: 2013-06-29
Publisher name: John Wiley & Sons
Source: researchoutputwizard
Source-ID: 2615
Research output: Scientific - peer-review » Article

Kohti automaattista yksittäisten paperikuitujen manipulointia

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Hirvonen, J., Kallio, P.
Number of pages: 6
Pages: 1-6
Publication date: 2013
Method for Investigations of Aged Fibre-Fibre Bonds with Micro and Nanorobotic Tools

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Saketi, P., Mikczinski, M., Fatikow, S., Kallio, P.
Number of pages: 18
Pages: 125-142
Publication date: 2013

Host publication information
Title of host publication: Advances in Pulp and Paper Research, Cambridge 2013: Transactions of the 15th Fundamental Research Symposium, Gambridge, September 2013
Place of publication: Bury
Publisher: Pulp & Paper Fundamental Research Society
Editor: I’Anson, S.
ISBN (Print): 978-0992616304

Publication series
Name: Pulp and Paper Fundamental Research Symposium
Volume: 1

Non-Binary Coding for Texture Descriptors in Sub-Cellular and Stem Cell Image Classification

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Paci, M., Nanni, L., Lahti, A., Aalto-Setälä, K., Hyttinen, J., Severi, S.
Number of pages: 12
Pages: 208-219
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Current Bioinformatics
Volume: 8
Issue number: 2
ISSN (Print): 1574-8936
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.23 0.288
Publication Forum (2016): 1
Scopus rating (2015): 0.32 0.428
Web of Science (2015): 0.77 0.93 4.1 0.016 8.3E-4 0.237
Novel method for intensity correction using a simple maskless lithography device

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Kattipparambil Rajan, D., Raunio, J., Karjalainen, M. T., Ryynänen, T., Lekkala, J.
Number of pages: 7
Pages: 40-46
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators A: Physical
Volume: 194
ISSN (Print): 0924-4247
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.803 1.655
Publication Forum (2016): 1
Scopus rating (2015): 0.848 1.599
Web of Science (2015): 2.201 2.214 8.1 0.385 0.01915 0.583
Publication Forum (2015): 1
Scopus rating (2014): 0.878 1.798
Web of Science (2014): 1.903 2.052 7.9 0.408 0.01879 0.566
Publication Forum (2014): 2
Scopus rating (2013): 0.827 1.802
Publication Forum (2013): 2
Scopus rating (2012): 0.915 2.113
Publication Forum (2012): 2
Scopus rating (2011): 0.907 2.111
Scopus rating (2010): 1.106 1.834
Scopus rating (2009): 1.029 1.674
Scopus rating (2008): 0.973 1.612
Novel polypyrrole-coated polylactide scaffolds enhance adipose stem cell proliferation and early osteogenic differentiation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Pelto, J., Björninen, M., Pälli, A., Talvitie, E., Hyttinen, J., Mannerström, B., Suuronen-Seppänen, R., Kellomäki, M., Miettinen, S., Haimi, S.
Number of pages: 11
Pages: 882-892
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Tissue Engineering Part A
Volume: 19
Issue number: 7-8
ISSN (Print): 1937-3341
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.168 0.956
Publication Forum (2016): 1
Scopus rating (2015): 1.492 1.085
Publication Forum (2015): 1
Scopus rating (2014): 1.557 1.254
Publication Forum (2014): 2
Scopus rating (2013): 1.649 1.293
Publication Forum (2013): 2
Scopus rating (2012): 1.984 1.187
Publication Forum (2012): 2
Scopus rating (2011): 1.848 1.121
Scopus rating (2010): 1.294 1.256
Scopus rating (2009): 0.873 0.781
Original language: English
DOIs:
10.1089/ten.tea.2012.0111
Pulse waveforms are an indicator of the condition of the vascular system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Huotari, M., Vehkaoja, A., Määttä, K., Kostamovaara, J.
Pages: 526-529
Publication date: 2013

Host publication information
Title of host publication: World Congress on Medical Physics and Biomedical Engineering, May 26-31, 2012, Beijing, China. IFMBE Proceedings
Publisher: Springer Verlag
Editor: Long, M.
ISBN (Print): 978-3-642-29304-7

Scale and Rotation Invariant Two View Microgripper Detection that Uses a Planar Pattern
In automated grasping of microparts or objects with unknown dimensions and orientations, at least two cameras have to be used to acquire the depth information. In addition to recognition and reconstruction of the real-world coordinates of the target objects, the system has to be able to detect also the real-world coordinates of the microgrippers from the images. This paper presents a scale and rotation invariant microgripper detection method that uses a planar pattern. The method is suitable especially for prototyping systems, whose composition might vary between the experiments. The gripper detection is shown to be accurate enough for challenging micromanipulation tasks of small electronic components and individual paper fibers.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hirvonen, J., Kallio, P.
Number of pages: 9
Pages: 414-422
Publication date: 2013

Host publication information
Title of host publication: 6th IFAC Symposium on Mechatronic Systems, April 10-12, 2013, Hangzhou, China
Publisher: International Federation of Automatic Control
Editor: Ju, B.
ISBN (Print): 978-3-902823-31-1

Publication series
Name: Elsevier IFAC Publications / IFAC Proceedings series
Silanointiparametrien vaikutus sähkökemiallisesti passivoidun austeniittisen teräksen pinnalle rakentuvan biofunktionaalisen seossilaaniohutkalvon koostumukseen

This thesis examines the chemical composition of a mixed silane thin film synthesized on electrochemically passivated AISI 316L -stainless steel. Silane thin films can be used to enhance the biocompatibility of stainless steel and to create surface functionalities that promote adsorption of biomolecules. Such hybrid materials made of steel and organic coatings can be utilized in e.g. medical implants and tissue engineering.

The goal of this work was to develop deposition equipment needed for the synthesis of silane thin films in order to improve the rate and reproducibility of the sample preparation. The equipment was used to investigate the effect of silanization parameters such as the composition of the silane solution, the hydrolysis time and the silanization time on the structure of the self-assembled thin film. The silane molecules used in this study were amine terminated (3-aminopropyl)trimethoxysilane (APS) and thiol terminated (3-mercaptopropyl)trimethoxysilane (MPS).

The silanization process was conducted as a liquid phase deposition in atmospheric pressure, which enables the method to be easily adapted to commercial applications. On the other hand, the measurements were performed in ultra-high vacuum utilizing both synchrotron radiation induced and conventional X-ray photoelectron spectroscopy (XPS). The acquired spectra enabled conclusions to be made on the chemical composition and thickness of the silane films. They also provided information on the ratio and orientation of the functional groups.

According to the results, the employed silanization process enables the reproducible manufacturing of approximately one monolayer thick silane films. In addition, the amount of surface functionalities can be adjusted by modifying either the silane concentration in the hydrolysis solution or the silanization time. However, changing the hydrolysis time only affects the chemical bonding between the silane molecules and steel surface, not the total amount of functional groups. Based on the measurements with varying surface sensitivities, it was possible to conclude that the majority of functional groups point outwards. This is an important result considering the adsorption of biomolecules on the surface.

This study found that the hydrolysis rate of different silane species shows considerable variation despite the similar basic structure of the molecules. In the future, the hydrolysis behaviour should be investigated more carefully in the liquid phase. This might help to understand the hydrolysis reactions and also enhance the repeatability of the sample preparation.

Simulation of Microporous Architecture's Effects on Fluid Flow Characteristics in Cell Seeding
Three-dimensional calibration of micromanipulators using stereo vision

Calibration is of great significance in the development of automatic micromanipulation systems. This paper presents a novel vision based procedure for three-dimensional (3D) calibration of micromanipulators. Two major issues in the proposed calibration approach - vision system calibration and manipulator kinematic calibration - are discussed in detail in this paper. Verification and evaluation experiments are conducted using a 3D micromanipulator in a microrobotic fiber characterization platform. Experimental results demonstrate that the proposed calibration approach is able to achieve prediction errors below 5 μm. The proposed approach also demonstrates the feasibility of calibrating the decoupled motions, by reducing the undesired movement from 28 μm to 8 μm (for 4800 μm desired movement).
Towards Fully Automated Pick and Place Operations of Individual Natural Fibers

This paper reports automated image-based pick and place procedures for manipulation of individual natural fibers. The developed procedures are part of an effort to develop a fully automated microrobotic-based platform for fiber characterization. The presented procedures are divided into unit operations, which can be reused in multiple tasks that the platform must perform. Two different demonstrations: pick and place, and coordinated fiber lifting are presented. In addition, a component-based software that promotes reusability of the developed unit operations is presented.
Combining unobtrusive electrocardiography and ballistography for more accurate monitoring of sleep

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Vehkaoja, A., Peltokangas, M., Verho, J., Lekkala, J.
Pages: 202-207
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the IEEE 12th International Conference on BioInformatics and BioEngineering BIBE, November 11-13, 2012, Larnaca, Cyprus
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-4357-2
ASJC Scopus subject areas: Biomedical Engineering

Publication series
Name: IEEE International Conference on BioInformatics and BioEngineering
Electronic versions:
Combining Unobtrusive Electrocardiography and Ballistography for more Accurate Monitoring of Sleep
DOIs: 10.1109/BIBE.2012.6399674

Bibliographical note
Contribution: organisation=ase mit,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 5528
Research output: Scientific - peer-review » Conference contribution

System for ECG and heart rate monitoring during group training
Cerebral glucose metabolism in survivors of childhood acute lymphoblastic leukemia

BACKGROUND. Cranial radiation therapy (CRT) has been suggested to be a principal factor responsible for long term neurocognitive deficits in survivors of acute lymphoblastic leukemia (ALL). However, neither reduction of the irradiation dose nor the elimination of irradiation entirely appear to have abolished neurocognitive impairment in long term ALL survivors. Positron emission tomography (PET) and [F-18] -fluorodeoxyglucose (FDG) can be used to quantitate cerebral glucose metabolism , a potential indicator of treatment-induced adverse central nervous system (CNS) effects. The purpose of this study was to assess whether CRT is associated with defects in cerebral glucose metabolism in long term ALL survivors. The authors also studied whether chemotherapy and/or the severity of disease have deleterious effects on glucose metabolism.

METHODS. Ferry long-term survivors of childhood ALL were studied using FDG PET. All subjects went through an elaborate neurocognitive assessment. In 20 of these children, the prophylactic treatment of the CNS had been CRT combined with methotrexate (MTX), and it was MTX only in the remaining 20 children.

RESULTS. No major differences were found in the regional cerebral glucose utilization or in neurocognitive performance between the irradiated and nonirradiated groups. A high leukocyte count at the time of diagnosis was found to be associated inversely with cerebral glucose utilization.

CONCLUSIONS. CRT does not appear to affect cerebral glucose metabolism in long term survivors of ALL. By contrast, the association between the leukocyte count and glucose utilization implies that disease severity may be partly responsible for adverse CNS effects in long term survivors of childhood ALL. (C) 2000 American Cancer Society.
Iterative reconstruction method based on median root prior in quantification with PET

The aim of this study was to compare reproducibility and accuracy of two reconstruction methods in quantification of regional myocardial blood flow (rMBF) and oxygen metabolism with [O-15] labeled tracers and positron emission tomography (PET). A new iterative Bayesian reconstruction method based on median root prior (MRP) was compared with filtered back-projection (FBP) method.

Methods, rMBF, oxygen extraction fraction (rOEF) and myocardial metabolic rate of oxygen consumption (rMMRO(2)) were quantified from images reconstructed using both MRP and FBP in 27 subjects. For each subject, regions of interest (ROIs) were drawn on the lateral, anterior and septal regions on four planes. To test the reproducibility, the ROI drawing procedure was repeated. Using two sets of ROIs, variability was evaluated with MRP and FBP images.

Results. Correlation coefficients of rMBF rOEF and rMMRO(2) were significantly higher in MRP images than in FBP images. Coefficient of variations for each parameter was significantly lower in MRP images than in FBP.

Conclusion. MRP reconstruction provides higher reproducibility and lower variability in the quantitative myocardial parameters compared with FBP. This study presents that the new MRP reconstruction improves accuracy and stability of clinical quantification of myocardial blood flow and oxygen metabolism with [O-15] and PET.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Former organisation of the author
Authors: Katoh, C., Alenius, S., Ruotsalainen, U.
Keywords: (Bayesian reconstruction, metabolic rate of oxygen consumption, myocardial blood flow, POSITRON-EMISSION TOMOGRAPHY, MYOCARDIAL BLOOD-FLOW, INHALATION)
Number of pages: 6
Pages: 265-270
Publication date: 2000

Host publication information
Title of host publication: Positron Emission Tomography in the Millennium
Place of publication: Amsterdam