IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

IOT BASED ICU PATIENT MONITORING SYSYTEM AUTOMATIC SMS ALERT USING GSM

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Abstract Integrating IoT technology has been crucial in modern healthcare for improving patient care and monitoring. This research presents a novel ICU patient monitoring system that utilizes the internet of things (IoT) to continuously monitor vital signs like temperature, humidity, pulse rate, and blood pressure in real-time. The system's data processing and collection is powered by Arduino microcontrollers, and its storage and analysis is made easy by the sophisticated cloud-based platform ThingSpeak. Medical practitioners may see and evaluate patient data in real-time using ThingSpeak's powerful analytics features. When anything out of the ordinary happens with your vitals, you may set up alerts and notifications to let the doctors know. In order to improve healthcare delivery efficiency and allow for remote monitoring, the system offers a user-friendly interface that can be accessed by online or mobile apps.

Keywords: IOT, Thingspeak, Arduino microcontrollers, Remote monitoring.

I. INTRODUCTION

Improving and tailoring patient care in today's healthcare system is more dependent than ever on using state-of-the-art technology. In the field of medical monitoring, for example, the Internet of Things (IoT) has discovered significant uses. This research presents a novel Internet of Things (IoT)-based intensive care unit (ICU) patient monitoring system that uses ThingSpeak, a cloud-based platform, and Arduino microcontrollers to evaluate and track vital health indicators in real-time. Patients in Intensive Care Units (ICUs) need constant and careful monitoring, and the suggested method is an all-encompassing attempt to meet this need. Healthcare providers have access to a wealth of data for ongoing health assessment thanks to the system's integrated sensors that record critical vital signs including temperature, humidity, heart rate, and blood pressure. Not only does the use of Arduino microcontrollers guarantee scalability and cost-effectiveness, but they also make data collecting and processing more efficient. The storage, processing, and presentation of data are supported by ThingSpeak, a strong cloud platform. Medical professionals may easily handle patient data using the platform's user-friendly interface, which enables for remote patient monitoring and quick decision-making. Medical professionals will be able to react quickly to any changes in typical health metrics since the system is also set up to send out warnings and notifications. By introducing a new age of proactive and data-driven patient care, this ICU Patient Monitoring System that is based on the

Internet of Things has the potential to revolutionize conventional healthcare methods. The technology guarantees accurate and real-time health data and provides doors for telemedicine and remote healthcare management via the amalgamation of Arduino's hardware capabilities and ThingSpeak's cloud-based analytics. Further investigation into this novel approach reveals that its adoption has the potential to greatly enhance healthcare services, which in turn might improve patient outcomes and create a more streamlined healthcare system. The goal is This study aims to offer a new ICU patient monitoring system that utilizes the ThingSpeak platform and Arduino microcontrollers to measure crucial health data in real-time. The system is based on the Internet of Things. The goal is to improve patient care and monitoring by storing, analyzing, and visualizing data in a seamless manner. Thanks to the system's intuitive design, medical professionals can keep tabs on patients from afar, and should any suspicious changes occur in their vital signs, they'll get the word quickly.

II. LITERATURE SURVEY

2.1.Patient Health Monitoring Using Arduino Through Iot

ABSTRACT: In the course of our daily lives, health is paramount. Having good health is essential for carrying out the everyday tasks correctly. These days, it's hard to keep tabs on the people you care about. It is challenging to monitor a patient's health state from the comfort of their own home. Regular monitoring of elderly people is essential, as is keeping loved ones informed of their health state while they are at work. A cutting-edge solution that effortlessly automates this process. System proposes a state-of-the-art patient health monitoring system that can keep tabs on a patient's vitals via the use of sensors and then notify those closest to them over the internet in the event of any problems. Building a system that measures core temperature, systolic and diastolic blood pressure, and pulse rate is the goal of this project.The Micro Controller Arduino ATMEGA328 is connected to these sensors. The programming for this microcontroller, the Arduino ATMEGA328, is written in embedded C. Through wireless data transfer, the data is sent to the server. The ESP8266 module is responsible for transmitting this data wirelessly. Graphs of temperature, blood pressure, and heart rate over time are generated by transmitting data on an IOT platform, where things communicate. In order to keep track of data throughout time, data visualization is done on Thing Talk. All users who have successfully signed onto the website with their username and password may access this data since it is saved on the web server.

2.2 A Smart Healthcare System for Portable ECG Monitoring Based on the Internet of Things

In this excerpt: Among the middle-aged and elderly, heart failure is one of the leading causes of sudden and unexpected death. In a life-or-death situation, a reliable cardiac monitoring device may detect abnormal heart abnormalities and aid in diagnosis. A major obstacle that individuals have when trying to get appropriate health care, such as frequent checkups, is the distance between themselves and their physicians. The Internet of Things (IoT) has several potential uses in healthcare, one of which is the development of monitoring systems. The electrocardiogram (ECG) monitoring device is prevalent due to its usefulness in the diagnosis of cardiac illness. This article proposes an advanced approach to an ECG monitoring system that makes use of the Internet of Things (IoT). The goal of this research was to develop a system that could regularly check in on the patient's electrocardiogram (ECG) signal, which would be recorded in a database that could only be viewed by authorized individuals. An automated email is sent to both users and clinicians in the event of a malformation finding, allowing them to assess the seriousness of the patients' illnesses and provide urgent medical treatment. This system has been tested on several patients to ensure its reliability and efficiency in gathering real-time electrocardiogram data, which may greatly aid in the diagnosis of cardiac disorders. This inexpensive Internet of Things (IoT) gadget may effectively lower the death rate and disability risk associatedwithcardiovascularillnesses.

2.3 An Internet of Things (IoT) Based Health Monitoring System Utilizing the Blynk App

In this excerpt: Crafty judgments, executed brilliantly via communications technology, may lead to resourceful communities, which in turn enhances common healthcare. Our everyday lives are greatly impacted by health. By using cutting-edge sensing and communication technologies, real-time health monitoring may often aid in the early diagnosis of potentially fatal illnesses, allowing patients to get life-saving treatment sooner rather than later. The primary objective of this project is to design a system that can measure vital signs such as temperature and heart rate with the help of a DS18b20 and a pulse sensor. The sensors are also connected to the Controller ESP32 Dev board. The Wi-Fi module allows Arduino to handle wireless data transfer. The BLYNK app for Android is used in conjunction with the ESP32 controller to enable wireless data transfer on the IoT technology. Using the Blynk Android app to graphically digitize the data. Data pertaining to patients will be preserved for an extended length of time. An Android app stores the data and allows for app-based device management.

2.4 An Affordable Healthcare System for Cardiac Patients in Bangladesh Utilizing Bio-sensors and the Internet of the things.

Recent figures show a dramatic increase in the number of persons affected by cardiovascular diseases (CVD). People in emerging and underdeveloped nations are disproportionately impacted by cardiovascular disease. Sudden heart failure mortality rose sharply with the chronic obstructive pulmonary disease (COPD) patient population in Bangladesh. Therefore, this paper suggests a low-cost healthcare system for CVD patients in Bangladesh based on the Internet of Things (IoT) and bio-sensors. This system will allow doctors to remotely monitor cardiac patients in hospital or at home, ensuring rapid treatment and monitoring. Three separate sensors measure the patient's core temperature, electrocardiogram (ECG), and heart rate as part of the system's hardware component. Then, using the local Wi-Fi network, the data may be sent to a cloud server for storage. Additionally, a website can be created to allow the doctor to watch the measured data. A message system may be put in place to alert the doctor and certain family members of the patient in the event of a serious situation. Patients with cardiovascular disease will benefit from the suggested method after it has been successfully implemented. According to the budget, the suggested system would cost between 80 and 100 dollars, which is quite inexpensive for a developing nation like Bangladesh. This is in comparison to other current gadgets. The design and development of a patient monitoring system involves connecting a medical device to a personal computer using an Arduino microcontroller. The purpose of a patient monitoring system is to improve patient care by enabling the constant tracking of vital signs, which in turn aids medical staff in making decisions. Devices that monitor and record a person's cardiovascular health, such as heart rate, blood pressure, temperature, and respiration rate, may be part of this system. Keeping tabs on vital signs like temperature and heart rate is the goal of this paper's proposed method for patient monitoring. A wearable gadget and software are part of the system, which allows the user to take temperature and heart rate readings with the touch of a fingertip. The gadget may connect to a PC with an Arduino microcontroller and save measurement data. Archiving the data for future use or viewing it as a historical file are two possible uses for the captured information. To further demonstrate the chosen sensors' use for the suggested patient monitoring system, this paper also details their first experimental findings. readings with the touch of a fingertip. The gadget may connect to a PC with an Arduino microcontroller and save measurement data. Archiving the data for future use or viewing it as a historical file are two possible uses for the captured information. To further demonstrate the chosen sensors' use for the suggested patient monitoring system, this paper also details their first experimental findings.

III. PROPOSED METHODOLOGY

In order to provide a thorough evaluation of the patient's health, the suggested system uses a number of sensors to track their vital signs in real time. Some of the sensors included in this tracker are temperature, humidity, pulse rate, and blood pressure. The first two take readings of core body temperature and relative humidity, while the latter two keep tabs on fluctuations in blood pressure. The data is processed by the Arduino microcontroller and sent securely over Wi-Fi to the ThingSpeak cloud platform. To enable speedy communication amongst healthcare workers in order to provide proactive and prompt treatment. Improve patient safety and lessen the likelihood of irreversible harm or death as a result of decision-making delays. To use current intensive care unit gadgets in conjunction with internet of things technology to provide a solution that is more cost-effective than other healthcare systems. So that medical professionals may access patient records and make educated judgments regardless of their location, via the use of remote monitoring and communication. The goal is to verify the system's efficacy in real-world settings by collecting and analyzing data from healthy and ill individuals. The overarching goal of the proposed work is to improve patient outcomes by enhancing the quality of treatment in the intensive care unit via the creation of a smart patient monitoring system that leverages IoT technologies. The Benefits: • Relative to other healthcare systems, the suggested approach is intended to be cost-effective. It provides a less expensive option for patient monitoring and administration by making use of current intensive care unit gadgets and internet of things technologies. • Improved patient safety: The suggested approach improves patient safety in the intensive care unit by providing continuous monitoring and timely notifications. Patients will get the treatment they need faster since fewer mistakes or delays in decision-making are possible. THE APPROACH: The Internet of Things (IoT)-based Intensive Care Unit (ICU) Patient Monitoring System development process comprises several critical phases. An Arduino Uno microcontroller, a DHT11 sensor for humidity and temperature monitoring, a pulse sensor for heart rate measurement, a BMP180 sensor for blood pressure monitoring, a WiFi module for connecting to the internet, an LCD display for viewing data in real-time, and a dependable power supply are all part of the hardware components that are integrated into the system architecture. Second, everything is wired and connected correctly during hardware setup so that data may be processed and sent without a hitch. Programming the Arduino Uno to communicate with all of the sensors and to take readings at certain intervals is the next step in the software implementation process. The use of error handling techniques to ensure data quality and reliability and the use of libraries and code snippets for sensor connection are all part of this. Health metrics including temperature, humidity, heart rate, and blood pressure are derived from raw sensor data using data gathering and processing algorithms In order to connect to the internet and send data to the cloud platform ThingSpeak, the WiFi module is integrated with the Arduino Uno. Using the right APIs or protocols, the Arduino Uno is set up to transmit data obtained from the patient to a ThingSpeak channel that can accept and store the data. Healthcare providers may now see and study patient data in real-time thanks to the analytics tools provided by ThingSpeak, which enable real-time monitoring and analysis. You may set up alerts and notifications to let medical professionals know if anything out of the ordinary happens with your vitals. The patient monitoring system is designed with an intuitive user interface that can be accessed by online or mobile apps. Ensuring compatibility with various devices and screen sizes allows for remote monitoring and improves healthcare delivery efficiency. Thorough documentation is created, including the system architecture, hardware setup, software implementation, and user recommendations; testing and validation are carried out to guarantee correctness, reliability, and functionality. After extensive training and assistance, the Internet of Things (IoT)-based Intensive Care Unit (ICU) Patient Monitoring System is finally put into action in actual healthcare facilities.

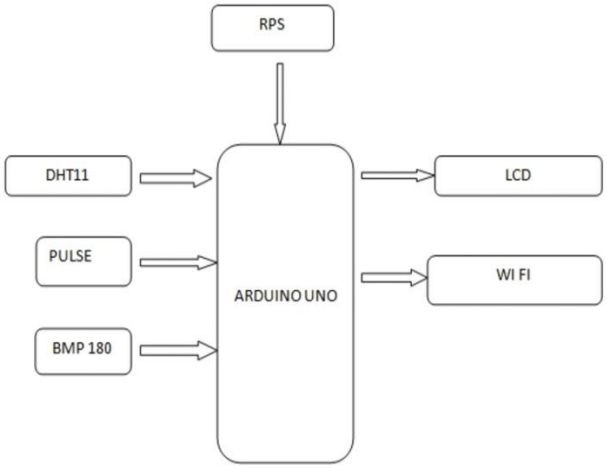

Fig 1: Block Diagram

IV. RESULTS AND DISCUSSION

We utilized the Arduino 1.0.6 IDE program to put the commands in this experiment into practice.

IMPLEMENTATION OF IOT BASED ICU PATIENT MONITORING SYSYTEM AUTOMATIC SMS ALERT USING GSM

In the IoT-based ICU patient monitoring system ,sensors continuously monitor the patient's vital signs such as heart rate, blood pressure, and temperature. These sensors are connected to Arduino microcontrollers, which process the data in real-time. If the Arduino detects any critical changes in the patient's vital signs, it triggers an alert mechanism. This mechanism is integrated with a GSM module, allowing the system to send SMS alerts to designated medical personnel. These alerts provide instant notification to the medical staff, enabling them to take immediate action to address the patient's condition. This automated SMS alert system enhances patient safety by ensuring that any abnormalities are promptly addressed, even if the medical staff are not physically present in the ICU.

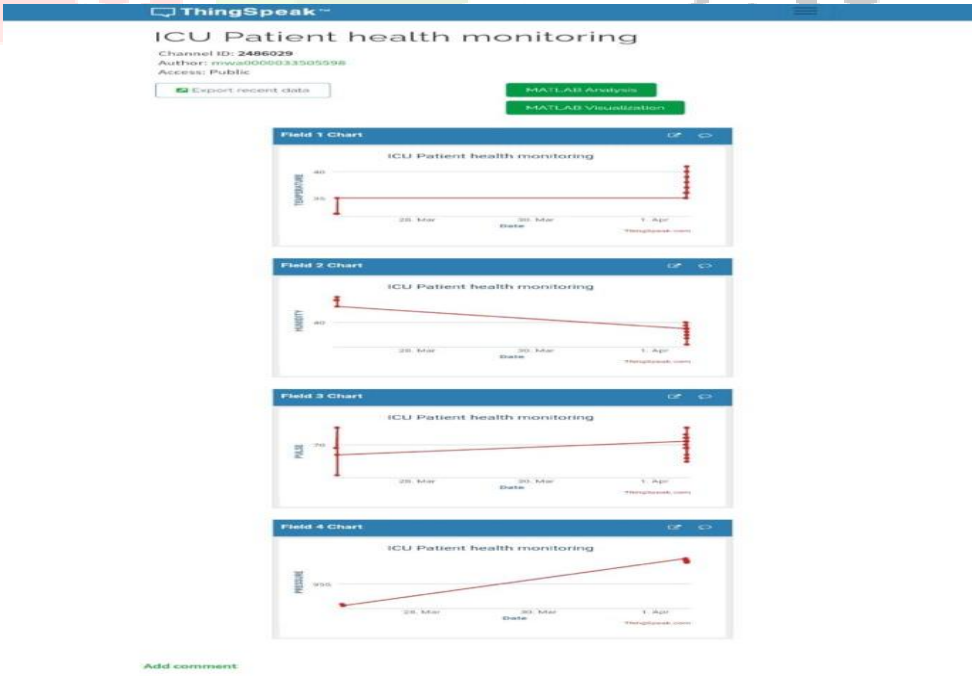

Fig 2: Output graphs of ICU patient health monitoring temperature, humidity, pulse rate, blood pressure.

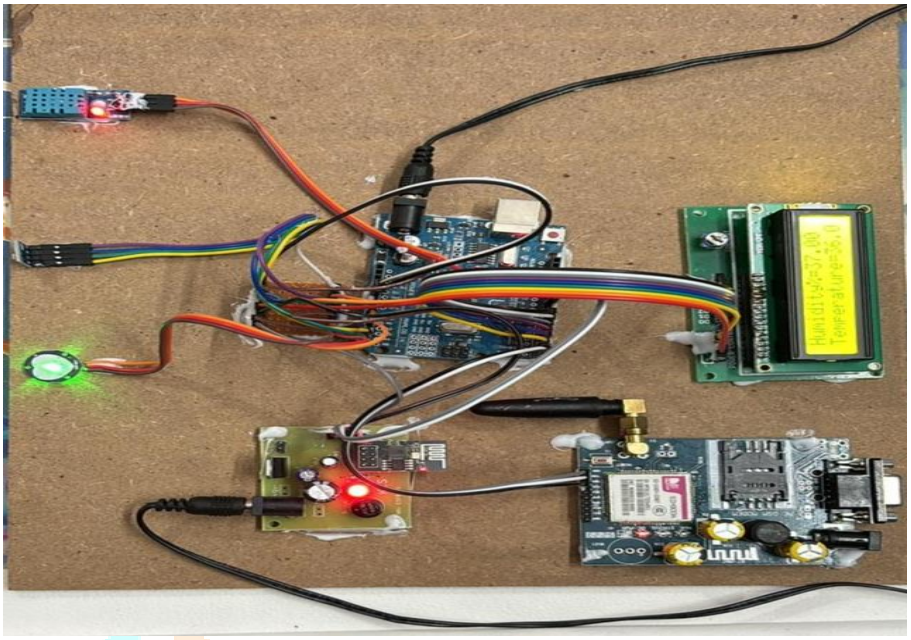

Fig 3: Prototype of implementation of IOT based ICU Patient monitoring system automatic sms alert using Gsm

V. CONCLUSION AND FUTURE SCOPE

Ultimately, the Internet of Things (IoT)-based Intensive Care Unit (ICU) Patient Monitoring System is a prime example of how healthcare organizations are using IoT technology to improve patient care and monitoring. The combination of Arduino microcontrollers with the cloud-based platform ThingSpeak allows medical personnel to monitor vital signs in real-time, which allows for more precise diagnosis and treatment plans. Medical decision-making and patient outcomes are improved by the system's data visualization and analysis capabilities, in addition to the configurable warnings. Additionally, it improves the accessibility and efficiency of healthcare services with its user-friendly interface that allows for remote monitoring. Such cutting-edge technologies have the potential to transform healthcare practices, encourage proactive patient management, and save lives as the Internet of Things (IoT) develops further. WHAT'S TO COME: Patient monitoring systems built on the internet of things have a bright future ahead of them. Smarter, more tailored medical treatment is on the horizon, thanks to developments in AI, data analytics, and sensor technologies. It may be possible to identify health problems earlier and intervene proactively with their help if wearable devices and predictive analytics were integrated. To further guarantee patient privacy and security and facilitate smooth data interchange, cybersecurity measures and standards for interoperability are essential. If all things are considered, the Internet of Things has tremendous future potential to revolutionize healthcare delivery and enhance patient outcomes.

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