

MEDICAL SMARTWATCH FOR REAL-TIME MONITORING OF HEART RATE AND OXYGEN SATURATION IN CARDIAC PATIENTS

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ABSTRACT

In the digital era, with increasing demand for independent and remote health monitoring, the development of IoT-based wearable devices presents a vital solution. This study aims to design a medical smartwatch capable of real-time monitoring of heart rate and oxygen saturation (SpO₂), equipped with additional features such as safety thresholds to detect abnormal parameter values and a medication reminder system that delivers timely notifications. These features are intended to enhance patient safety and adherence to treatment, especially for individuals with heart disease. The system is designed using a MAX30102 sensor, an ESP32 S3 SuperMini microcontroller, and an OLED-based user interface, all integrated into a compact enclosure. The smartwatch was tested by comparing its sensor readings against a standard oximeter. The results demonstrate high accuracy, with an average error of 3.03% for heart rate (BPM) and 0.82% for oxygen saturation (SpO₂). The system achieved a success rate of 96.97% for heart rate detection and 99.18% for oxygen saturation. Additionally, it consistently issued accurate alerts when vital signs exceeded safe limits and provided medication reminders exactly on schedule. In conclusion, this smartwatch system effectively, accurately, and reliably monitors vital parameters, delivers notifications, and supports remote health tracking. Technology has strong potential as a portable and dependable tool for improving self-managed healthcare and early detection of cardiac conditions.

Keywords: medical smartwatch, IoT, heart rate, oxygen saturation, medication reminder.