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Health Monitoring System Using Internet of Things

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ABSTRACT

Healthcare service delivery components like mobile health and patient monitoring can be managed effectively and efficiently using Internet of Things (IoT) technology. Cloud computing can process the tremendous amount of data that IoT creates. However, the latency caused by sending data to the cloud and back to the client is intolerable with real-time remote health monitoring. In this approach, it was advised to use the fog computing idea at the goal of implementing to integrate regular health records monitoring in connected devices. The best plan utilizes a wide range of state-of-the-art tools and services, such as notification systems, distributed data, and embedded data mining. It has become common practice to monitor and Keep track of the patients' medical information while they are away from hospitals. The main aim to create a system that will allow for continuous online patient monitoring. By employing sensors, this system measures a few biological parameters in affected patient and transmits the results to an IOT cloud platform via a Wi-Fi module. Every aspect of patient health information will be kept in the cloud, allowing doctors to keep track on their wellness and do so on their smartphone. This project uses an Arduino controller to be implemented.

1 Introduction

The general public and governments today place a high priority on maintaining excellent health. IoT has become an effective way to create smart healthcare systems that may be installed in homes or hospitals. These networks remotely monitor patients using biomedical sensors that are present in technology devices [8]. IoT technology provides a responsible and organized technique for managing client service aspects of healthcare, including remote patient monitoring. Cloud computing can process the tremendous amount of data that IoT creates. However, the time lag

imposed by sending data over the web and back to client is unsuitable for real-time healthcare monitoring. This strategy examined leveraging cloud computing at the aim of being able that can provide virtual patient health monitoring [3]. Major responsibilities of medical professionals include keeping an eye on patients and responding quickly when they are in danger; otherwise, patients risk becoming critically ill and dying. Every sensors can notify healthcare teams of any unexpected circumstances in the early stage of the process due to an emergency detection algorithm. To check for dangerous scenarios, let's first construct the regular patient monitoring model and the Advance Warning Score guidance [8]. Numerous conveniences are offered to both patients and physicians by the IoT-based health system, which also allows physicians to promptly diagnose patients based on monitored health data. Since these sensors typically have low compute and storage capabilities, it is not possible to use current data integrity verification tools with IoT-based health systems. The fact that the current public data integrity verification methods rely on a dependable third party auditor to carry out the verification task adds to the management burden and increases the danger of data leakage [6]. Since these sensors typically have low compute and storage capabilities, it is not possible to use current data integrity verification tools with IoT-based health systems. The present public integrity verification methods' reliance on a reputable external auditor to do the verification task raises the risk of data leakage and adds to the will manage [1]. Dental image information transmitted to the digital dental service layer over the network (Wi-Fi, 3G/4G). The mobile terminal may very effectively fulfil this demand since a display terminal is required in this layer to satisfy the routine needs of users in the dental self-inspection service. This multiple iHome dental Health-IoT solution makes it easy for dentists to engage with patients who are receiving care at their homes on a regular basis or just when needed [9]. The inbuilt health monitoring sensors are part of a vast IoT network that regularly analyses and sends data to neighboring devices or to authorities. Because of the accessibility of the data, an attacker may exploit security flaws that are exposed by the interconnection of these IoT-based sensors with various entities. Modifications in sensor readings will alter the course of a treatment and have a substantial detrimental impact on patient health, making this a serious worry, specifically for the healthcare sector [2]. With IoT-based smart edge architecture, remote health monitoring moved the medical sector to the IoT edge. Data from portable critical sensors is received by a number of cutting-edge software engines, including Rapid Active Summarization for useful PROgnosis (RASPRO) and Criticality Measure Index warnings, which are installed in the IoT smart edge. For this, the IoT is being exploited by two strong software engine, RASPRO and CMI. [5]. A lightweight, affordable IoT node, cloud ML algorithms for data analysis, and a mobile application.

As the IoT node monitors health factors like body temperature, blood oxygen saturation, cough, and respiration rate, the mobile app updates to reflect the user's health statuses. IoT works with user device to use bluetooth to gather proximity data and the wireless network to connect to the server. Temperature and photoplethysmogram sensors, an RPIZ as the primary CPU, and a LoRa module for data communication whenever WiFi and cellular data networks are not accessible make up this device [4]. The potential for combining human skills with robot intelligence, like in telerobotics providing residential care, is becoming more and more attractive. In order to support home-centric healthcare systems, this study suggests the Home automation, a standard IoT-enabled telerobotic architecture. In specifically, it is made possible by merging the robot control and human movement capturing subsystems [7]. An advanced ICU healthcare monitoring system powered by the Internet of Things to assist organizations and medical staff in continuously monitoring patients and taking prompt action. The patient's body parameters can be measured using our suggested method in real-time, and the device will alert the designated doctor and the patient's emergency care unit if the patient's body parameters display unusual numbers (ECU). Doctors can remotely monitor the patient using our system [10].

2 Recent Works

Adarsh Kumar *et al* (2020) have suggested comparing the healthcare system, industry 4.0, and blockchain technology. It is proposed to use a simulation-optimization technique to raise the performance of the primary system and all of its supporting systems. In order to increase the efficiency of blockchain-based, independent apps for such digital healthcare system, this article looks into optimizers relevant to Healthcare 4.0 trends. Because of changes in the environment and limitations of the simulator, the results of the implementation and simulation demonstrate varying levels of inaccuracy.

Tejasvi Alladi *et al* (2020) have described a PUFs in which a patient node utilises a wireless sink node to attempt server authentication. The client node and sink node are the second stage of identification, while the sink node and server constitute the first. A single secure session is created that data transmission between the sink and patient nodes as well as the server and sink node when the sick node has are shown with the server. The suggested approach is cybersecurity-safe. However, it is challenging to search through data on a blockchain.

Gagangeet Singh Aujla *et al* (2020) have developed a decoupled blockchain technique for keeping track of healthcare. This method facilitates the secure communication of healthcare different sensors to edge nodes by constructing isolated blocks in blockchain utilising adjacent devices. The

tensor-based method is then applied by the edge nodes to transmit and store data. This helps vast IoT network's data duplication be reduced. Future network services performance needs to be improved much further.

Anar A. Hady *et al* (2020) have developed an EHMS to track patient's health. Data transmit to a server and there are more alternatives for diagnosis and therapy. About 16,000 records of attacks and regular healthcare information were compiled in a dataset. The system employs a number of machine learning methods to evaluate and educate the dataset towards threats. The suggested system offers robustness in proper intrusion detection. The results also show that system's performance is subpar, calling for further research.

Farah E. Shamout *et al* (2019) have put in place a DEWS (Deep Early Warning System) for a worsening clinical condition. The proposed technique can forecast cardiac arrest, unexpected ICU hospitalizations, and mortality. DEWS has achieved precision that exceeds the state of the art. Due to the lack of datasets for non-ICU scenarios, we developed and tested our proposed approach using a personal dataset. Future work must be conducted on the effectiveness of warnings for each outcome.

3 Proposed Work Explanation

The tragic events of the past are put behind us as we reach the age of information and trade. When it reflect on the past, can see how greater urbanization, population expansion, and a plethora of social and commercial relations among nations and regions all led to the spread of disease. In the past, significant epidemics like cholera, leprosy, yellow fever, leprosy, swine flu, ebola, and malaria have all been effectively controlled. The world has come a long way, but human society still contains some anomalies. Humans have developed to the point where they are more interested in and open to different cultures, eco systems, and trades. The public healthcare systems, whose strategies and efforts have contributed to lower the number of fatalities all over the world, deserve a major thank you for their role in making the epidemic, and the succession of struggles with it, begin to fade from memory over time. First, as a physical layer that permits connections by utilizing technology and sensors. Temperature, oxygen saturation, and pulse rate are all measured via sensors.

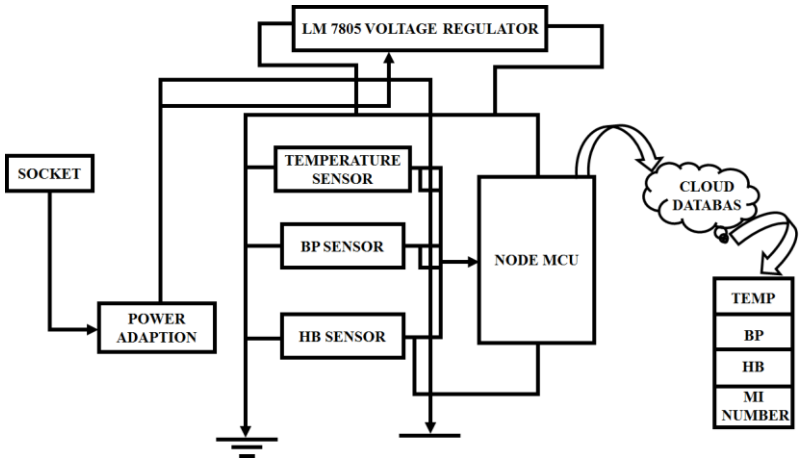

Figure 1: *Proposed block Diagram*

Figure 1 demonstrate the block diagram of proposed system. The sensors for health monitoring are used for data collection, or the gathering of health-related information. The controller can communicate in order to wirelessly deliver data over the internet. On the server, data processing was completed. At the server point, all data are gathered and consolidated. The Blynk app can be used to view health-related information in an easily understandable style.

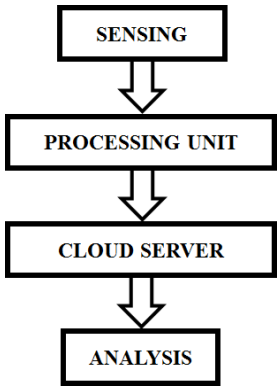

Figure 2: *Proposed system Flowchart*

Figure 2 shows the working flow of system. The sensor's data is evaluated, and if unusual behavior is found, in order to inform the doctor of the patient's status, an immediate crisis is started. As a result, hospital critical conditions decline.

3.1 Pulse Sensor

As seen in Figure 3, Pulse Sensor is a heart-rate sensor for Arduino that is plug-and-play. Game developers, Students, athletes, artists, makers, and mobile app developers can all use it to quickly incorporate real-time heart rate data into their works. In essence, it is a sensor with an integrated optical amplifier and noise-reduction circuit. You can read heart rate by attaching the pulse sensor to an earlobe or fingertip and connecting it to your Arduino. Additionally, it has an Arduino sample code that makes use of it simple.

Figure 3: *Pulse Sensor*

3.2 Pressure Sensor

One of the BMP XXX series sensors, the MP180, is depicted in Figure 4. They are all designed to measure barometric pressure in the atmosphere. BMP180, a high-precision sensor, was developed for consumer use. The weight of the air delivered to everything is the sole component of barometric pressure. Wherever there is air, there will be pressure, and pressure has weight. The pressure is measured by the BMP180 sensor, which digitally delivers the information. Because the temperature affects the pressure as well, we need temperature-corrected pressure values. To make up for this, the BM180 also boasts a superior temperature sensor.

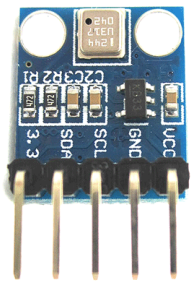

Figure 4: *Pressure Sensor*

4 Results and Discussion

The suggested method involves The ATmega328, ESP8266 Wi-Fi Module, pulse, temperature, heartbeat, and BMP180 sensors make up the Arduino Uno microcontroller board. In this method, the robot is moved in all directions by an electric motor driver. Using an Arduino Uno, the pressure and temperature levels are recorded and tracked. Through an amplifier circuit and a signal conditioning unit, the Arduino Uno receives the signals from these sensors. Because the signals' level (gain) is low, the amplifier circuit raises the signals' gain before passing them to the Arduino Uno. Figure 5 shows how the health of the patient was monitored on a computer screen using an Arduino Uno connected to a cloud database system and monitored from any location using an internet source. The server then immediately transmits data to the receiver system. In Figure 6, the hardware implementation is displayed.

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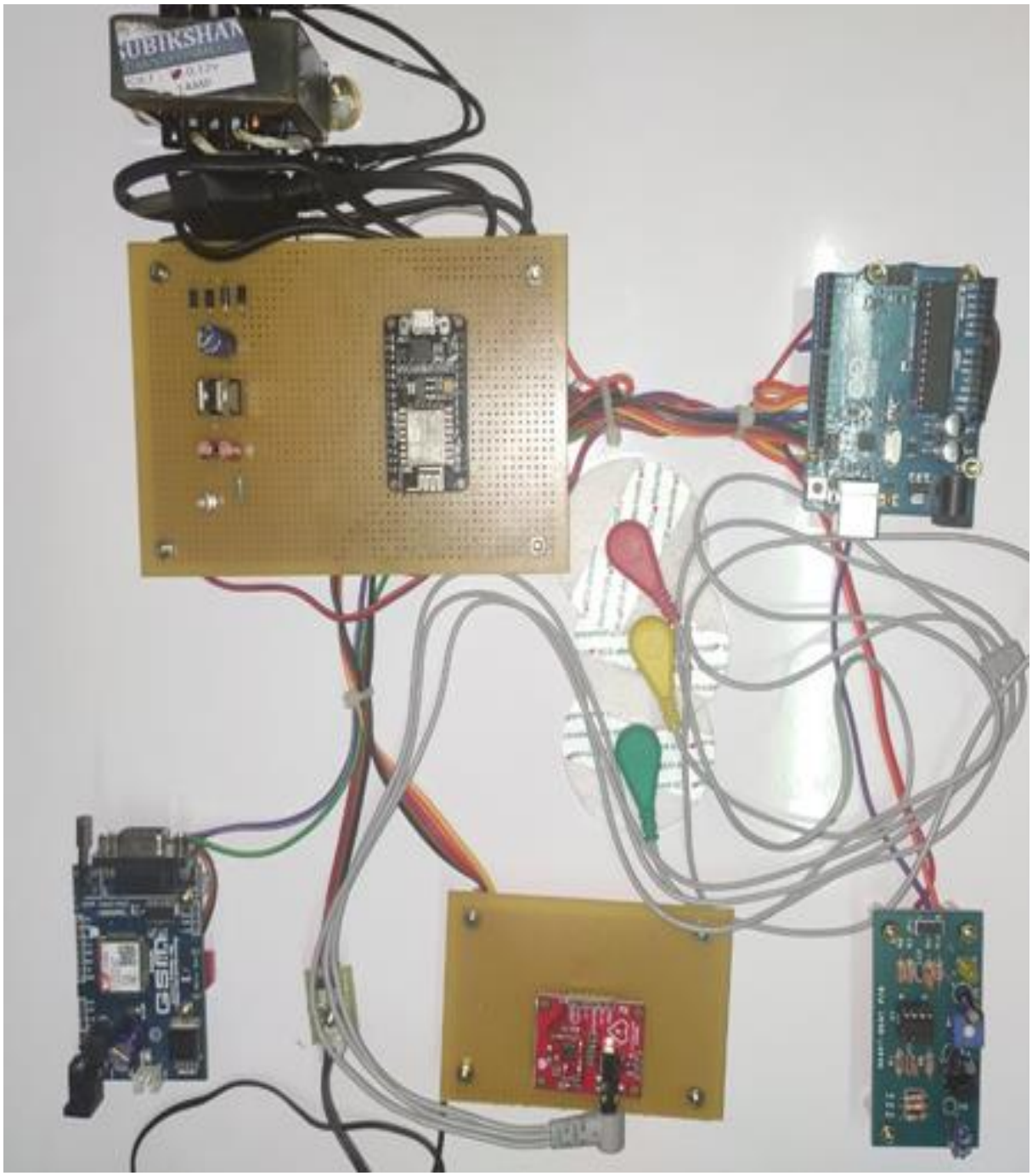

Figure 5: *Hardware view*

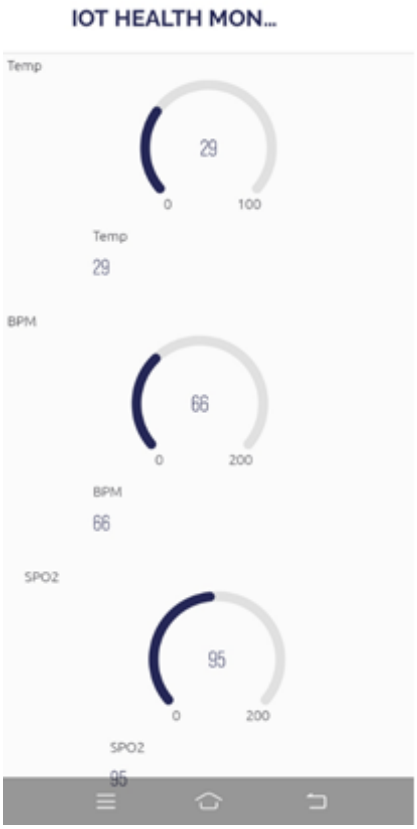

Figure 6: *Output showing the display of Temperature, Heart Rate and SPO_2.*

Table1: *Experimental Result*

Sl.no	NAME	AGE	SEX	TEMP	BPM	SPO_2
1	ASWINI	32	FEMALE	29	66	95
2	RAM	28	MALE	31.2	70	93
3	SHAM	31	MALE	29.5	68	90
4	SHALU	43	FEMALE	29.7	69	94

5	ABI	39	MALE	31.6	67	89

The above Table 1 shows the outcomes of the experimental results. In this table it shows the value of the particular persons Temperature, Heartbeat, SPO_2 .

5 Conclusion

It is clear from this suggested system that wireless sensor technology is becoming an important component of healthcare services. A mobile physiological monitoring system track patient's heartbeat and other important metrics in a hospital is described in this suggested system. The system has an IoT-enabled emergency aid mechanism and can monitor a patient's condition over time. Robotic systems will become digital as a result. People are affected by numerous variations of diseases that are highly sensitive diseases, on a daily basis. People therefore worry constantly about their health. This project focuses on the IoT, a modern idea that is expanding and has an impact on many aspects of human life, resulting in smart technology in daily lives.

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