

3rd International Conference on

Medical Physics & Biomedical Engineering

November 07-08, 2016 Barcelona, Spain

Evaluation of mental stress by measuring four physiological signals simultaneously

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Conducting a mental stress monitoring is considered an important approach to prevent stress-related diseases. Many of the used techniques for evaluating stress level are based on measuring one or two physiological parameters; which may not be sufficient to measure stress accurately. In this study, we describe a low-cost and easy to operate device that can be used to evaluate the level of mental stress based on measuring four physiological parameters; eye pupil diameter, galvanic skin response, respiratory rate, and heart rate. A 5 MP Raspberry Pi camera is used to image the left eye of a subject under controlled light intensity of both eyes by turning on/off five LEDs in front of each eye, individually. Heart rate is measured using reflected infrared Photoplethysmography placed on a volunteer's finger. Skin resistance is measured by passing safe electric current (1 μ A) using two galvanic skin electrodes in direct contact with the skin. Finally, the respiratory rate is measured using high accuracy thermistor placed close to outlet of right or left nostrils. The camera, sensors, and LEDs are all connected to a Raspberry Pi microprocessor in order to control their operations, acquire signals and images, and transfer them into a PC. Signals and image processing and feature extraction are performed using Matlab software. Graphical user interface is developed to real-time control the device and show the measured parameters. Experimental results will be presented to support the device's ability in measuring mental stress under conditions of rest and controlled provocation.

Biography

Rabah M Al Abdi received his BSc in Biomedical Engineering (BME) from Jordan University of Science and Technology (JUST) in 2003 with an Excellent GPA. He got a full scholarship from JUST to complete his higher education. He received his MSc in BME from Polytechnic Institute of New York University in 2007 and his PhD in BME from State University of New York, Downstate Medical Center in 2012. He is currently an Assistant Professor at JUST. His research interest includes the development of medical instrumentation and image processing. He has published 5 papers in reputed journals and one patent.

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