Real-time Monitoring for Vital Signs Analysis and Pattern Recognition for Cognitive Workload and Stress Estimation

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Project Description

Continuous monitoring of human’s affective state in a real-time scenario is a challenging task that involves physiological data collection, preprocessing, feature extraction and classification. To collect and process bio-signals, a wide range of wearable devices are available today, such as the Jawbone UP3 activity tracker [1] and the Smartcardia INYU [2]. However, none of them meets the requirements for human's affective state monitoring, neither has enough computational power for online processing. The ESL is currently designing a new wearable device that can collect real-time multi-sensor vital signs data, preprocess them, extract and transmit physiological features via a Bluetooth channel to a portable device.

The main goal of this project is to implement both firmware and app for previous mentioned wearable device, in order to create a system usable for data acquisition and online processing.

Tasks of the Student:

1. Get familiar and understand the previous works.
2. Make the necessary modifications of the firmware to ensure the transmission of all the physiological signals available on the device.
3. Implement preprocessing algorithms (filtering, feature extraction, etc.) and optimize them for their execution on the wearable device.
4. Implement an app on a tablet for visualization and data storage.

Requirements

- Good knowledge of mobile application programming (Android/Java).
- Good programming skills in C/C++ and Java languages (knowledge of MATLAB is encouraged).
- Familiarity with embedded architectures.
- Interest in biomedical applications.

Type: Master project / Semester Project

Section(s): SEL

Type of work: 15% theory analysis, 80% software and 5% hardware related design

References: