A Prototype Device for Monitoring Heart Rate and Blood Oxygen Saturation

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***Abstract*—This thesis develops a prototype for monitoring heart rate and blood oxygen saturation. The design combines a MAX30100 optical sensor, a NodeMCU controller, an Android application, and Firebase storage. The report describes component connections, Arduino IDE programming, transmission of sensor readings to the online database, and application views for monitoring the values. Photographs, diagrams, and code excerpts document the implemented signal path. The author reports that the device and software were assembled and that readings can be displayed. The manuscript does not establish clinical accuracy against a certified pulse oximeter, reliability during continuous use, or fitness for medical diagnosis. Its later-work section proposes multiple-patient management, user roles, messaging, alerts, and a wearable form. The outcome is an educational connected-device demonstration whose medical and operational performance needs separate validation.**

***Index Terms*—heart rate, oxygen saturation, MAX30100, NodeMCU, Firebase**

I. Introduction

Heart rate and oxygen saturation are useful physiological measures, and connected sensors can make their readings available remotely. The thesis proposes a student-built device and application to capture and display these values. It reviews Arduino programming, NodeMCU, optical sensing, Firebase, and Android development. The purpose is to show a connected monitoring workflow. The project does not present the prototype as a certified medical device or a replacement for professional measurement [1]. Earlier ICTU student work on related designs is included here for context [2], [3]. Related published studies provide context for the subject and methods [4], [5], [6], [7], [8], [9], [10]. These contextual works were selected for this English summary; they are not asserted to appear in the original thesis bibliography.

II. Methods

The design uses a MAX30100 optical pulse oximetry sensor connected to a NodeMCU controller. The author configures the hardware and firmware in Arduino IDE, connects the controller to Firebase, and develops an Android interface in Android Studio. The source includes circuit descriptions, initialization and database code, and screens showing how a user places a finger on the sensor to obtain readings. It does not specify a controlled comparison with clinical instruments [1].

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III. Results

The report presents the assembled device, sensor interface, Android screens, and Firebase data path. Its code and screenshots show that readings can be generated and transferred to the application environment. The author concludes that the central construction requirements were met. No calibration curve, clinical reference comparison, uncertainty range, or long-duration reliability test is reported. The observed result is thus a functioning prototype workflow, not evidence of diagnostic accuracy [1].

IV. Discussion

The hardware and cloud workflow illustrate remote observation of measured values, but pulse oximetry requires careful attention to motion, placement, and sensor calibration. The source provides no clinical validation, so its readings should not be treated as medical decisions. The author proposes extending the application to multiple patients, adding separate doctor and family roles, messaging, alerts, and a wearable device. These are future possibilities rather than functions established by the present source [1].

V. Conclusion

The thesis documents a NodeMCU, MAX30100, Firebase, and Android prototype for reporting heart rate and blood oxygen readings. The circuit, code, and screens support that an end-to-end data path was built. The evidence does not show clinical accuracy or readiness for patient care. Further technical and medical evaluation would be required before deployment. The present contribution is a documented educational implementation of a connected physiological monitoring workflow [1].

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