Upoznajte Marija Cifreka

Osnovno i šturo…

- Diplomirao na FER-u 1987. godine
- Magistrirao na FER-u 1992. godine
- Doktorirao na FER-u 1997. godine
- Od 1987. godine radi na Zavodu za elektroničke sustave i obradbu informacija Fakulteta elektrotehnike i računarstva u Zagrebu
- Redoviti profesor
- Prodekan za nastavu

Predmeti

- Analiza i obradba EKG signala
- Biomedicinska informatika

Znanstveni interesi

- Biomedicinsko inženjerstvo
- Elektronička mjerna tehnika

Trenutni projekt

- **Research of Intrabody Communication for Body Area Networks**

  - bilateralni projekt FER-a i Fuzhou
University iz Kine

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PROJEKTI

<- Povratak na popis projekata

Project	
Acronym:	
Name:	**Research of Intrabody Communication for Body Area Networks**
Project status:	**From:** 2011-10-01 **To:** 2013-09-30 (Execution)
Type (Programme):	BILAT
Project funding:	-
International partner	
Organisation Name:	Key Laboratory of Medical Instrumentation & Pharmaceutical Technology, Fuzhou University
Organisation adress:	Fujian Province
Organisation country:	P.r. China
Contact person name:	Yue ming Gao
Contact person email:	Email
Croatian partner	
Contact person names:	Prof. dr. sc. Mario Cifrek
Contact organisation unit:	Zavod za elektroničke sustave i obradbu informacija
Contact person tel:	6129-933

Short description of project

Body Area Network (BAN) is a network of wearable sensor nodes placed on or implanted inside the human body. BAN plays an important role in the mobile health care, military training, consumer electronics and others. Usually, the BAN consists of the wearable and implanted sensor nodes which acquire, analyze and process all kinds of physiological parameters. An important issue in the development of the BAN prototype is the choice of physical layer and the communication protocol. Although often used in biomedical applications, standard communication protocols like Bluetooth, WLAN, RFID, ZigBee, and IrDA, are optimized for other purposes: WLAN for data transfer, Bluetooth for voice transmission, RFID for identification and tracking, and ZigBee for industrial applications. Data rate of WLAN and Bluetooth communication modules is fast enough for biomedical applications, but they emit high levels of EMF radiation, which can lead to tissue overheating and irritation. High transmitted power also requires frequent replacement of batteries, which is undesirable in the case of implanted sensors. ZigBee and RFID modules have lower consumption, but their achievable data rates are insufficient for biomedical applications. IrDA modules demand a direct line of sight to realize a successful communication. Common to all of these standards except to IrDA is that they are designed for communication at a distance of several tens of meters, so they inherently generate excessive power which affects the practical system usability in long-term monitoring applications. Also, they are unsuitable for a body area network from the viewpoint of security and difficulty of implantable antenna design. As an optimal wireless communication method in the vicinity of the human body, a new emerging transmission technique called intrabody communication (IBC) is proposed. Since the human body is a rather good conductive medium for the electric signals, IBC employs the human body as the transmission medium for connecting different electronic devices on, inside or near the body. In IBC the human body becomes an integral component of the electric signal transmission path, external electromagnetic noise has little influence on the signal, and abundant cables which are often used in health care monitoring are no longer needed. Moreover, high conductivity of human body compared to the surrounding environment implies the IBC as a power-saving method, capable of operating on only several milliwatts of power. The intrabody communication range is limited to the close proximity of the human body, so the receiver unit is always placed at the short distance from the transmitter unit (maximum possible distance is the subject's height) and the security is not a problem. Two main types of intrabody communication are capacitive coupling and galvanic coupling. In the capacitive coupling approach, the induced electrical signal is controlled by an electric potential and the signal return path from the transmitter to the receiver ground electrodes is closed through the environment. It is suitable for the BAN sensors situated on the human body. In the galvanic coupling approach, the induced signal is controlled by an alternating current flowing through the human body and all the electrodes must be in direct contact with the subject. The signal is coupled to the human body via a pair of transmitter electrodes and the potential is detected differentially by the receiver electrodes of another BAN node. The galvanic type IBC is especially suitable for the sensor implanted in the human body.

Short description of the task performed by Croatian partner

The Chinese organization, Key Laboratory of Medical Instrumentation & Pharmaceutical Technology of Fuzhou University is currently focused on the galvanic coupling IBC. They proposed a mathematical model which represents a human forearm as a homogeneous multilayer cylinder. The model solves the IBC problem analytically, and is used for determination of the potential and current density distribution mechanisms and

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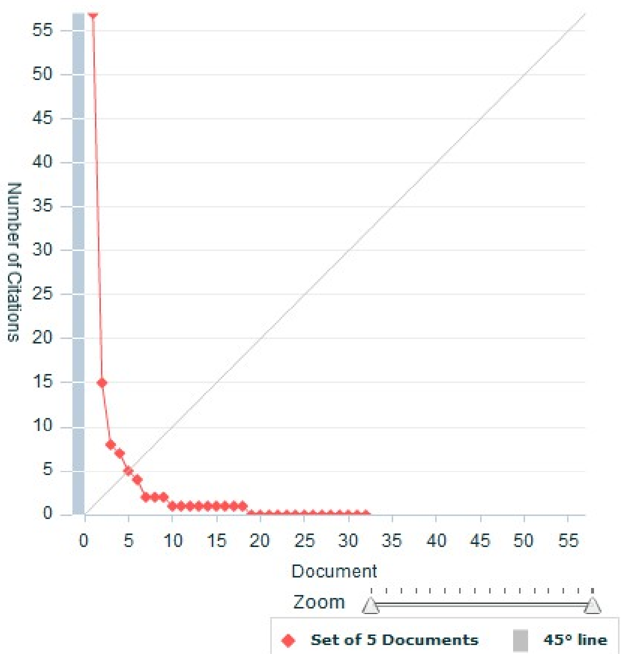

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Author(s): Cifrek, M; Tonkovic, S; Medved, V
Source: MEASUREMENT Volume: **27** Issue: **2** Pages: **85-92** DOI: **10.1016/S0263-2241(99)00059-7** Published: **MAR 2000**
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1. Biomechanics of the cervical spine. I: Normal kinematics

November 2000
Nikolai Bogduk | Susan Mercer

Abstract: This review constitutes the first of four reviews that systematically address contemporary knowledge about the mechanical behavior of the cervical vertebrae and the soft-tissues of the cervical spine, under normal conditions and under conditions that result in minor or major injuries. This first review considers the normal kinematics of the cervical spine, which predicates the appreciation of the biomechanics of cervical spine injury. It summarizes the cardinal anatomical features of the cervical spine that determine how the cervical vertebrae and their joints behave. The results are collated of multiple studies that have measured the range of motion of individual joints of the cervical spine. However, modern studies are highlighted that reveal that, even under normal conditions, range of motion is not consistent either in time or according to the direction of motion. As well, detailed studies are summarized that reveal the order of movement of individual vertebrae as the cervical spine flexes or extends. The review concludes with an account of the location of instantaneous centres of rotation and their biological basis.RelevanceThe facts and precepts covered in this review underlie many observations that are critical to comprehending how the cervical spine behaves under adverse conditions, and how it might be injured. Forthcoming reviews draw on this information to explain how injuries might occur in situations where hitherto it was believed that no injury was possible, or that no evidence of injury could be detected.

2. Surface EMG based muscle fatigue evaluation in biomechanics

May 2009
Mario Cifrek | Vladimir Medved | Stanko Tonković | Saša Ostojić

Abstract: In the last three decades it has become quite common to evaluate local muscle fatigue by means of surface electromyographic (sEMG) signal processing. A large number of studies have been performed yielding signal-based quantitative criteria of fatigue in primarily static but also in dynamic tasks. The non-invasive nature of this approach has been particularly appealing in areas like ergonomics and occupational biomechanics, to name just the most prominent ones. However, a correct appreciation of the findings concerned can only be obtained by judging both the scientific value and practical utility of methods while appreciating the corresponding advantages and limitations. The aim of this paper is to serve as a state of the art summary of this issue. The paper gives an overview of classical and modern signal processing methods

Clinical Biomechanics

Volume 24, Issue 4, May 2009, Pages 327-340

Surface EMG based muscle fatigue evaluation in biomechanics (Review)

Cifrek, M.[a], Medved, V.[b], Tonković, S.[a], Ostojić, S.[a]

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Abstract

In the last three decades it has become quite common to evaluate local muscle fatigue by means of surface electromyographic (sEMG) signal processing. A large number of studies have been performed yielding signal-based quantitative criteria of fatigue in primarily static but also in dynamic tasks. The non-invasive nature of this approach has been particularly appealing in areas like ergonomics and occupational biomechanics, to name just the most prominent ones. However, a correct appreciation of the findings concerned can only be obtained by judging both the scientific value and practical utility of methods while appreciating the corresponding advantages and limitations. The aim of this paper is to serve as a state of the art summary of this issue. The paper gives an overview of classical and modern signal processing methods and techniques from the standpoint of applicability to sEMG signals in fatigue-inducing situations relevant to the broad field of biomechanics. Time domain, frequency domain, time-frequency and time-scale representations, and other methods such as fractal analysis and recurrence quantification analysis are described succinctly and are illustrated with their biomechanical applications, research or clinical alike. Examples from the authors' own work are incorporated where appropriate. The future of this methodology is projected by estimating those methods that have the greatest chance to be routinely used as reliable muscle fatigue measures.

Reaxys Database Information

Author keywords

Biomechanics; Biomedical signal processing; Muscle fatigue; Surface electromyography

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Zu, X. , Li, Y. , Zhou, Q.
Evaluation of muscle fatigue based on surface electromyography and subjective assessment
(2013) IFMBE Proceedings

Peñailillo, L. , Silvestre, R. , Nosaka, K.
Changes in surface EMG assessed by discrete wavelet transform during maximal isometric voluntary contractions following supramaximal cycling
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