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disp2ppg: Pulse Wave Generation to PPG Sensor using Display

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Abstract

Research on wearable devices has been actively conducted, and devices of various shapes and wearing areas have been proposed. Wearable devices are often used to record the user's biometric information, and methods to detect physical abnormalities from the acquired data have been proposed. Among biometric data, pulse data has been used in methods such as emotion estimation. The most common type of pulse sensor is the PPG (Photoplethysmogram), which irradiates a green LED on the skin and measures pulse data from the changes in the light reflected through the blood vessels. PPG sensors have been introduced into commercially available wearable devices such as smartwatches. The PPG sensor requires blood flow for data acquisition due to the characteristics of the mechanism. When a smartwatch is worn on an artificial body such as a prosthetic hand or a wearable robot arm, correct data cannot be acquired because there is no blood flow. In this study, we propose a method to make the PPG sensor measure arbitrary pulse data using a display. If this method is realized, it will be possible to input pulse data measured at the junction of the live body and the prosthetic hand to the display, and have the smartwatch attached to the prosthetic hand read same pulse data. In this paper, we focus on the heart rate, and describe the results of an experiment in which the target heart rate was input and the display was controlled, and whether the target heart rate could be obtained by a smartwatch worn on the display. We implemented a display drawing program and conducted an evaluation experiment using five kinds of smartwatches and four kinds of displays to confirm the effectiveness of the proposed method. As a result, the overall error between the target heart rate entered and the heart rate acquired by the smartwatch was within -3 beats per minute in most cases.

Keywords

ppg sensor, display, pulse wave, heart rate, smartwatch

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