

“An Implementation of IoT System for Smart Hospitals to Monitor Patients”

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Abstract

Internet of Things (IoT) enable humans to urge high level of automate by establish system using sensors, interconnected devices and Internet. In ICU, patient monitoring is serious and most vital activity, as small delay in decision associated with patients' treatment may cause permanent disability or maybe death. Most of ICU devices are equipped with various sensors to calculate health parameters, but to watch it all the time remains challenging job. We are proposing IOT based system, which may help to fast conveying and identifying emergency and initiate communication with healthcare staff and also helps to initiate proactive and quick treatment. This health care system reduces possibility of human mistakes, delay in communication and helps doctor to spare longer in decision with accurate observations. With the rapid development of smart devices and the Internet of Things (IoT) technology, some traditional business sectors are embracing new possibilities. Particularly, in the field of healthcare, the IoT technology is transforming the landscape and posing high requirements on the hospital resource management. This paper develops an IoT system that could be deployed in hospitals for various applications, supports LoRa, Wi-Fi and other data collection methods, uploads the data to the cloud platform for further processing through a secure connection, and feeds back to users in real-time through the user interface. This article contains an introduction to the implementation and structure of the system, as well as a simple demonstration design and test results. Index Terms—Internet of Things (IoT), Cloud Computing, Data Visualization, UWB Position, ECG Signal, LoRa, MQTT.

Keywords: *Internet of Things(IoT), ICU, Real Time, smart hospital, Temperature sensor Heartbeat Sensor, wi-fi module, microcontroller, 2-way communication, Arduino UNO.*

Introduction

IoT system for healthcare sector especially useful in ICU, CCU, and Ambulances etc. Efficient monitoring in ICU, CCU or ICU on wheel is indispensable need in healthcare. In ICU, patient monitoring is critical and most important activity, as small delay in decision associated with patients' treatment may cause permanent disability or maybe death. Most of ICU devices are equipped with various sensors to live health parameters, but to watch it all the time is still challenging job. In nutshell the proposed intelligent real time IoT based system for monitoring ICU Patient will prevent from human errors and allow to continuous patient monitoring with less support staff; also provide efficient communication for precise information. Real time patient monitoring system collect data through bed side patient monitors. Inter communication network system uploads this data on cloud for further processing. Intelligent software agent process this data further and sending notification to special monitoring cell and doctor. In hospitals, where patient's status needs to be regularly monitored, is usually done by a doctor or other paramedical staff by constantly observing some important parameters, such as body temperature, heartbeat, and blood pressure thus, this task becomes tedious after sometime. Hence it can cause problems. However, there are many researchers have attempted before to solve it in many different ways, but the earlier methods in several cases either SMS will be sent using GSM or RF module will be used to send patient's data from sender device to receiver device. Moreover, in the earlier cases the history of the patient cannot be displayed, only current data is displayed.



Fig: Smart Hospital Scenario

Our implemented System

This system we are developing IOT for smart hospital. This system are controlled by an single admin which is an operator and also Technical person in ICU, CCU. The person should have register his authentication like name password recovery password etc. Then the person should login to this system and monitor to the system. The login database should get check at the login time then it fetches the database. The system can check temperature, Humidity, ECG, pulse rate and give a fire alert/alarm. There are two sensors used in this system Temperature Sensor and Humidity Sensor and some of the wearable devices and some are the bed aside devices to monitor patient and ICU, CCU. Smart ICU System sends continuous data to the cloud base monitoring system through different sensors and devices. Using that system continuous remote monitoring is done. When the patient is in the critical condition system generate the alert and notify to the doctor/admin.

Algorithm:

- 1] Start
- 2] Initializing Arduino kit.
- 3] Login /Sign up of user
- 4] Monitoring
- 5] Detecting alert/Notification.
- 6] Reach to the patient for treatment.
- 7] Stop.

1. Temperature sensor

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. There are many different types of temperature sensors. Some temperature sensors require direct contact with the physical object that is being

monitored (contact temperature sensors), while others indirectly measure the temperature of an object (non-contact temperature sensors).

2. Humidity sensor

A humidity sensor is an electronic device that measures the humidity in its environment and converts its findings into a corresponding electrical signal. ... Relative humidity is calculated by comparing the live humidity reading at a given temperature to the maximum amount of humidity for air at the same temperature.

3. ECG

An electrocardiogram (ECG or EKG) records the electrical signal from your heart to check for different heart conditions. Electrodes are placed on your chest to record your heart's electrical signals, which cause your heart to beat. The signals are shown as waves on an attached computer monitor or printer.

4. Pulse rate

Pulse/heart rate is the wave of blood in the artery created by contraction of the left ventricle during a cardiac cycle. The strength or amplitude of the pulse reflects the amount of blood ejected with myocardial contraction (stroke volume). Normal pulse rate range for an adult is between 60-100 beats per minute.

5. Fire alarm/alert

A fire alarm system warns people when smoke, fire, carbon monoxide or other fire-related emergencies are detected. These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns.

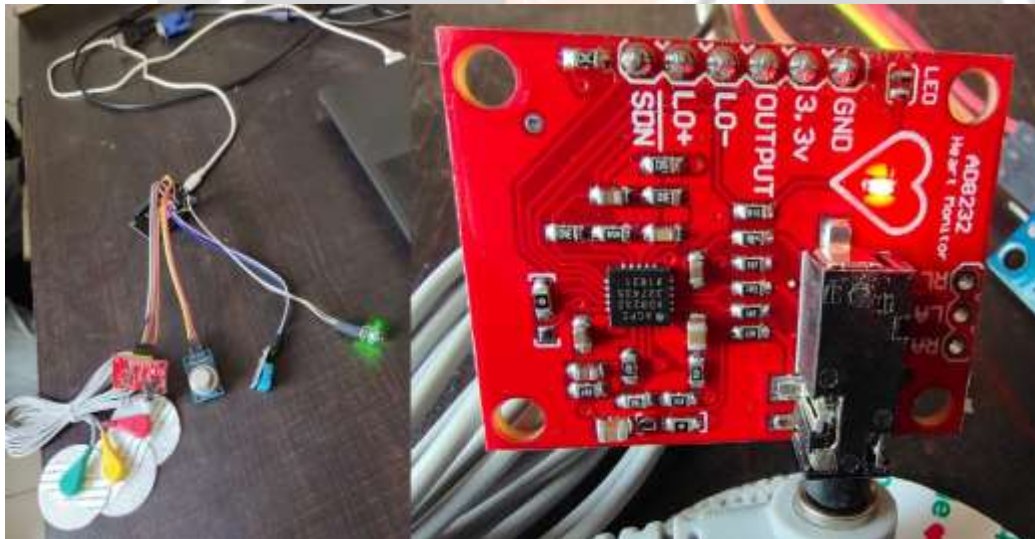
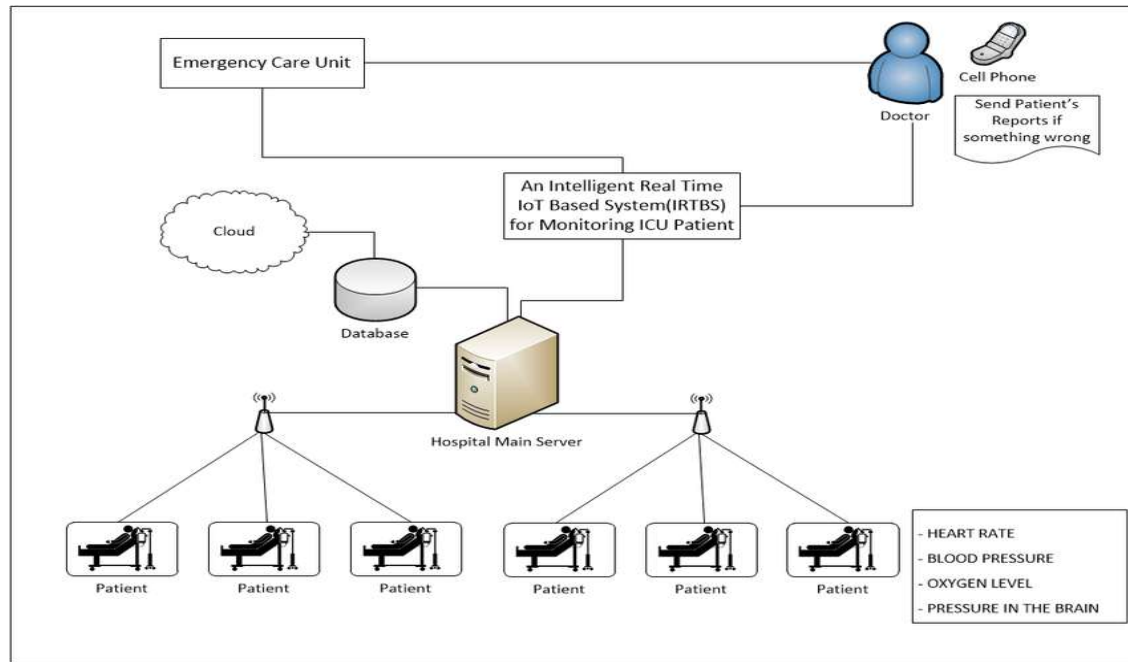


Fig. IOT Sensors and devices

System architecture



Configuration details

Software required

- Operating System: Windows 7 or higher
- Platform: IoT Cloud
- IDE: Arduino 1.8.4
- Database: MySQL
- Technologies used: SQL

Hardware required

- Micro controller: Arduino Uno Board
- Sensors: Temperature(LM35), Toxic gas(MQ9), GSM Module, GPRS Module, ECG,
- Humidity, Air Quality, Pressure
- Processor: Pentium IV or higher
- Processor speed: 1.6GHz
- RAM: 512 MB or higher
- Disk Space: 80 GB or higher

Application :-

- Remote patient monitoring
- Heart-rate monitoring
- Public safety Security
- Tracking patients.

Conclusion

Real time IoT based system for monitoring ICU Patient reduces chance of human errors significantly as patient admitted in hospital require 24x7 continuous monitoring. is normal scenario patients as compared to attendees doctors. IoT based systems automate the critical observations in ICU and facilities doctors to spare towards decision. Future work can extend by connecting and coordinating doctors availability for treatment and contribute /serve to the hospitals and helps in balancing the load. The proposed architecture tested and compared with existing system.

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