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MULTIPLE PATIENT MONITORING SYSTEM USING IOT AND CLOUD COMPUTING

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Abstract - *This document specifies about the centralized patient monitoring system based on IOT(Internet of Things) and cloud computing. In which the vital body parameters of patients is sensed through various sensors and is frequently updating the real time data to the cloud ,where all the parameters have present range, but if in case there is any abnormalities it will be recognized and then system gets alerted and will also alert the medical staff. In this method by giving the monitor unique code to each bed the patient location can be easily located and the details of the every patient on bed at the current situation can be taken into consideration. This can also be used during a pandemic situation where thousands of patients can be monitored based on the data.*

***Key Words*: IOT, ICU, ITU, ECG, CCU, cloud computing.**

1. INTRODUCTION

Patient monitoring system is a very critical monitoring system which is used for monitoring physiological signals of the subject under observation. In Patient monitoring system the multiple sensors and electrodes are used for receiving physiological signals from the subject[1]. During treatment it is highly important to continuously monitor the vital physiological signals of the patient, therefore, the patient monitoring system has always been occupying a very important position in the field of medical devices. The continuous improvement of technology has not only help us transfer the vital physiological signals to medical personnel but also simplifies the measurement and as a result rises monitoring efficiency of patient.

The Patient monitoring system is mainly used in sensitive units of the hospital such as ICUs.

Intensive Therapy Unit or Intensive Treatment Unit (ITU) or Critical Care Unit (CCU), also commonly known as an intensive care unit (ICU), is a special department in the hospitals, where specialized treatments are provided to the patients who require a critical medical care. These ICU rooms should be monitored carefully and frequently, to keep an update with the patient's condition and their responses to the ongoing treatment.

Intensive Care Unit (ICU), have devices to monitor patient's physiological conditions such as the health support devices, such as, Mechanical Ventilators, monitors, infusion pumps, Bedside Terminals, electrocardiogram (ECG), body temperature, blood pressure and respiration monitoring system.

Monitoring all the above different body parameters of the different patients and keeping a track of various patients is a difficult task, where the minute information of the patient can be overviewed or ignored.

Therefore, patient monitoring system using Internet of things(IOT) and cloud computing plays a vital role, in frequently updating the real time processed data to the cloud and if any abnormalities are sensed the concerned authorities are intimated immediately.

2. EXISTING SYSTEM

The present patient monitoring system is:

1. Traditional monitoring system
2. Smart patient monitoring system

Traditional patient monitoring system:

The traditional patient monitoring system is where a doctor or the nurse observes the subject's behavioral or physiological changes.
All the information and updates concerning the patient are noted down by the nurse/doctor in charge of that individual.

Smart patient monitoring system:

The smart patient monitoring system is where a single patient is monitored by the doctor remotely i.e., IoT based single patient monitoring system (at present only a single subject is considered).

In these, smart patient monitoring systems, IoT based development boards, such as Arduino 101 are used to collect the data from the health support devices, and further, the patient's data is sent to the database where the information is stored. And if any abnormalities are sensed by the system, it sends an alert message to the doctors[2].

3. PROBLEM STATEMENT

The disadvantage of the existing system is that we are using only single patient monitoring system and only nurses are checking every half an hour on patient manually but this must not take place because if there are more number of patients admitted at once then need to give preferences only to people who are in critical system and this can be overcome by using multiple patient monitoring system which will keep sending real time data and will be stored in cloud.

Using this method the patient who is critically not doing well can be spotted easily and the doctors can react to the situation very easily and start with their medication.

In pandemic situation no of patients are larger, present technology can monitor patients one by one personally where health care becomes inefficient hence by using this technology we can keep track on all patients and doctors from stressing and keep both in good condition.

4. METHODOLOGY OF PROPOSED SYSTEM

The methodology of the proposed system can be shown in the FIG-1 in which we can use the microcontroller ESP 32 For reading the data from the medical health support Which consists of all the sensors which can take physiological parameters from the patients from the given monitor coded machines for particular beds in ICU wards with the help of IOT(Internet of Things) for this reading of data and make it more efficient to transfer data at higher speed with low cost. This data will be then sent with the help of Wi-Fi to the router and then to the cloud which keep updating because of the real time values to the monitoring room and this would be monitored by the technician and the nurses and if in case they find some abnormality in the patients data then they would check on the patients. This is helpful when there is pandemic situation where huge amount of people can be given importance and can be uniformly maintained and checked based on the reports we get in the cloud.

This method would be highly reliable, time efficient and cost efficient. This can also keep medication digitally checked this will help the nurses and doctors to would be tension free and would not forget any patient and every patient as well as doctors and nurses are taken care with this method.

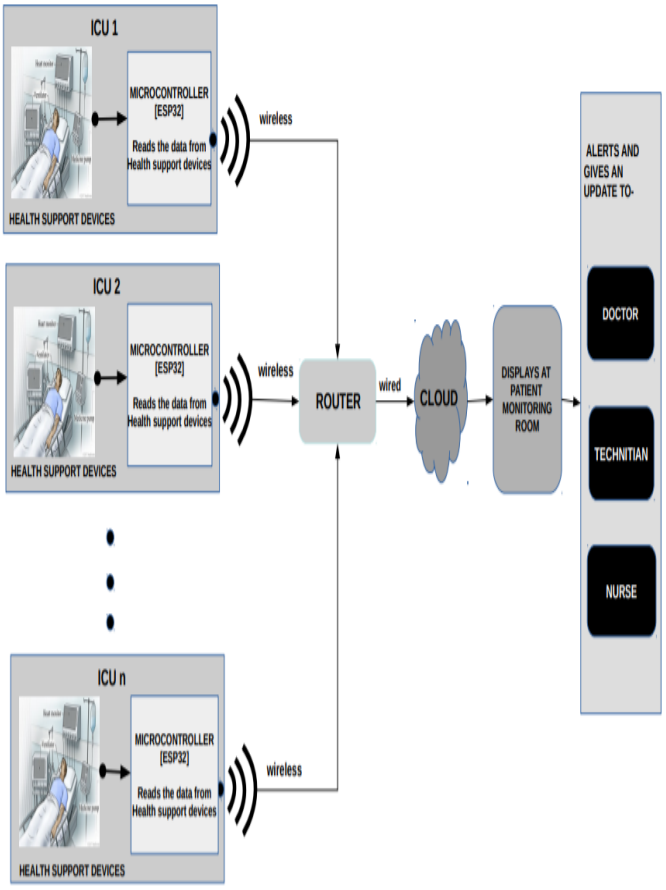

FIG -1 PROPOSED MULTI PATIENT MONETERING SYSTEM USING IOT AND CLOUDCOMPUTING.

5. HARDWARE COMPONENTS

HEALTH SUPPORT DEVICES :

These are the devices that are used to note the different body parameters of the patient. Few examples of health support devices are:

1. **Electrocardiogram (ECG)**:

An electrocardiogram (ECG) is a test that measures the electrical activity of the heart to check whether or not it is working normally. An ECG records the heart's rhythm and activity as a line on a screen.

2. **Mechanical Ventilators** :

A mechanical ventilator is a machine that helps a patient breathe when they cannot breathe on their own due to a critical illness. The patient is connected to the ventilator with a hollow tube that goes in their mouth and down into their main trachea.

3. **Body temperature sensor** :

The body temperature sensor allows you to measure body temperature. The reason is that several diseases are accompanied by characteristic changes in body temperature.

4. **Blood pressure monitoring** :

blood pressure is a reading of the force with which the blood is passing through your circulatory system. Blood pressure can be monitored with the help of A sphygmomanometer. Monitoring the blood pressure of the patient is important as the blood pressure fluctuates as a response to small changes.

5. **Respiration monitoring** :

Monitoring the respiration rate is important as the change in respiration rate is often the first sign of deterioration as the body attempts to maintain oxygen delivery to the tissues. A respirometer is a device that is used to measure the rate of respiration of a person by measuring their rate of exchange of oxygen and/or carbon dioxide.

MICROCONTROLLER:

The microcontroller device used to process the data received from the health support devices is ESP32.

ESP32 is a low-cost microcontroller which has integrated Wi-Fi and dual-mode Bluetooth(BLE).

ESP32 also has a variety of modules and development boards for building IoT applications effectively.

Wi-Fi and BLE (Bluetooth low energy) are common network stacks in the Internet of Things applications that provide cost-effective solutions.

Due to integrated Wi-Fi, ESP32 can easily transmit the received data from

ROUTER:

A router is a networking device that is used forward data packets between the computer networks. The Routers are meant to perform the traffic directing functions on the Internet. The main motive of a router is to connect multiple networks and forward packets to its destination. The ESP32's wireless adapter translates data into a radio signal and transmits it using an antenna/transmitter. A wireless router receives the signal from the ESP32 and decodes it. The router sends the information to the Internet/cloud using a physical, wired Ethernet connection[3].

CLOUD STORAGE:

Google cloud is used for cloud computing for centralized patient monitoring systems, where the Google cloud is secured and has dynamic ability for computing which makes detecting patient abnormalities easily, and can be intimated health workers remotely, this enhances the flexibility in usage of the technology and also volatile in patient observation.

The Google cloud is more reliable for long term usage as data rate in this use case is lower and data can be further used for scientific studies related to healthcare and medicines.

6. CONCLUSIONS

The benefit of this multiple monitoring system using IOT and Cloud computing helps patient data to kept on track and It also provides us the security .By using this we can keep a track on vital physiological parameters from the time of admit and discharge of patients. This data can be used to make detailed case study of the patients health and all the data combined would be used for research .By storing all the data of the patient in the cloud we can create a secured environment for the patient.

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