MALAYSIAN JOURNAL OF INNOVATION IN ENGINEERING AND APPLIED SOCIAL SCIENCE (MyJIEAS)
e-ISSN : 2811-3780
VOLUME 02, ISSUE 01

IoT Portable Based Patient Monitor With GPS

A.L.H Azlan[1] S. Bohanudin[2]

[1]Department of Electrical Engineering, Politeknik Sultan Salahuddin Abdul Aziz Shah, 40150 Shah Alam, Selangor, Malaysia.
Corresponding Author's Email: 08BEU21F3010@student.psa.edu.my
Article History : Received 17102022; Revised 07112022; Accepted 28112022;

ABSTRACT – Patient monitors (PM) are devices used to measure, record, and display various patient parameters such as heart rate and rhythm, oxygen saturation SPO2, blood pressure (BP), temperature, respiratory rate, blood pressure, to keep a track of the patient's health and provide them with high-quality health care. The existing patient monitors nowadays at the hospital are limitation in their function. There are the lacking of the function of patient monitor. The data is sent to the capital equipment to be stored, processed, and interpreted. The software is processing the data collected by the sensors and converts it into readable information that is displayed on the capital equipment. It didn't have IoT system and the device is stick to the stand at hospital. The expected result of this project is to get the parameter and data or patient in hospital and outside of hospital that obtained from the device. In conclusion, this patient monitor will have IoT system to facilitate all users either doctor, nurse or patient.

KEYWORDS : Blood Pressure (BP), Oxygen saturation (SPo2), Internet of Things (IoT), Patient Monitor (PM)

1.0 INTRODUCTION

[1] Figure 1 shows a patient monitor [1], which is a device used to measure, record, and display various patient parameters such as heart rate and rhythm, SPO2, blood pressure, temperature, respiratory rate, and blood pressure. Patient monitors are used to track a patient's health and provide them with high-quality healthcare. However, the common patient monitor has certain deficiencies: it does not have an IoT system and must be stationary as it uses a power cord. Patient monitoring systems are collections of machines or equipment used to constantly monitor patients through various vital signs and warning systems to detect and record changes in patient well-being.

The objective of this paper is to develop a portable IoT-based patient monitor with GPS that has a database where patients can store more data. The method of using this device is to collect data from the patient, such as their blood pressure (BP). The data collected from the patient monitor will be displayed on the patient monitor itself and will also be transferred to an open platform application called ThingSpeak. Additionally, the data will be sent through notifications in the Blynk application. The data will be stored in a database, and the readings will display the blood pressure (BP), temperature, Oxygen saturation (SPO2), and the location where the patient is located on both platforms. This way, doctors can easily monitor their patients. The data will be analyzed based on the past data collected from the patient.

Figure 1: Patient Monitor [1]

2.0 PROBLEM STATEMENT

The patient monitors currently available in hospitals have limited functionality. They are missing an IOT system which would allow for data to be sent directly to the doctor and patient, instead of being sent to large-scale equipment that stores. Processes and interprets the data. Software then processes the data collected by the sensors and converts it into readable information that is displayed on the devices. Without an IOT system, doctors cannot easily monitor their patients after they discharged and still under medical supervision. Patients may also have to make additional appointments to see the doctor, which can be inconvenient.

Privacy is the biggest challenge with IOT systems, as all connected devices transfer data in real-time. Personal data can be vulnerable to hacking if the end-to-end connection is not secure. Criminals can use this personal data for their own benefits. This presents several challenges:

- Limited storage of data
- Lack of portability in most patient monitors
- Security vulnerabilities in IOT systems
- Privacy concerns regarding personal data.

2.0 METHODOLOGY

The power supply will provide energy to the microcontroller. The heart rate sensor will collect the patient's heart rate data and send it to the Node-MCU, while the temperature sensor will collect the patient's temperature data. Once the Node-MCU receives data from the sensors, it will process the data and send it to the cloud wirelessly using ThingSpeak as the cloud platform. The data will be separated into two streams: notifications will appear on the Blynk app and web browser, while the machine itself will display the data on an OLED screen. [2]**Figure *2:*** Block Diagram of the project *[2]* [2] shows a flowchart of this project.

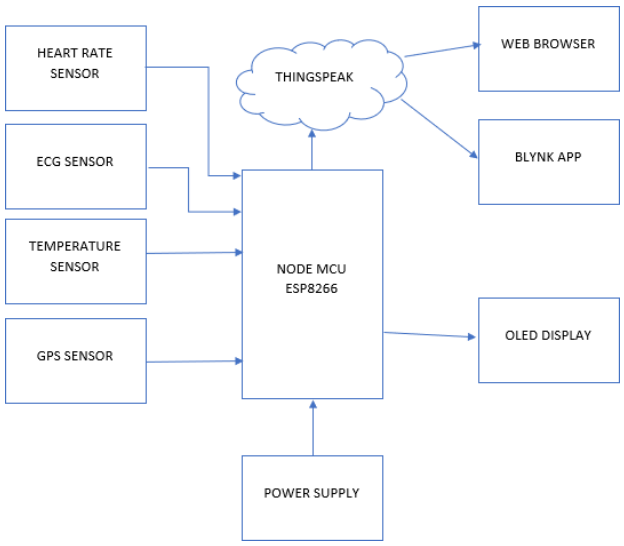

Figure 2: Block Diagram of the project [2]

2.1 PROJECT HARDWARE

Hardware or component are the most important element as for this project to able data to transmit from the IoT patient monitor to cloud which is ThingSpeak. The NodeMCU used to be programming and give function to the GPS, Heart Rate, and Temperature sensor and connect to internet through local WIFI.

2.2.1 NodeMCU

Figure 3 : ESP8266 Node MCU [8]

Figure *3* **:** ESP8266 Node MCU [8] is an open source IoT platform. It includes firmware running on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware based on the ESP -12 module. The operating system is XTOS. The memory for NodeMCU is 128kBytes and the storage spaceis 4MBytes. The power supply is via USB 5Volts

2.2.2 NEO 6M GPS

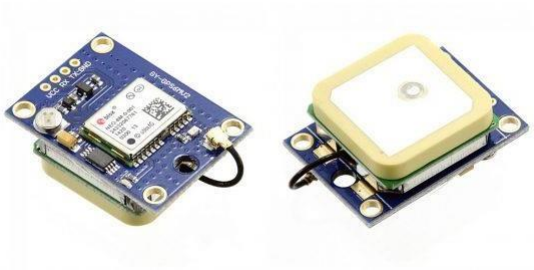

Figure 4 : NEO 6M GPS [3]

Figure 4 : NEO 6M GPS [3] modules is quite good, and it also has a high sensitivity for indoor applications. There is also an MS621FE-compatible battery for backup and an EEPROM for storing configuration settings. The module works well with a DC input in the 3.3 to 5 V range.

2.2.3 MCP9808 Temperature Sensor

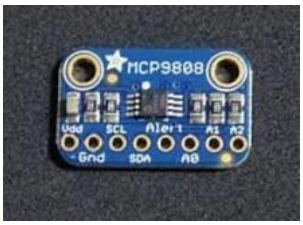

Figure 5: MCP9808 Temperature sensor [4]

Figure 5*: MCP9808 Temperature sensor* [4] is a useful temperature sensor with a wide working range and high accuracy. The sensor can handle temperatures between -40°C and +125°C with an accuracy of +/- 0.25°C. Thanks to the I2C interface, you can use this tiny module with virtually any current development board and microcontroller.

2.2.4 MAX30102 Heart Rate Sensor

Figure 6: MAX30102 Hear Rate Sensor *[8]*

Figure 6 is referring to an integrated pulse oximetry and heart rate monitoring biosensor module. It contains internal LEDs, photodetectors, optical elements and low-noise electronics with ambient light suppression. The MAX30102 is a complete system solution that facilitates the design-in process for mobile and wearable devices.

2.2.5 AD8232 ECG SENSOR

Figure 7: AD8232 ECG Sensor

Figure 7: AD8232 ECG *Sensor* is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify and philter small biopotential signals even when they are noisy, e.g. due to movement or remote electrode placement. ECGs can be extremely noisy. The AD8232 Single Lead Heart Rate Monitor acts as an operational amplifier to obtain a clear signal from the PR and QT intervals.

2.2.6 OLED Display

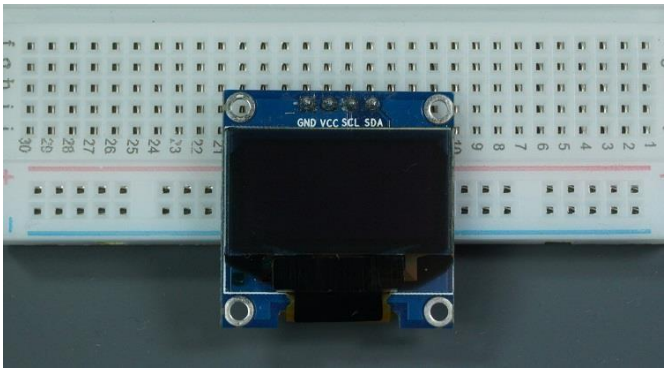

Figure 8: OLED Display

Figure 8*: OLED Display* is an alternative for LCD display. The OLED is super light, almost paper thin, flexible and produces a brighter and sharper image.

2.3 SCHEMATIC DIAGRAM

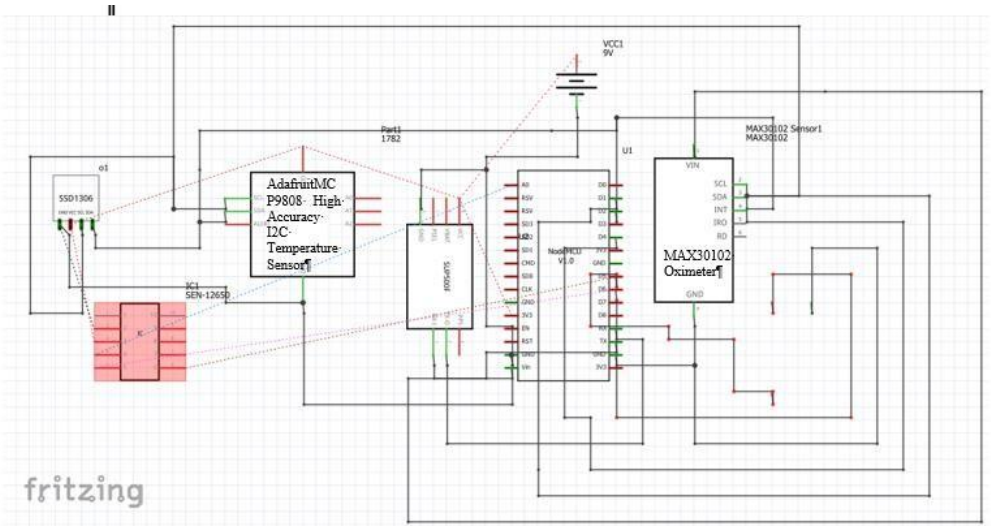

Figure 3: Schematic Diagram [2]

This **Figure 3: Schematic Diagram** [2] shows where there is a connection of this project. From NodeMCU there will have 4 sensor which is GPS sensor to tell a doctor where patient location, Temperature sensor to get a temperature of patient, Heart rate sensor to get a heart rate patient either low or high, and Battery will be a power supply for this device. This schematic diagram was created on Fritzing software.

2.4 CIRCUIT OPERATION

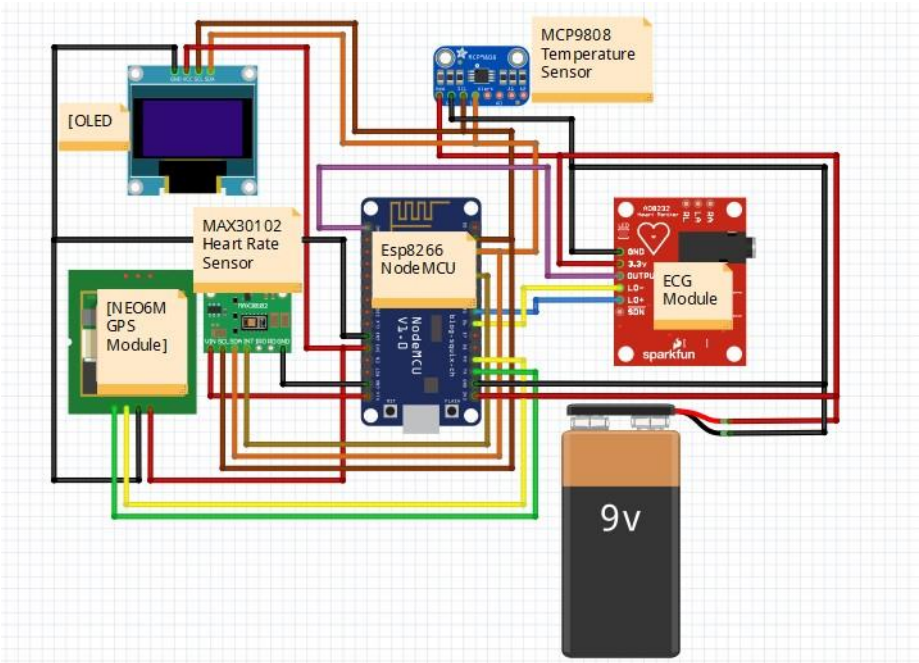

Figure 4: Circuit operation of the project [2]

Figure 4 shows the circuit operation of the project. The battery will serve as the power supply for all components. The Node MCU will function as the brain of the device, processing all the input data collected from the sensors. The sensors will collect data from the patient, while the OLED display will show the readings obtained from the sensors. The circuit diagram was created using Fritzing software.

The main objectives of the study are to develop an IOT-based portable patient monitor with GPS. The mobile interface will use the Blynk application, while the computer will use an open platform software called ThingSpeak, which can be set to either public or private. This is to ensure that patient data is not easily accessible to unauthorized individuals.

3.0 RESULT

The expected result of this project, as shown in Figure 9, is to obtain patient data and parameters both inside and outside of the hospital. The device will be used by authorized doctors and nurses in the hospital and by patients at home or outside of the hospital to provide data to their doctors online. The MAX30102 Heart Rate sensor will measure the heart waveform, while the NODEMCU ESP8266 will serve as the microcontroller, sending the patient's heart rate data to the THINGSPEAK platform, which will display the data in graph form. The MCP9808 temperature sensor will measure the patient's temperature. Doctors will receive notifications, as shown in Figure 10, to stay updated on their patients' status.

This project builds upon previous research and uses findings from previous studies to improve the system and ensure that is delivers similar results. Supporting images and research from the journal are attached to this initial proposal.

The heart rate sensor will provide a reading of the patient's heart rate, while the temperature sensor will indicate whether the patient's temperature is within a normal range. The GPS sensor will locate the patient within the hospital building. Together, these sensors

will provide doctors and nurses with essential information to monitor the patient's health status and make informed decisions about their care.

Figure 9: The result that will appear in ThingSpeak [7]

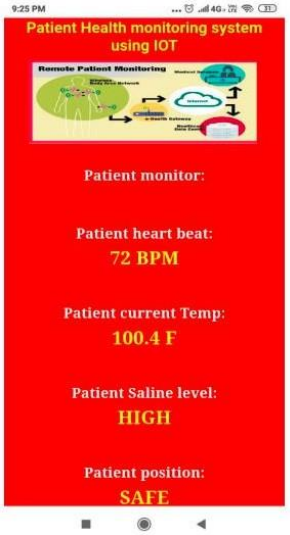

Figure 10: Output that will appear in smartphone [7]

4.0 CONCLUSION

The IoT-based portable patient monitor with GPS will be designed to be portable, so that doctors, nurses, and patients can use it in the hospital or wherever they go. This device will offer more storage than traditional patient monitors, which are often limited in storage capacity. To address this issue, the device will include a database system to store all patient data securely. Additionally, the device will be developed with an IoT system, making it easy for doctors and nurses to monitor the patient's data in real-time. The data will be displayed on an open platform website, and doctors and nurses will receive notifications when the patient's data is measured. By offering more storage capacity and an IoT system, this device will enhance the monitoring and care of patients, improving their overall health outcomes.

REFERENCES

Reference

[1] V. Healthcare, "Vannin Healthcare Mobile," Isle of Man Chamber of Commerce, 2021. [Online].Available: https://vanninhealthcare.com/product/phoebe-patient-monitor/.
[2] A. L. H. B. Azlan, "IOT PORTABLE BASED PATIENT MONITOR WITH GPS," Shah Alam, 2022.
[3] S. k. ,. S. S. P. A. Ravichander Janapati, "IOT BASED INTEGRATED SYSTEM FOR PATIENT," JOURNAL OF MECHANICS OF CONTINUA AND MATHEMATICAL SCIENCES, jld. 15, p. 11, July 2020.
[4] "Electro Schematics," [Dalam talian]. Available: https://www.electroschematics.com/neo-6m-gps-module/.
[5] "Random Nerd Tutorial," 2013. [Dalam talian]. Available: https://randomnerdtutorials.com/guide- for-oled-display-with-arduino/.
[6] H. K. M. S. K. P. K. L. L. W. Q. T. Tzen Ket Wong, "Real-time Machine Health Monitoring System," p. 10, 2021.
[7] A. A. P. S. M. Shivkumar Dharmoji, "IoT based Patient Health Monitoring using ESP8266," p. 6, 2020.
[8] K. D. Shinde, "IoT Based Patient Monitoring and Future Health," p. 6, 2021.
[9] D. MANDUVA SIRI CHANDANA, "An IoT based Patient Health Monitoring System using Node MCU," p. 6, 2020.
[10] K. Guan, Shao, Minggang dan Wu, Shuicai, "A Remote Health Monitoring System for The Elderly Based on Smart Home Gateway," p. 10, 2017.
[11] S. N. S. A. H. K. N. R. M. N. A. M. S. Z. M. S. M. N. N. N. A. M. Mohamad Hariz Hasshim, "IoT Based Health Monitoring System for Elderly Patient," p. 10, 2020