

ABSTRACT

The increasing number of elderly people in Indonesia presents new challenges in the healthcare sector, particularly in monitoring physical conditions that naturally decline with age. Elderly individuals tend to be more vulnerable to degenerative diseases such as hypertension, heart disease, or diabetes, which often go undetected in the early stages due to limited mobility and low awareness of the importance of monitoring vital signs. In addition, limited access to healthcare facilities and the high cost of regular check-ups remain significant barriers to receiving consistent and efficient medical services.

To address these challenges, a smartwatch-based wearable device has been developed to monitor vital signs such as heart rate, body temperature, blood oxygen saturation (SpO_2), and blood pressure. This device is integrated with the Firebase cloud platform and a mobile application called LiveLy, enabling real-time and remote health monitoring. The system utilizes the ESP32-C3 microcontroller and sensors MAX30102 and MAX30205, which simultaneously measure vital signs data and send it to Firebase for display in the application. Additionally, the system processes PPG signals using a machine learning model for non-invasive blood pressure estimation.

Testing results show that the wearable device achieves an average accuracy rate above 95% for each vital parameter compared to standard medical devices. The system also successfully transmits data in real-time, with an average delay below 150 ms and a throughput exceeding 100 bps, meeting the Quality of Service (QoS) standards set by TIPHON. Therefore, this device can serve as a practical and efficient health monitoring tool, improving the quality of life for the elderly and supporting remote healthcare services.

Keywords: *Internet of Things, Wearable Device, Vital Signs, Real-Time Monitoring*