Continuous health monitoring using E-textile integrated biosensors

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Abstract:
In this work, continuous health monitoring for disabled or elderly people is proposed using textile integrated electrodes for ECG measurement. Other applications, such as EMG or skin impedance measurement are also envisaged. The paper specifically describes a shirt integrating electrodes for ECG measurement that has been tested in several conditions. The techniques for integration of ECG electrodes can be directly applied for production of EMG or skin-impedance electrodes. Signal processing techniques for heart rate value extraction and to deal with low-quality signal or motion artefacts are being tested and will also be described. Results show that signals acquired with the shirt are comparable to signals acquired with conventional gel electrodes. The complete integration of the electrodes into clothing may have a very interesting psychological benefit, but some issues related to comfort and daily use have to be further investigated.

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Contents

At present time, considering the ageing of the modem societies' populations, the interest for ubiquitous, continuous and automatic health monitoring has been growing intensely. One of the technologies that have captured some attention in this context is the integration of sensors and systems into textiles. Textiles are excellent interfaces for biological signal sensing. They are flexible, conformable and are used by everyone on a daily basis. There are many types of textile conductive yams available on the market that can be processed by conventional textile production techniques. Many researchers have studied the realisation of sensors for health monitoring using textile materials and technologies, such as extension sensors for monitoring breathing rate and movement [1] [2] [3], electrodes for physiological signal sensing, such as ECG, EMG or skin impedance [3] [4] [5] [6] [7], moisture sensing [8]. In these studies some limitations have been observed [2] [8], but the performance of textile electrodes as biosignal interfaces has generally been found - at least - satisfactory [4] [6] [7].