ABSTRACT

Photoplethysmography (PPG) is a plethysmograph instrument using an optical sensor. PPG signals are obtained using a Pulse Oximeter (PO). One of the functions of PO is to detect the heart rate in the body non-invasively. However, on wearable devices, the continuous transmission of PPG signal data is not efficient. The purpose of this study is to implement the Compressive Sensing (CS) technique to improve delivery efficiency, with the smallest measurement and the level of accuracy and good performance. The limitation in this research is direct implementation. Does not discuss further about the network structure, network security and the type of network used. Does not discuss further on the medical side and tool calibration in detail.

This Final Project implements CS on PPG signal, using ESP32 device and Receiving Laptop. There are 2 stages of CS implementation, namely the acquisition stage and the reconstruction stage. The data acquisition stage is carried out using 2 methods, in the form of sparsification transformation and projection transformation. The sparsification transformation uses the Fast Fourier Transform (FFT) and the projection transformation uses the Gaussian distribution technique. The reconstruction phase used the Orthogonal Matching Pursuit (OMP) technique. Optimization of the performance of the method proposed a partial reduction in the coefficient of Fast Fourier Transform (FFT).

The compressed signal reconstruction uses assessment parameters in the form of Signal to Noise Ratio (SNR), Mean Squared Error (MSE), Mean Absolute Error (MAE), and Percentage Root Mean Square Difference (PRD). The results obtained are that it can implement CS on the ESP32 device and the Receiver's Laptop, and can reconstruct a 10% data measurement, with an MAE accuracy of 0.126%, a PRD of 0.014%, and an SNR of 12.798dB..

Keywords: *Photoplethysmography, Compressed Sensing, Pulse Oximeter, Fast Fourier Transform.*