



BASED ON ARDUINO UNO ALERT SYSTEM SAMPLING IN IoT USING NTC THERMISTOR AND PHOTOPLETHYSMOGRAPHY

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Abstract: Nowadays people are facing lots and lots of health issues. This project aims to develop a system that can remotely monitor BPM and temperature of the body using a pulse sensor, a temperature sensor, a GSM module, and an Arduino Uno microcontroller. Arduino UNO collects real time health data from Photoplethysmography which measures heart beat per minute or BPM. A NTC Thermistor connected to Arduino UNO measures body temperature of the patient. The pulse sensor detects the pulse rate by calculating the blood flow in the fingertip, while the temperature sensor measures the body temperature. The Arduino Uno communicates with the sensors and the GSM module to send the data to a remote server via SMS. The remote server can receive and store the data in a database for further analysis. IoT can be used to monitor patients remotely, provide real-time health data, and improve patient outcomes. The system is designed to be low-cost, portable, and user-friendly. It can be used in various applications, such as monitoring the vital signs of patients in remote areas or monitoring the health of athletes during training. The system can provide real-time data on pulse rate and body temperature, allowing for quick detection and response to any abnormalities. This will improve the Medical system to function efficiently.

Index Terms - Pulse sensor, LM35, Global System For Mobile Communication(GSM) Module 900a, Arduino UNO.

I. INTRODUCTION

IoT's evolution has increased nowadays with smart devices' astounding ability to share information between them. IoT stands for Internet of Things, which refers to the network of physical devices and other items embedded with sensors, software, and connectivity, that enables them to collect and interchange data over the internet. IoT is a rapidly upcoming field that enables physical devices and objects to connect and communicate with each other over the internet. IoT technology has advanced significantly in recent years, and sensors are a key component of this technology. Previously, it was impossible to monitor the patients during critical hours. This system can accurately monitor the human body's pulse rate and body temperature. The data is combined using the Internet Of Things for processing, connecting to achieve real-time monitoring. The IOT is generally considered as connecting objects to the Internet and using that connection for control of those objects. A NTC Thermistor connected to Arduino UNO measures body temperature of the patient. Photoplethysmography (Pulse sensors) are used to measure heart rate and can be worn as a wristband or placed on a finger which is connected to Arduino UNO measures the pulse of the patient. It will show the pulse rate and temperature, and notify the person who is registered with the number with the help of SMS. This improves the medical system to function efficiently. Currently, the health care system is going to change from a traditional approach to a bring up to date patient-centered care approach. In the traditional way, we need to admit the person who suffers from heart pain for necessary checking. There are some basic problems related to this approach. In today's condition everybody can face heart attack issues. One day admitting patients for necessary checking makes medical expenses high. To reduce this cost, the kit will help many families. By using our project, this will serve lots and lots of people financially. This will make a change in the medical industry because a little sensor will make a human life a better life.

II. LITERATURE SURVEY

Moustafa H. Aly, Mohamed Tamazin, and Ahmed Kassem. Due to the growing adoption of wireless technologies and the miniaturization of electronic sensors, wearable health monitoring technology has seen a significant improvement. Medical applications like telemedicine, biofeedback, and remote monitoring create a brand-new framework for managing health quality and costs. The objective of this endeavor is to create a multifunctional, affordable wearable smart gadget [1].

Mohammad Monirujjaman Khan, Turki M. Alanazi, Amani Abdulrahman Albraikan, and Faris A. Almalki (2022). The plan of a health observation system utilizing the (IoT) are dispensed in this study. Nowadays, with the growth of upheaval, experts are constantly searching for cutting-edge electronic gadgets to make it simpler to identify body anomalies. Technologies that support

the IoT make it possible to create cutting-edge, non-invasive clinical assistance systems. A mechanism for tracking medical care is advertised in this study. In particular, those with COVID-19, high blood pressure, diabetes, etc. who live in rural Bangladesh or other developing nations lack immediate access to emergency medical centers for testing [2].

Muhammad Ur Rahman et al. The IoT has improved medical facilities, according to early researchers. It is now possible to detect routine parameters in set apart COVID-19 patients in rural locations where patients cannot access a doctor. Using sensors, utility storage, data transmission, and IoT mobile applications, the doctors and brood can be used to monitor the sufferer well being outside of the hospital. The suggested research-based project's major goal is to create a remote health inspection system using nearby sensors. The suggested system additionally sends email, GSM messages, and real-time locations[3].

Mohammad Monirujjaman Khan, Safia Mehnaz, Antu Shaha, Mohammed Nayem, and Sami Bourouis Internet of Things (IoT)-based health observation devices could be extremely helpful for COVID-19 patients during the ongoing pandemic. The most crucial measurements needed for critical care are body temperature, pulse rate, and oxygen saturation. This study provides an IoT-recommended system that is an instantaneously health observation system using the measurable values of the patients' body temp, heart beat rates, and O2 saturation. This device has a LCD that can be easily harmonized with a mobile application to provide rapid access to the observed temp, heart beat rates, and O2 saturation level. The proposed IoT-based approach was evaluated and verified on five people as part of an Arduino UNO-construct system. The system's results were encouraging, and the data it collected are now archived[4].

D. Shiva Rama Krishnan, Subhash Chand Gupta. Science and knowledge based on Wireless-Sensing node Technology are now being created in the healthcare environment. Patients are dealing with the difficult circumstance of an untimely death because of heart difficulties and attacks, which is caused by the absence of adequate medical maintenance to patients at the required time. This is done specifically to keep track of elderly people and to tell doctors and loved ones. Therefore, we are putting forth an inventive initiative to prevent such high rates of unexpected demise. Patient Health Monitoring uses sensor technologies and the internet to interact with loved ones in case of issues. This device tracks the health of patients using temperature and cardiac sensors. The Arduino-uno is wired to receive data from both sensors. The microcontroller is connected to an LCD screen and a wireless connection to a web server (a wireless sensing node) to track the patient's health. IoT is used to send a patient alert in the event of any abrupt changes in the patient's heart rate or body temperature. Additionally, this technology transmits real-time data on patients' heartbeat and temperature with timestamps over the Internet. Therefore, IoT-based patient health monitoring systems use the internet to efficiently track the health of patients, enable users to keep tabs on their loved ones when away from home, and even save lives[5].

Harsh Bhardwaj, Kartik Bhatia, Anjali Jain and Neelam Verma. This research paper discusses an IOT-based health monitoring system that enables us to monitor a patient's body temperature, humidity, and pulse rate using a smartphone. Due to its significance in making a regular check on the patient's health in the event of casualties, which are quite common in this Covid pandemic condition, such a system has been developed. The suggested approach aids in the monitoring of health parameters in this case when the patient cannot be closely observed via face-to-face monitoring. In this instance, a DHT11 sensor and a fingertip heartbeat sensor are both used to determine the patient's body temperature and humidity. The Node MCU is a microcontroller as well[6].

Zhe Yang et al. J. In this research study, an IOT-based health monitoring system is explored. This system will allow us to monitor a patient's body temperature, humidity, and pulse rate using a mobile phone. A system of this kind has been suggested due to the significance of making a regular check on the patient's health in the case of casualties, which are common in this Covid pandemic condition. When a patient cannot be closely monitored via face-to-face monitoring in such a circumstance, the proposed system aids in the monitoring of health parameters. Here, a fingertip heartbeat sensor is used to determine the patient's pulse rate, and a DHT11 sensor is utilized to determine the patient's body's temperature and humidity. Additionally, a microcontroller called Node MCU is utilized. It already has a Wi-Fi module and uses an I2C module to convert serial data to parallel data for an LCD panel. A growing amount of attention has been dedicated to public healthcare as a result of the exponential expansion in both the human population and medical costs. It is common knowledge that an efficient health monitoring system can diagnose conditions based on the gathered data and quickly identify irregularities of health conditions. ECG monitoring is a crucial method used to diagnose cardiac disorders that has been extensively researched and used. However, almost all portable ECG monitoring systems currently in use require a mobile application for data collection and display in order to function[7].

Mohd Javaid et al. J Oral Biol. The Internet of Things (IoT) has the potential to bring about disruptive innovation in the healthcare industry. As a result, research into various IoT-enabled healthcare applications is necessary during the COVID-19 Pandemic. A quick study is needed for this to determine the best course of action for the research. To determine the possibilities of this technology, research papers on COVID-19 Pandemic and IoT in healthcare are examined. This literature-based study may help professionals envision solutions to associated issues and combat the COVID-19 type pandemic. used a process map to quickly study the key IoT accomplishments. then names seven key IoT technologies that are useful for healthcare during the COVID-19 Pandemic. The paper concludes by identifying and briefly describing sixteen fundamental IoT applications for the medical sector during the COVID-19 Pandemic[8].

Richa, Anwasha Das, Ajeet Kumar Kushwaha. An online system is the Internet of Things (IoT). IoT devices are employed in a variety of application areas to improve user lifestyle. The IOT-based health monitoring system typically measures temperature, pressure, and other parameters. The severe acute metastatic syndrome coronavirus type 2 (SARS-CoV-2) that is rapidly spreading throughout the world is what causes the corona virus (COVID-19). The clinical spectrum of SARS-CoV-2 disease (respiratory dysfunction) varies from mild to severely ill individuals, and requires early discovery and observation, both remotely for mild cases and periodically in the clinical environment for serious cases. The number of on-the-spot referrals for regular care has been drastically reduced due to concerns about contamination in clinical settings. Additionally, there has been a perception that non-severe COVID-19 patients need to be continuously monitored, either from their quarantine website reception or from designated quarantine sites (such hotels). As a result, the epidemic has created incentives to improve existing methods of providing relief services remotely or to create new ones. In particular, this has dramatically increased the need to look for creative ways to remotely and effectively monitor patient health status. The three most typical signs of Covid-19 are a dry cough, a rapid or irregular heart rate, and an increase in body temperature. Our project recognises these signs and ensures that a person's fundamental health is being monitored[9].

Anandh Rajasekaran .Smart gadgets are linked to the internet via a new technology called the Internet of Things (IoT). IoT supports and propels health monitoring solutions that use external or internal wearable sensors. The sensors record the patient's motions, as well as his or her physical and mental state. This study attempts to create a system that measures both heart rate and body temperature utilizing sensors (LM35 and AD8232, respectively). The Arduino UNO board and ESP8266 are interfaced with these sensors to allow for wireless data transmission to Thing Speak. Data visualization is the consequence of the result on Thing speak. In order for the data record to be accessible and stored throughout time [10].

III. ANALYSIS

3.1 EXISTING SYSTEM

Some systems have bugs in the hardware or even power failure can impact the performance of sensors and result in risk..In existing system the GSM module(800 L) to send data over a cellular network, network coverage issues can cause connectivity problems.Other electronic devices or sources of electromagnetic interference can cause problems with the sensors or GSM module. Many try to improve it effectively, but it was not that much effective.Some of the Disadvantages are ,Database getting becomes hard due to traffic in networks.Finds many hospitals but results in confusion.Sometimes the sensors failed due to power supply.The GSM module(800 L) failed due to electromagnetic interference.

3.2 PROPOSED SYSTEM

To overcome existing problems our project helps the patient in an effective way so that a life can be saved. With the help of IOT and sensors we made a project which will help the doctor's in their field. With the help of our project we can analyze the patient in order to make them connect with their health.The sensors associated with this project makes a best analysis of the patients who suffer from heart attack.This will help the medical field which needs to be advanced. We are using two types of sensors: NTC Thermistor and Photoplethysmography which is used to measure temperature and pulse rate. The GSM module will send the SMS to the user who takes care of the patient, when the patient gets a heart attack. With this project, Since IoT devices can collect and analyze a massive amount of data, they have a high potential for medical research purposes.Some Advantages are Advantages,By using the correct resistance the sensor won't get any trouble to read the readings of the human body.GSM Module (900A) will help to send the data properly without any problems of electromagnetic interference.

IV. ARCHITECTURE

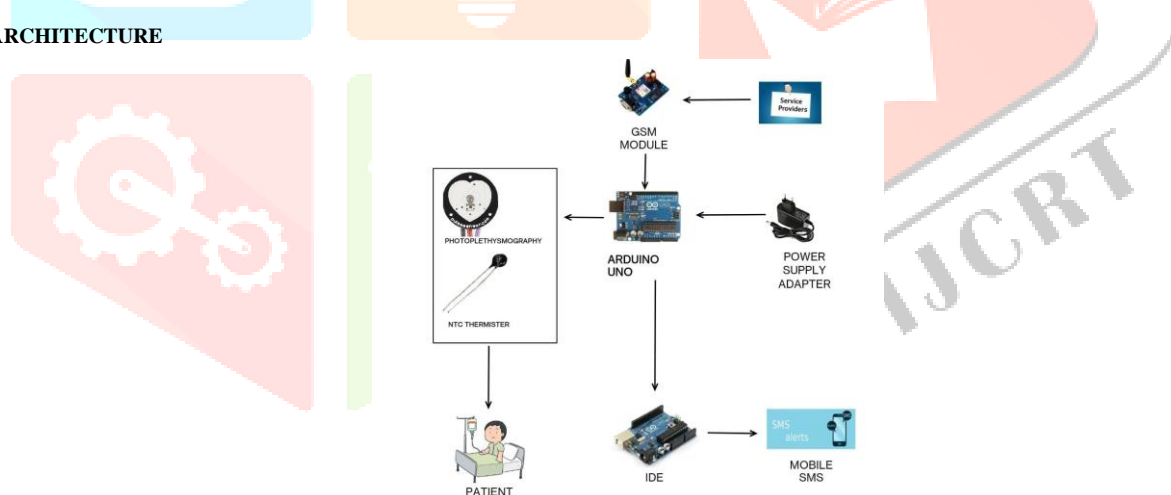


Figure:4.1 General Architecture

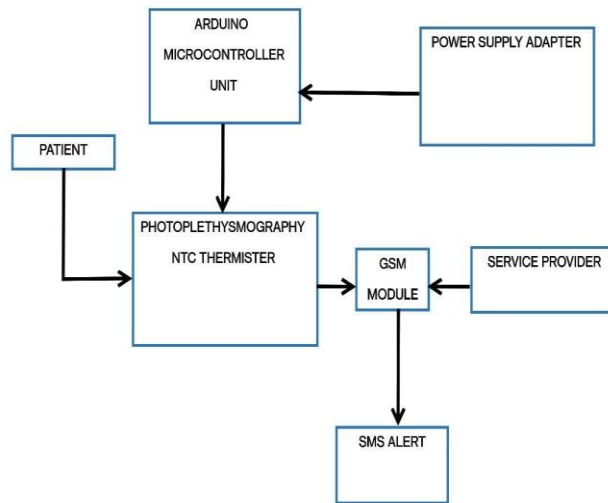


Figure 4.2: Hardware Architecture

In Figure 4.1, The General Architecture shows the sensors such as Photoplethysmography(pulse sensor), NTC Thermistor(LM35) and GSM module 900A . With the use of a sensor, it connects with the kit. The Photoplethysmography will have 3 pins. The NTC Thermistor and Photoplethysmography which is used to measure temperature and pulse rate. The GSM module is connected to Arduino UNO which is used to send sms to the patient’s protector who takes care of the patient. The software architecture mainly consists of 2 components such as Arduino UNO (hardware) and Arduino IDE (software). The hardware Arduino UNO connects with Arduino IDE software using the USB port. After executing the programs on IDE they will see the result in the IDE serial monitor. Then by using the web page log in system we will update the details in the website and it will notify the authorized doctors by SMS.

In Figure 4.2 ,The hardware architecture consists of Arduino UNO, photoplethysmography ,NTC Thermistor and GSM Module 900A. The 2 sensors will connect to the Arduino UNO kit. With the help of a sensor it will measure the pulse rate and temperature and send an SMS ert to the user about the patient’s condition

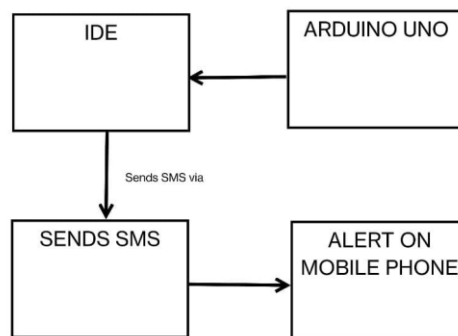


Figure 4.3: Software Architecture

In Figure 4.2, The software architecture consists of Arduino IDE which is used for coding. The codes will be embedded and it will provide the output in the screen and with the GSM Module it sends the SMS to the user who takes care of the patient.

V. SCREENSHOT

Overall Kit

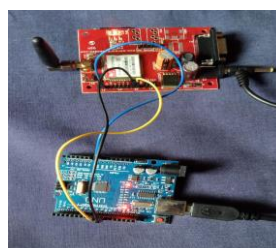


Figure 5.1 Arduino with GSM

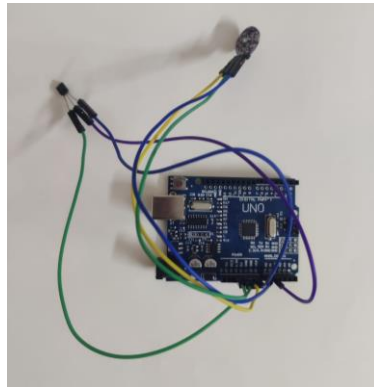


Figure 5.2 Arduino with sensors

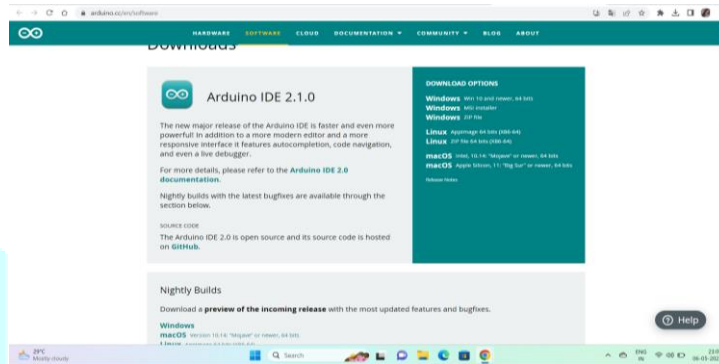


Figure 5.3 Arduino IDE official page to download IDE



Figure 5.4 Arduino IDE in desktop

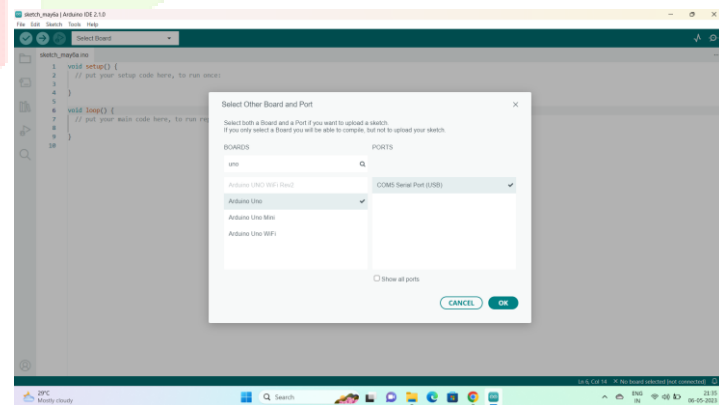


Figure 5.5 Select port and board

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21:52:40.399 -> ♥ A HeartBeat Happened !
21:52:40.399 -> BPM: 61
21:52:40.789 -> ♥ A HeartBeat Happened !
21:52:40.789 -> BPM: 66
21:52:41.821 -> ♥ A HeartBeat Happened !
21:52:41.821 -> BPM: 65
21:52:42.465 -> ♥ A HeartBeat Happened !
21:52:42.465 -> BPM: 68
21:52:42.875 -> ♥ A HeartBeat Happened !
21:52:42.875 -> BPM: 73
21:52:43.921 -> ♥ A HeartBeat Happened !
21:52:43.921 -> BPM: 73
21:52:44.618 -> ♥ A HeartBeat Happened !
21:52:44.618 -> BPM: 76

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Figure 5.6 Output on IDE Screen for Sensors

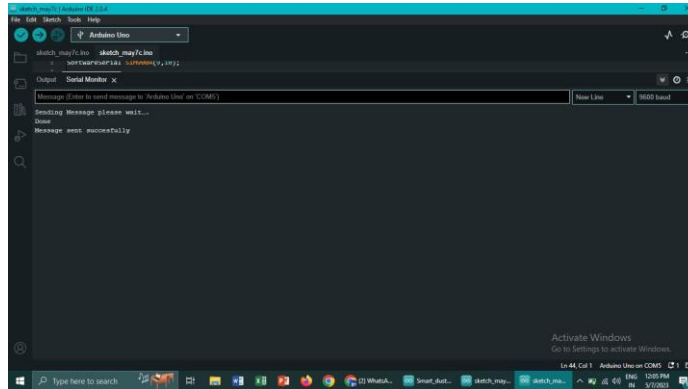


Figure 5.7 Output on IDE screen for GSM

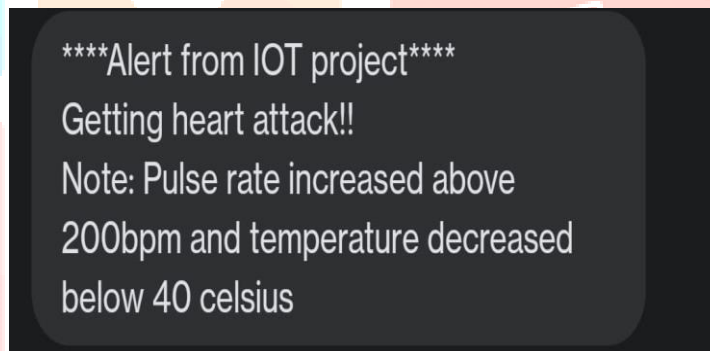


Figure 5.8 Demo Output

If the patient gets a heart attack it will notify the user with the help of SMS. It will send the alert with the following message such as the patient is getting a heart attack!! and their temperature and pulse rate also shown in the SMS. The above images and screenshot are the output of our project.

VI. CONCLUSION AND FUTURE ENCHANCEMENT

Thus by implementing our project, it helps people to know about their health conditions. Using pulse and temperature sensors with Arduino UNO can be a great addition to our project. The pulse and temperature sensors can detect the user's physical state and environmental conditions, respectively, while the GSM module can provide a means of communication through text messages. Combining a pulse sensor, temperature sensor, and GSM module in an Arduino project can create a useful device for monitoring vital signs remotely. The pulse sensor can measure the heart rate of the user, while the temperature sensor can monitor their body temperature. With the GSM module, the data can be transmitted to a remote location for analysis or monitoring by healthcare professionals. Overall, this project demonstrates the versatility of the Arduino platform in creating innovative solutions to real-world problems. By combining different sensors and modules, Arduino can be used to create a wide range of devices that can help improve people's lives. By integrating these components into a project, you can create a remote health monitoring system that can send alerts to a user who takes care of the patient.

In future by using this project they can use this as a Wearable device with many sensors for the human body. An advanced improvement would be to use machine learning algorithms to analyze the data collected from the sensors. This could provide insights into the user's health and identify potential health risks. This will make the medical system function effectively.

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