Novel Approach for IoT based Patient Health Monitoring System using Wearable Sensors

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Abstract - *An innovative concept that has already been implemented in industrialized countries in recent years is a continuous patient health monitoring framework with a remote sensor system that uses delicate registration. The bodily area network is created utilizing small sensors that collect and evaluate body parameters and development. The device has a limited number of helper capabilities that meet patient's daily needs. Furthermore, it employs a variety of sensors to continuously monitor patient's vital signs, such as their heart rate and body temperature Sensor and Arduino are used to send these patient's records over the web to a web server where the database is stored. In addition, depending on the summation of all patient records, it will make a prognosis about the patient's well-being. Doctor and patient can communicate in real time with the help of a web application. Where data was gathered and shown, the prototype was successfully implemented. The prototype's goal is to assist people in poor countries who still lack access to medical technology, as well as timely diagnosis and treatment.*

Key Words: Internet of Things, e-health, Web Services, Integrated application

1.INTRODUCTION

Rapid changes in the e-health care system have been brought about by advancements in medical technology. A wireless e-health monitor model that is unique and functional can be a huge aid to individuals in advancing countries. The technology assists physicians in better diagnosing and treating patients who are not physically present on site, since it is often necessary to deliver therapy or remedy to people who are unlucky enough to be away from well treatment. Advanced medical technology plays an important role in our daily lives in the current day. This helps to improve and save the lives of innumerable people all around the world. Medical technology is a broad sector in which innovation is critical to keeping people healthy. A Body Area System is defined as "a communication standard optimised for low-power devices and operation on, in, or throughout the human body to serve a wide range of applications including medical, consumer electronics/personal entertainment, and other applications," according to IEEE 802.15. Wireless body area framework is a significant technology for continuous health monitoring that is more proactive and delivers reasonable medical care. The purpose of a remote body region system is to encourage the continuous recording and checking of a man's well-being status and the interchange of this information through a long distance communication. In developing countries, the current medical environment permits patients to come in for regular health checkups or to be admitted for continuous supervision. The system is inflexible and inefficient. Today's remote sensor systems enable patients to maintain constant control over their everyday lives from any location. As a result, in order to provide real-time patient health monitoring, we suggest in this work that a person's body temperature and heart rate data be transmitted using a sensor and an Arduino to a web server that is available to both the doctor and the patient. The potential usage of a remote e-health framework is beneficial for routine checkups, crisis alerts, and preventing more critical situations based on the patient's continuous record. According to the American Heart Association, treatment within the first 12 minutes can result in a positive rate of 45 to 60%. It should be noted that the proposed design is intended at allowing everyone, including patients, to keep track of their regular health conditions and to establish a flexible atmosphere between doctors and patients by monitoring their long-term well-being.
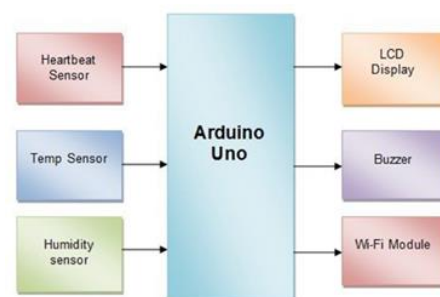
Figure 1 Block Diagram of Patient Monitoring and Alerting System

1.1 Related Work

A few sensors, such as a temperature sensor and a pulse sensor, will be used to detect the patient's temperature and heart rate. We'll need sensors, an Arduino Uno, and a power source for this. The data will be submitted to the database via application when the patient's reading is taken. The database would store all of the data, as well as the patient's personal information, such as name, age, and so on.

By logging into his or her account, the doctor can see the reading from a remote location. The patient's data will be displayed on both the patient and doctor's mobile applications. To use this system, you must have access to the internet. To make the device wearable, an application is used. The technology allows the patient to move from one location to another, which does not provide an issue for the doctor to observe. For our system's work flow, we may say that it has both a hardware and software component. Along with the programmer, we're storing the gathered data from the hardware implementation in a database on a web server. In addition, the system has a web-based mobile application

1.2 System Module

The vital signs of a patient are obtained using a temperature sensor and a pulse sensor, according to our system model. The data from both sensors is received by the Arduino. The internet connection is activated after the GSM modem is turned on and network access is established. The data from the wireless transfer is subsequently stored in the database.[3]
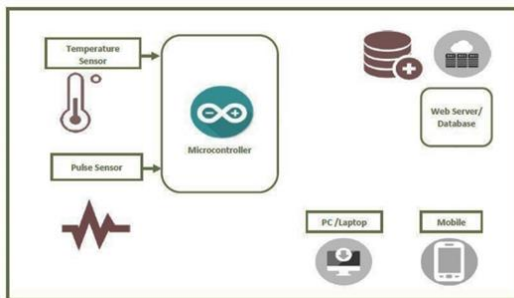

Figure 2 System Module of Patient Health Monitoring System

2. Hardware Module

Hardware Of The System:

1.Microcontroller

2.Sensors

3.Laptop/pc

Microcontroller:

A microcontroller does the work of a little PC (likewise called a microcomputer). It can direct the activity of installed frameworks. It comprises of a processor center, memory and a few info/yield peripherals. We are utilizing ARDUINO UNO as a microcontroller. Arduino is a straight forward, adaptable and open source stage yet exceptionally refined gadget for investigating purposes. Arduino board goes about as an expert unit of framework as it is mindful for controlling different parts.[3]
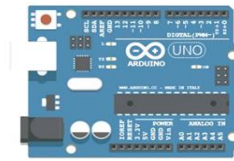
Figure 3 Micro-controller

Temperature sensor (DS18B20)*:*

Temperature sensor helps in recognizing temperature of a surface; may it be an article or the climate in touch with it. For taking internal heat level estimation we are utilizing Dallas Temperature sensor which is broadly utilized for assessing temperature readings. Dallas Temperature can be designed with Arduino UNO and give yields of temperature Readings. [1]

Figure 4 Temperature sensor

Pulse Sensor:

Heartbeat sensor SEN 11574 is a typical sensor for estimating beat rate. It is an attachment and play sensor when designed with Arduino. By basically cutting the sensor to fingertip we can gather pulse information.[1]

Figure 5 Pulse sensor

Laptop/PC/Smart Phone:

In request to get to the information shipped off the data set from through GATWAY there needs to be a medium. There can be different mediums in this world brimming with assistive innovation gadgets. Such as PC, PC, advanced mobile phones. Some other equipment gadgets we need are connector to give power source to the GSM module. Arduino can be associated with a PC/Laptop and get its force from that

2.1 Connection Set-Up:

The temperature sensor, DS18B20 and therefore the pulse sensor, SEN11574 are first configured with the Arduino Uno Board so as to urge these two vital measurements from a patient. The Dallas temperature sensor has three pins, the primary pin is connected with the

ground, the second pin is connected with a 4.7K ohms then with the output pin within the Arduino board., which basically gives the temperature result. The last pin is connected with the 5volt pin within the Arduino. Dallas Temperature requires One Wire and Dallas Temperature libraries within the Arduino library folder also. Since the heart beat sensor is just a plug and play sensor it doesn't require much calculation after the information is received. the heart beat sensor has three pins also. One pin is for the signal coming from the sensed data and therefore the other two pins are 5volts and Ground. [3]

Figure 6 Arduino UNO Configured with LM 35

Figure 7 Arduino Configured with Pulse sensor.

3. Software Module

WEB SERVER IMPLEMENTATION

A web server is a computer programed that processes requests using the http protocol, which is the most used network protocol for transferring data over the Internet. The storage, processing, and delivery of data to clients is one of the key functions of a web server. We used GSM to deliver data and a web server to store it in our project. For our project, we chose the MySQL database management system. MySQL is a prominent SQL database management system that is open source, extensively used, and sponsored by Oracle Corporation. MySQL also supports relational databases, which is another reason to use it. As a result, it's incredibly versatile to utilize because we may put information in separate tables rather than all of it in one.

Initially, we used our localhost for development, database creation, and testing, as well as quality assurance checks, because it can be difficult to identify bugs in online and live environments. We adopted an agile strategy because it is a good strategy for making changes that are both flexible

and quick. We purchased paid hosting and uploaded our application for real-time testing after a successful installation on localhost.

Figure 8 Web Server Implementation work flow

It's worth noting that with our system, a single Integrated application treat a large number of patients. The method is founded on a one-to-many interaction, with numerous patients receiving care from a single doctor. [4][5]

3.1 Integrated Application Development:

Our project's main goal was to collect data from sensors and transfer it to an application using an Arduino Uno module. However, we came up with the notion of creating an integrated application after that. We chose the Microsoft platform for the application. Microsoft provides a world-class platform for developing applications and games for Microsoft customers all over the world, as well as an open commercial centre for distributing to them straight away. With more than 300 hardware and software products, Microsoft has swiftly become the fastest-growing portable system. Our primary goal was to create a platform that allowed patients, doctors, nurses, and medical shops to communicate more easily even when they were not physically there. As a result, it was another. "Novel approach for IOT based patient health monitoring system utilising wearable sensors" is the name we chose for our application, which means "an application that is as useful as a friend for patient and doctor. [8]

3.2 Work Flow of application:

For our project, we developed an integrated application based application. Our application has a desktop mode that allows us to view all of our data, which is kept on a live server. Our programme can only be used on a computer. We'll go over the source code section in more detail below. When our application starts to create, the on Create method is invoked, and we've used auto generated

classes to initialize Microsoft Dot Net Framework and set the content and layout of our programme. As the desktop attribute requires multiple enable difficulties, we must enable vb.net, xml enable, and so on. First, we use the dot net desktop built-in connection string class to check internet connections using the Online method. If internet connectivity is unavailable, the show Settings Alert method is invoked, which displays an alert message stating that internet access is unavailable and, if necessary, initiates the settings activity via the on Click Method Present inside it.[8]

RESULT AND DISCUSSIONS

The data is distributed to the database by Arduino UNO and application and the way the application "Novel approach for IOT based patient health monitoring system using wearable sensors" was developed.
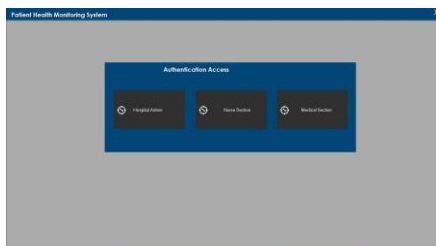
Figure 9 Integrated Application Dashboard
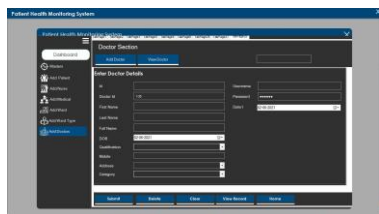
Figure 10 Admin Section Dashboard
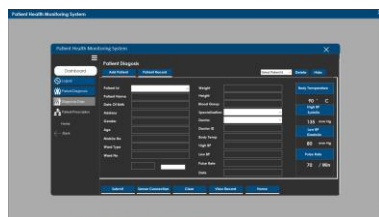
Figure 11 Nurse Section Dashboard

Figure 12 Medical Section Dashboard

3. CONCLUSIONS AND FUTURE WORK

The system that was proposed was a model of prototype system. Our main objective was to focus on the monitoring of health with the wireless body area network. However, we have successfully implemented the prototype and an accurate results analysis occurred. Basically, the wireless body area network is a vast area to expand. The implementation of computing in medical science has become a new era to develop. The introduction of a health monitoring system with a request will really be useful for people in the developing country. One of the main reasons for our project was to create a real-time communication between the doctor, the patient, the nurse and the medical stores in an easier way. Although our model has implemented and tested, but to introduce it in real life, many more improvements are needed and equipment is also needed. The actual goal of our system will be fulfilled when we can use the health monitoring system and the "novel approach to the IOT-based patient health monitoring system using portable sensors" will benefit peoples in world.

We want to add some characteristics to this application in the future, how to do it dynamic, so That the doctor can customize the time interval. Currently the data is sent according to our device which is already configured.

We have an automated emergency email sending system on our request. When EL. The patient's data are abnormal; an emergency email will be sent to emergency email Talk to. We also plan to implement a push notification system in the future.

We will also include the GPS system to know the current location of the patient. Our project is just a platform. This is our initiative to introduce this device to development. Country like ours. Although it may sound like an expensive project, but it is very profitable as Our concern was the developing country. but we hope to continue with our Investigate on this topic and implement it in the real world.

REFERENCES

[1]. An IoT Based System for Remote Patient Monitoring Alexandru Archip, Nicolae Botezatu, Elena S¸erban, Paul-Corneliu Herghelegiu and Andrei Zala,Gheorghe Asachi ,2018

[2]. Pine, C. John, "Technology and Emergency Management," John Wiley& Sons, book, 2017.

[3]. Mobyen, H. Fotouhi, U. Kockemann, I. Tomasic, N. Tsiftes, and T. Voigt, "Run-Time Assurance for the E-care@home System, " the 4th EAI International Conference on IoT Technologies for HealthCare, 2017.

[4]. P.Y.Shende,P.M. Mude, "Design and Implementation of Security System for Medical Test Data Mining", Journal of Advanced Database Management & Systems , Volume 1, Issue 1, 2014.

[5]. Tomasic, N. Petrovic, H. Fotouhi, M. Linden, M. Bjorkman, "Data flow and collection for remote patients monitoring From wireless sensors through a relational database to a web interface in real time," EMBEC & NBC, Springer, Singapore, pp. 89-92, 2017.

[6]. A.M. Uddin, Sh. Begum, and W. Raad, "Internet of Things Technologies for HealthCare," Springer, book, 2016.

[7]. H. Rahman, Sh. Iyer, C. Meusburger, K. Dobrovoljski, M. Stoycheva, V. Turkulov, Sh. Begum, and M. U. Ahmed , "SmartMirror: An Embedded Non-contact System for Health Monitoring at Home," International Conference on IoT Technologies for HealthCare. Springer, Cham, pp. 133-137, 2016.

[8]. M. Canonico, S. Montani, and M. Striani, "TEEM: A Mobile App for Technology-Enhanced Emergency Management" International Conference on IoT Technologies for HealthCare. Springer, pp. 101-106 Cham, 2016.

[9]. E. Granulo, L. Bećar, L. Gurbeta, and A. Badnjević , "Telemetry System for Diagnosis of Asthma and Chronical Obstructive Pulmonary Disease (COPD)," International Conference on IoT Technologies for HealthCare, pp. 113-118, Springer, Cham, 2016.