

ABSTRACT

Real-time heart health monitoring is essential for the early detection of potential arrhythmias. However, conventional electrocardiogram (ECG) devices are typically large, expensive, and require trained personnel for operation, making them difficult to access, especially in areas with limited medical facilities. This study aims to develop an Android application to monitor ECG signals generated by an ESP32 device as a simulation, display the signal graph in real time, calculate the heart rate in beats per minute (BPM), classify heart rate conditions, and store examination results for later retrieval as historical records.

The method includes generating synthetic ECG signals on the ESP32 microcontroller, transmitting the data wirelessly to the Android application, processing the signal in the application for BPM calculation and heart condition classification (bradycardia, normal, tachycardia), and sending the results to a backend server for storage in a cloud database. Testing was conducted to ensure the application's performance in terms of data transmission rate, latency, and BPM calculation accuracy.

The test results show that the application can display ECG signals at an average transmission rate of 125 data points per second, with an average latency of 82 ms (maximum 110 ms) and a BPM calculation accuracy of 100%. The system also successfully stores and retrieves historical examination data accurately. These results indicate that the developed application can serve as a simulation and educational tool for real-time ECG monitoring without the need for costly medical devices, thereby supporting broader access to health monitoring.

Keywords: *ECG, ESP32, Android application, BPM, real-time monitoring*