A Report on

Health Care Monitoring System

For

Mini Project-2A Embedded System Project (ECM-501) of Third Year (Semester-V)

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CERTIFICATE

This is to certify that Sanjay Chaurasia, Mojes Dhotre, Mitesh Dhuri and Rishabh Dwarapu are the bonafide students of St. Francis Institute of Technology, Mumbai. They have successfully carried out the project titled "Health care monitoring system using ESP8266" in partial fulfilment of the requirement for the award of Mini project 2A of third year (Semester-V), in Electronics and Telecommunication Engineering of Mumbai University during the academic year 2023-2024. The work has not been presented elsewhere for the award of any other degree or diploma prior to this.

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ABSTRACT

In this article, Health Care Monitoring is designed and implemented using ESP8266 controller which is industry standard controller since it has much more capable libraries. System health monitoring is a set of activities undertaken to maintain a system in operable condition and may be limited to an observation of current system states, with maintenance and repair being prompted by these observations. Many sensors are required to provide real-time, onboard structural integrity assessments for the integrated system health management (ISHM) system. This chapter reviews system health monitoring sensor technologies, builds a sensor optimization selection model to select the minimal most informative, cost-effective sensor subset, and develops an energy-efficient decentralized detection scheme based on the sensor selective framework

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List of Abbreviations

uC	Micro Controller
uP	Micro Processor
TLC	Traffic Light Controller
B	Bytes
KB	Kilo Bytes

Chapter 1

Introduction

Structural health monitoring (SHM) systems are being deployed to collect measurements of structural responses originating from ambient and/or external disturbances, and to draw conclusions about the state of health of a structure based on the measurement data. Typically, sensors are strategically placed in a structure to measure and record environmental and response data.

1.1 Motivation

Real-time health monitoring systems using IoT can help doctors prioritize patients, and provide urgent care to those who are in the most danger, thereby saving lives. More competent patient management can help utilize the resources of the hospital more efficiently and save money. It is easy for patients and medical professionals to use the system. The remote health monitoring system is especially useful to monitor patients with chronic diseases. Most chronic diseases are incurable, so it is necessary to monitor the state of the patient while at home, and quickly respond if health indicators worsen.

1.2 Scope of Project

The evolution of telemedicine has made it possible for healthcare professionals and patients to exchange medical information over electronic media. It proved to be beneficial, especially during the COVID-19 pandemic, when contactless visits were not only mandatory but also important from a health perspective.However, IoT in telemedicine has carried this process far beyond contactless consultations. It revolutionized the healthcare industry by helping caregivers and patients connect virtually.

1.3 Organization of Project

- Literature survey
- Software Used
- Hardware Used
- Working Principle

Chapter 2

Literature Survey

2.1 Literature Review:

The study of “IoT” was comprehensive and montages relations and constraints. The main goal of “IoT” is to ensure that, in conjunction with “electronic sensor” devices, Internet-based communications and the sending and reception of information are conventionally accessible. In a report “28.4 billion IoT users in 2017 and by 2020 they are going up to 50.1 billion” remained the result of one report. “IoT”, according to scientific charity, provides a range of services. “Wi-Fi, mobile phone, NFC, GPS etc.” is continuity of contact. The IoT main aim, though, is to incorporate organizations, mechanization so that messages can be transmitted without interruptions, compared to software creation; the start of the programmed is the most frequently recycled sensors with accelerometers, compression-embedding camps such as the “MCUS, MPUs”. The services have improved “intelligent fitness, transportation, grids, parking and intelligent homes.” Therefore, the core goal of IoT is to combine organizations and mechanization in order to provide messages continuously. The initial opinion for the “IoT phase is divided into criteria, specifications and implementation” is comparable to software development overall. An essential method is the final section containing the company process. “H.” In order to understand the specifications of any IoT project Eskelinen submitted two questions and included them in the design phase. These moments of designbased science lead to adequate exploration of the following concepts, before the construction is funded, a strategy needs to be created that blends realistic goals with theory, and one has to bear in mind at the same time that real life is a research centre. Systematic and professional testing methods should be carried out. The designs should always be taken into account for any failure, and the designs chosen should be demonstrated to be durable over time. While Saini et.al developed its healthcare system, the consumer was the subject of the study: the programmed specifications used a basic design methodology similar to typical software development courses. The WSN is a significant part of IoT, and it also plays an important role in its healthcare applications. control systems over other regular devices. Working on the WSN for pulse rates and oxygen saturation was emphasized by Rotariu and Manta in 2012. Yuehong etc., on the other hand, and ECG and blood pressure sensors mounted on the mobile telephone in 2016. With the IoT approach in the health analogy, the wireless network improves, he said. Tan et.al used Wi-Fi technology for its 2012 work in the control area to relay messages on different body functionality, such as blood pressure, pulse rate, body temperature and oxygen saturation. J.J.R. and Wannenburg. Bluetooth was introduced into the smart phone by Malekianc to track patients further

Table 2.1: Summary of existing works on object detection

Title with Author	Work Done	Results or Remarks
R. Alekya , Neelima Devi Boddeti , K. Salomi Monica , Dr.R. Prabha , Dr.V. Venkatesh[?]	IoT based Smart Healthcare Monitoring Systems	IoT was defined as main distributor of health care systems as one of IoT most important uses
P. Pradeep1 , M. Arogia Victor Paul2 , Arbind Kumar Gupta3 , S. Venkatesan4 M [?]	Health care monitoring system.	This survey briefs about the concept of biosensors for an effective healthcare monitoring system
Prof. Y. R. Patni[?]	Health Care monitoring system using PIC microcontroller	The presented Patient Monitoring System, utilizing a PIC Microcontroller and wireless technology, offers a promising solution to enhance patient care by enabling real-time monitoring of critical health parameters.

Chapter 3

Software Used

3.1 EasyEda

EasyEDA is a web-based EDA tool suite that enables hardware engineers to design, simulate, share - publicly and privately - and discuss schematics, simulations and printed circuit boards. Other features include the creation of a bill of materials, Gerber files and pick and place files and documentary outputs in PDF, PNG and SVG formats.

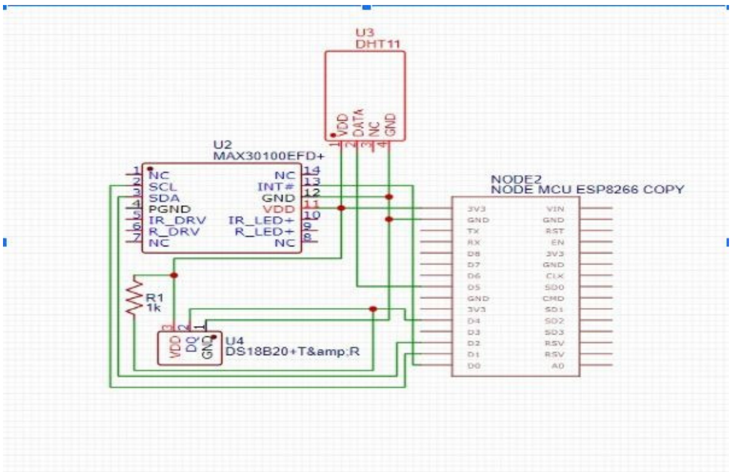


Figure 3.1: EasyEda Software.

3.1.1 Circuit Simulation Software

EasyEDA allows the creation and editing of schematic diagrams, SPICE simulation of mixed analogue and digital circuits and the creation and editing of printed circuit board layouts and, optionally, the manufacture of printed circuit boards.

Chapter 4

Hardware Components Used

4.1 Humidity sensor (DHT11):

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form. Operating Voltage: 3.5V to 5.5V Operating current: 0.3mA (measuring) 60uA (standby) Output: Serial data Temperature Range: -40°C to 80°C Humidity Range: 0Resolution: Temperature and Humidity both are 16-bit Accuracy: $\pm$0.5°C and $\pm$1

Figure 4.1: DHT11 sensor

4.2 DS18B20 Sensor:

This is a pre-wired and waterproofed version of the DS18B20 sensor. Handy for when you need to measure something far away, or in wet conditions. While the sensor is good up to 125°C the cable is jacketed in PVC so we suggest keeping it under 100°C. Because they are digital, you don't get any signal degradation even over long distances! Usable temperature range: -55 to 125°C (-67°F to +257°F) 9 to 12 bit selectable resolution Uses 1-Wire interface- requires only one digital pin for communication Unique 64 bit ID burned into chip Multiple sensors can share one pin ±0.5°C Accuracy from -10°C to +85°C Temperature-limit alarm system Query time is less than 750ms Usable with 3.0V to 5.5V power/data

Figure 4.2: DS18B20 sensor

4.3 Max30100 Sensor:

Heart Rate click carries Maxim's MAX30100 integrated pulse oximetry and a heart-rate sensor. It's an optical sensor that derives its readings from emitting two wavelengths of light from two LEDs – a red and an infrared one – then measuring the absorbance of pulsing blood through a photodetector. This particular LED color combination is optimized for reading the data through the tip of one's finger. 1.VIN Input voltage (1.8V to 5.5V) 2.SCL IIC-SCL 3.SDA IIC-SDA 4.INT MAX30100INT 5.IRD MAX30100 6.RD MAX30100 7.GND Ground

Figure 4.3: MAX30100 sensor

4.4 ESP8266 microcontroller:

1.GND, Ground (0 V) 2.GPIO 2, General-purpose input/output No 3.GPIO 0, General-purpose input/output No. 0 4.RX, Receive data in, also GPIO3 5.VCC, Voltage (+3.3 V; can handle up to 3.6 V) 6.RST, Reset 8.TX, Transmit data out, also GPIO1 1.Processor: L106 32-bit RISC microprocessor core based on the Tensilica Diamond Standard 106Micro running at 80 or 160 MHz 2.Memory 32 KiB instruction RAM 32 KiB instruction cache RAM 80 KiB user-data RAM 16 KiB ETS system-data RAM 3.External QSPI flash: up to 16 MiB is supported (512 KiB to 4 MiB typically included) 4.17 GPIO pins 5.10-bit ADC

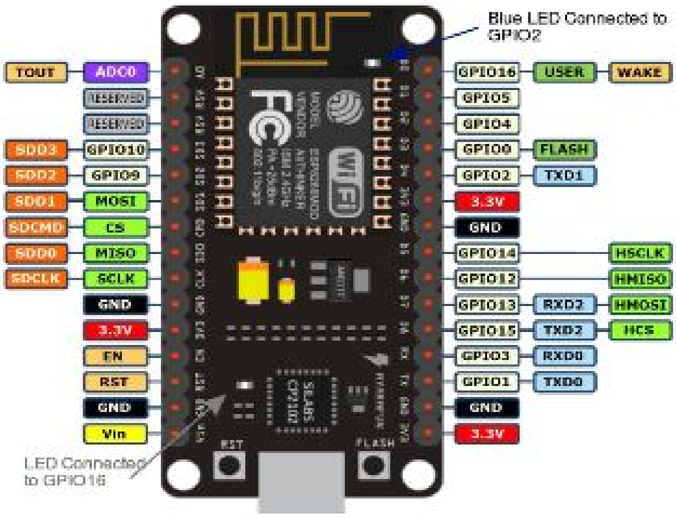


Figure 4.4: ESP8266 microcontroller

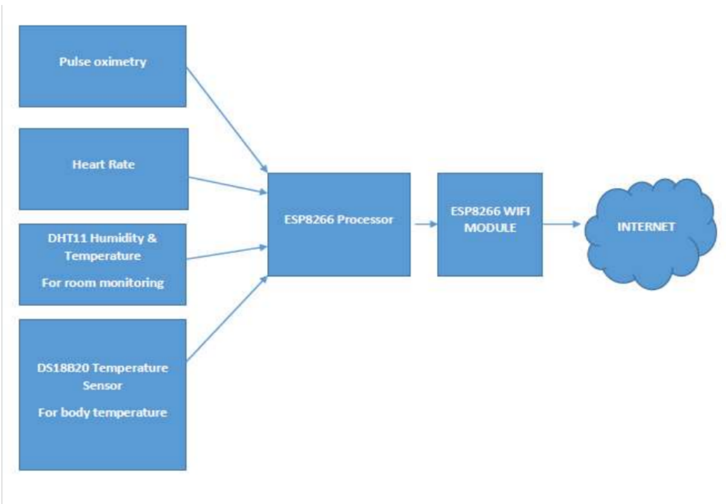
Chapter 5

System block diagram and Working Principle

An IoT-based smart patient healthcare monitoring system utilizing ESP8266 has been designed by using an Infrared thermal MLX90614 sensor and Pulse oximeter MAX30100 to monitor patient Heart rate. Adafruit IO's health monitoring system and the internet have made it possible for everyone to track their health.

5.1 Principle

Inadequate security often leaves patient data vulnerable to an unidentified danger, making a proper collection of essential medical data critical to therapy. It is suggested in this study that different kinds of sensors be utilized to gather data regarding health-related and environmental characteristics and sent to the cloud as part of an e-Health monitoring and Adafruit IO monitoring system that is built on the Internet of things. An energy-saving and bandwidth-saving feature of the proposed system is schedule data aggregation. Protecting data and personal information from unwanted access has become a top priority. As a result, data is safely kept, and the creation of duplicates is minimized. These systems let people keep track of their health and Adafruit IO condition, and they may also use this information to ensure that they are taking the right measures.is as shown in the fig.4.

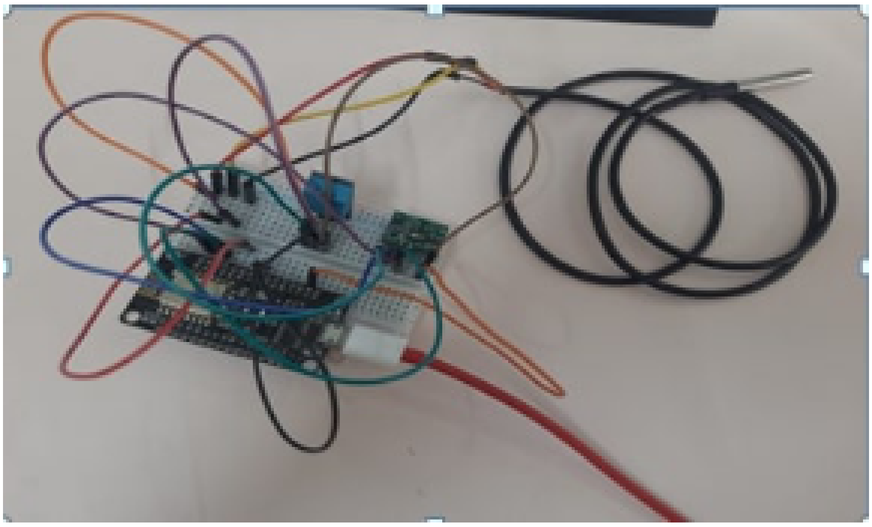


Chapter 6

Results and Conclusion

6.1 Experimental Results

The experimental results underscore the effectiveness of the wearable health monitoring system in facilitating continuous health tracking and early intervention for individuals with cardiovascular diseases. The system's ability to provide real-time data and alerts proved instrumental in improving the overall health outcomes and quality of life for the participants. Further studies are recommended to assess the long-term impact and scalability of the monitoring system in broader healthcare settings.A significant reduction in mean resting heart rate was observed over the monitoring period, indicating improved cardiovascular health for the participants. Blood pressure fluctuations were effectively tracked, with early warnings provided in cases of abnormal readings, enabling timely interventions and prevention of potential health risks.



6.2 Conclusion

In this paper healthcare monitoring system for cardiac patients is proposed which monitors body parameters of heart patient like Heart rate, Temperature and SPO2. It helps caregivers and hospital staff to monitor and store patient's body parameters continuously. On any abnormality, it gives alert to caregivers. Using Internet, data can be made available for remote use and only to authorized users like remote specialist doctors for special advice. In this project we have gotten an IP address through espwebserver lib and with the help of ajax client output is display properly in web-app

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