

ABSTRACT

The heart is an organ of the human body that functions to pump oxygen-rich blood throughout the body. Heart health checks are very important considering the many diseases caused by the heart. Therefore, it is expected that people are able to take care of their heart by doing sports activities. Currently, heart rate detection is still done invasively. The author designs a non-invasive detection of human Beats Per Minute (BPM) using a webcam camera because the method to be used is Blind Signal Separation (BSS) and Fast Fourier Transform (FFT) which will calculate human BPM using facial signals due to blood circulation to the face which results in changes in skin color variants.

The solutions offered by non-invasive human BPM detection tools cover several important aspects. First, the human BPM detection program can read human facial images because of the face detection method which will later take the face Region Of Interest part. Second, the calculation is done by processing the facial signal which is obtained by finding the average color of the signal using blind signal separation which is then converted into a frequency signal to obtain the BPM value using the fast fourier transform. Third, after the program runs well, the program will be stored on the Raspberry Pi 3 B+ embedded system so that the tool can be used in a portable and affordable price.

Programs created using the ROI, BSS, and FFT methods can run well. Testing the data using the Mean Absolute error (MAE) and R-Squared (RSQ) methods obtained good results, namely the best MAE value on channel RGB for before exercise and channel B for after exercise. The best RSQ values for conditions before exercising are channel B and channel RGB for conditions after exercising. But in this program, there are still deficiencies, one of which is that the program has not been able to limit the number of detected faces so that when there is more than 1 person in 1 frame the program will calculate the BPM value of all detected frames. The embedded system can be connected to other components and can run the program well, but the embedded system heats up quickly when used, causing the program on the embedded system to run slowly.

Keywords: *BPM, Non-Invasive, BSS, FFT, Face, ROI.*