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Unobstrusive heart rate and respiratory rate monitor embedded on a wheelchair

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Abstract:
A biomedical system embedded on a wheelchair able to measure heart rate, respiratory rate, and the wheelchair motion state is presented. A wireless multi-channel acquisition module is connected to a BCG (ballistocardiography) unit and to an inertial 3-axial MEMS accelerometer based unit. The sensing units are embedded on the seat and backrest of the wheelchair and the acquired data is transmitted through Wi-Fi connection to a remote processing unit expressed by a laptop PC. Considering the different motion situations of the wheelchair when utilized by the user, an important part of the work was focused on BCG noise and artifacts removal as well as to heart rate and respiratory rate accurate estimation from BCG signal using wavelet based filtering and ICA (Independent Component Analysis) algorithms. Experimental results for different scenarios of wheelchair utilization are included in the paper.

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Contents

I. Introduction

The average money gained per year of life gained in the USA in 1960–2000 was approximately 31,600*at 15 years of age*, 53,700 at 45 years of age, and 84,700*at 65 years of age*. *At the age of 65,* 121,000 between *costs rose more rapidly than did life expectancy*: *the cost per year of life gained was* 145,000 between 1990 and 2000 [1]. Aware of the rising costs and burden of chronic diseases, related to health of elderly and of people with disability, many countries are taking a comprehensive approach to health cost reduction. Telemedicine, remote monitoring of in-home patients are the best solutions. Moreover, the evidences from the literature have been shown that implementing Electronic Health Record and Telemedicine can reduce substantially health costs [2], [3].

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