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IEEE1451.4 multi-sensing platform for wheelchair users assessment

Publisher: IEEE Cite This PDF

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Abstract: The article presents a prototype of a distributed system for wheelchair users assessment characterized by multi-sensing, embedded processing compatible IEEE 1451.4 standard for smart sensors and wireless communication based on IEEE 802.15.4. A set of smart sensing channels are connected in a 1-Wire network supported by an embedded platform that assures the acquisition and appropriate digital processing of photoplethysmogram (PPG), ballistocardigram (BCG) and skin conductivity signals. The wheelchair user identification is performed using LF RFID technology and the information is uploaded in a Electronic Health Record framework. The designed and implemented distributed measurement system was tested and experimental results are included in the paper.

Published in: 2014 21st International Conference on Telecommunications (ICT)

Date of Conference: 4-7 May 2014 **INSPEC Accession Number:** 14416635

Date Added to IEEE Xplore: 30 June 2014 **DOI:** 10.1109/ICT.2014.6845074

ISBN Information: **Publisher:** IEEE

Conference Location: Lisbon, Portugal

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I. Introduction

The new solutions in the field of sensing but also on pervasive computing and wireless communication create new opportunities of deploying of this architecture in institutions like nursing or supported living facilities for the elderly. Elderly people and patients with physical disabilities who need to use a wheelchair in their daily life can benefit from continued use of these technologies [1]. By using unobtrusive biomedical sensors which have been developed to reduce the induced stress of the utilization by the patients during continuous monitoring of health status, the acceptance of healthcare monitoring system increase assuring for the physicians, nurses or physiotherapists to keep track of the subject health by remote monitoring [2]. Considering the simple interaction requirement, plug-and-play features of sensing channels are very important since no significant overheads are required by the user. Standards that provide particular focus on providing plug-and-play and interoperability are reported in [3] and [4]. Important work on smart sensing field is related to IEEE 1451 standard for smart sensors that deals with various aspects of sensors, such as the definition of sensors and actuators, the format of transducer data sheets, sensing channel operation. One of those standards, IEEE 1451.4, provides an interface for analog sensors, enabling them with (digital) data describing the sensor [5] [6]. It is the case of present sensing platform where the 1451.4 implementation permits the photoplethysmography (PPG), ballistocardiography (BCG) and skin conductance (SKC) signals acquisition together the specific information of measurement channel that corresponds with transducer electronic data sheet.

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