NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696
VOLUME 5, ISSUE 5, May-2018

IMPLEMENTATION OF SMART HOSPITAL USING INTERNET OF THINGS FOR HEALTHCARE SYSTEM

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ABSTRACT
In India, the hospitals are slowly gaining importance, now we can find very few Smart hospitals but they are very expensive. The wide use of Internet of Things, mainly smart wearables, is important forgood quality of medical care, which bring comfort for patients and improving the organization level of hospitals.In before research there was one disadvantage that when the server gets off then the communication problem can occur to solve this we are using alarm which will indicate the server is down. Wi-Fi module is the important thing for this project which consist of data that is required anytime anywhere. The costing of smart hospital can be decreased by using Internet of Things. Thus, the project is a combination of sensors, softwareand Internet of Things. Using this system, one can control electricity equipment's and monitor the medication from a remote place and monitor entire process.

KEYWORDS: Sensor Technology, Smart Hospital, Wi-Fi module, Health Monitoring, Internet of Things.

INTRODUCTION
Internet of things consist of network which has various physical quantities such as software and sensors which are embedded together and can collect the data from surrounding and share it across internet.[1] In smart hospital Iot system we focus on review of IoT based Smart Healthcare System. Here wireless communication is used for transmitting the patient's health monitoring parameters. [2] In the latest technology, IOT is a recently growing technology for communication for short range. [3]In a design approach to smart system based on Internet of Thing the hospitality efficiency and related issues had become one of the leading focuses of the global world. [4]The main objective in hospital security is to help patient's and to control medical devices and aware them in critical situations. [5] Internet of Things allows machine to machine interaction which will convert the healthcare delivery, affordability and reliability in coming future. Additionally, it will increase patient's engagement in decision making will boost the healthcare service compliance. [6]
The IOT provides very smooth and new life to the healthcare field. It also has a very fast development in many sections. But in medical field it is most important. The Internet of Things, boost the quality of information and the patient care in Medical section. So, IOT is actually used for internally joining all the resources. [7] Whenever a saline is given to any patient, he/she needs to be constantly checked by a nurse or any staff. Most of the time due to carelessness of staff, inattentiveness and more number of patient's in hospital, the saline is totally consumed by patient. When the quantity of saline goes below a certain level the value will be shown on monitor or other device and the nurse can take quick action. [8]
The system consists of planning and arrangement of smart hospital based on Internet of Things to overcome the drawbacks of the information system, such as the fixed information point, inflexible networking mode and so on. [9]

The paper is well ordered as follows- the section-I consist Introduction, Section-II consists of Literature Survey, Section-III consists of Implementation, Section-IV consist of Methodology. Similarly, next section consists of Result, Future Scope, References.

LITERATURE SURVEY

System is purely working on IOT and Wi-Fi module. We used Wi-Fi modulefor communicating data, this data can be stored permanently and can be accessed anywhere. Wi-Fi moduleis also useful to keep update of patient. Doctors and hospital staff can immediately take serious action on patient and also provide medication depending on patient's situation. [1] IOT has been already designed for Wireless sensor network.This system presents the architecture of IOT and alsoplanning on Smart health monitoring using IoT. In IOT there are some problem which are required to be solved. New technologies could be used to minimize them by giving them better quality and alsosecurity. This system showed us the problems and challenges that could come. The patient's status is automatically generated and cache in the cloud server and also alerts are generated if the patient is in a critical condition. [2] Currently we can saythat for providing a better solution to the hospital's management system in many hospitals IOT promises appear to be acceptable. This paper shows a patient's care and monitoring system architecture to get the answer of the problem of observing and controlling. The proposed architecture has following technologies like IOT, wireless sensor network Wi-Fi module, agent and other advanced technologies to collect, store, manage and supervise traffic information. [3]

In this following system we had tried to present basic idea how we can control hospital appliances by computer technology. The main purpose of this system is to help handicapped people.It provides security and is easy for staff to observe. As the devices are operated through a website, the staff or the operator can access it far away from hospital where Wi-Fi is available. [4]IoT enables the real time health monitoring, data registration and health record maintenance to assist in the data driven decisions. These may give the personalized health management for the patients. [5] IoT is universal occurrence of devices and software which are divided and work together to achieve common goal. IoT spreads out a set of technologies that authorized in a wide range of things to work together and communicate among themselves using networking. [6]

Saline level indicator for patient in smart hospital for safety is affordable, low power consuming and highly efficient device that can be used for checking the amount of saline present in the bottle. From the hospital staff someone is continuously present to monitor, but the patient fed to a saline as a slight carelessness can cause fatal accidents. [8] The sufficient analysis of smart hospital's connotation, architecture, technology and construction, we suggest a concrete application scheme and it changes the existing hospital clinic model, having achieved satisfactory result.In this paper, we analysed the current state and gave future directions for integration of remote health monitoring technologies into the clinical practice of medicine. Wear able sensors, particularly those furnished with IoT intelligence, offer attractive options for observation and recording of data in hospitals and working environments.

From the last few years, Wi-Fi module has served many chances for business by providing users a wide length of computing services. It also defeated platform dependency problems with no software installation on user side. People pay only for the service becomes an economical substitute for managing and be responsible for data centres to web applications and batch processing users [3].It permits location independence facility as users will access these services anywhere with an internet connection.

IMPLEMENTATION

In the medical domain of IOT some scholars recommend IOT in medical such as medicines based on IOT, IOT in health maintenance which have the same effect, only another angle and range of description. In the technology of IOT, the hospitals are constructed with the many application service systems.

In the below figure, there are three parts which are given as follows:

1. First part consist of fan,light,ultrasonic sensor etc.
2.Arduino mega (ATMEGA Atmel328PU)+Ethernet shield(W5100)
3. WEB serverto transmit and receive the data.

4. Second part which includes html page or smart mobiles having Web lens application which includes switch controller for fan and light.

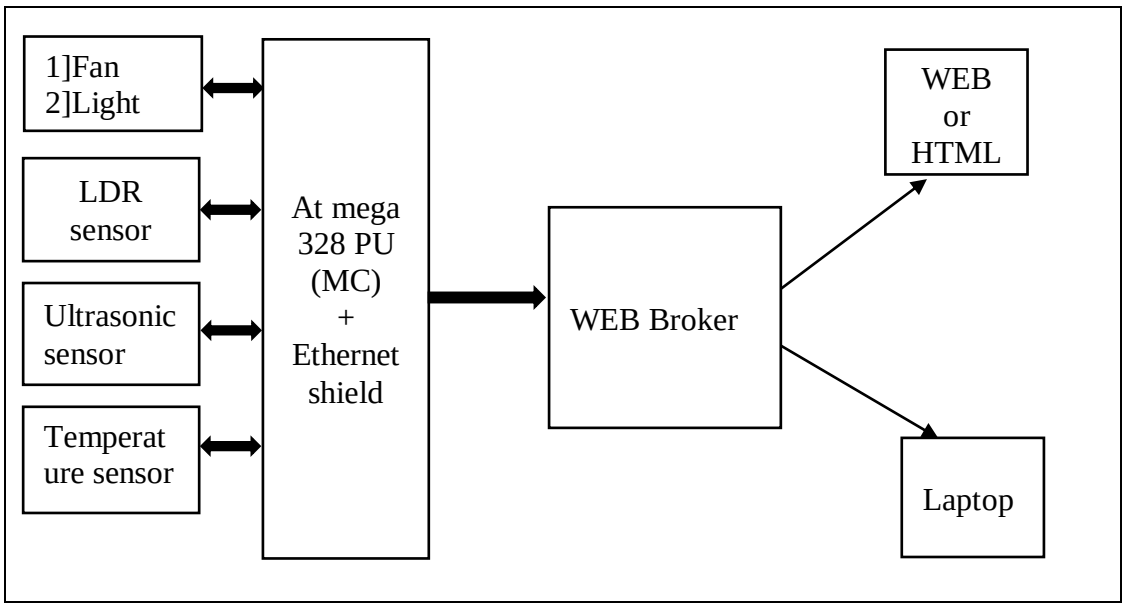

Figure 1:Implementation of system.

IOT will become a very important part of next generation of network, and it will totally internet based and can be implemented in very low cost and consumption of electricity will be very less.

Table 1. Components used and working

SR NO.	SENSORS	WORKING
1.	Digital Temperature Sensor (DS18B20)	In this system,digital temperature sensor will capture the data from surrounding that is digital temperature sensor will constantly monitor and will give values on web page or on smart mobile devices.
2.	Light dependent Register	LDR(Light Dependent Resistor) will continuously monitor light of patient's room in terms of resistance value and displayed on web page.
3.	Ultrasonic sensor	Ultrasonic sensor will check the quantity of saline in bottle. This level will determine whether to change the saline bottle by staff or not.
4.	Arduino At-mega (AT mega Atmel 328PU).	In this system, all the sensors are connected with Arduino mega board(AT mega Atmel 328PU).
5.	WI-FI Module	This will provide communication in system which will use to receive and transmit data from server and Arduino.

METHODOLOGY

In this project we have implemented the following technologies for smart healthcare system. This will help the hospital to provide the patients a satisfaction and improves the management of hospital.

1] Internet Technology:IOT is important for next generation and it is essentially network.Therefore,the internet is basic requirement of IOT in order to communicate with any person and object at any time and place.

2] Sensor Network Technology: The sensing layer mainly solves the data collection problem from devices. In this layer, there are two main parts. One is the basic sensors, such like ultrasonic sensor, various sensors, cameras, GPS, two - dimensional code labels and readers and other basic identification and sensor components). The other one is the sensor network. Both networks could help to recognize the mark on the item and collect information intelligently. Therefore, the following layer is the primary and core layer in IoT. Both networks could help to recognize the mark on the item and collect information intelligently.

Sensor nodes are tiny devices; they are self - organizing wireless communications. They use Wireless communication technology for data forwarding. Each node has both data acquisition and data fusion forwarding functions. There are various types of sensor, most of them have the function of detecting temperature, light, sound and vibration. There are also some components for the wireless sensors, which are processor, memory, RF transceiver and sensor.

3] Wireless Communication Technology:IOT is a new trend. In order to obtain the goal of present computing system, several technologies work effectively in IOT. They are RFID, Wireless Sensor Network and Web server. Among all the technologies, these three are playing an important role in the Internet of Things.

4] Embedded Technology: Just because many intelligent products have the requirements of network, it accelerate the production of IOT, so IOT is the good solution for embedded technology development and it cannot do extensive use without embedded technology supporting.

5] Internet of Things: In our proposed system we have implemented IOT which is the network ofembedded with electronic, software, sensors, and connectivity which enables these objects to connect and exchange . Each thing can be identified through embedded computing system andcan be operated within the existing Internet network.The IoT allows devices or things to be sensed or controlled remotely across existing network, creating opportunities to merge world into embedded computing system, and resulting in improved efficiency, accuracy which will reduced human efforts. When the sensors are increased in IOT , the technology becomes an example of the of cyber-physical systems.

6]Arduino at mega: The microcontroller Arduino Atmega328 is single chip and is created by Atmel in mega AVR family.The Arduino AT mega328 is 8bit AVR RISC microcontroller which combines 32 kB flash memory with read-while-write operations, 1 kB EEPROM, 2 kB SRAM, 32 general purpose working registers, 23 general purpose I/O lines,internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN packages), three flexible timer/counters with compare modes, programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The ATmega328 is commonly used in many projects and systems where a simple, affordable micro-controller is needed. It is mostly implemented in Arduino platform that is Arduino Uno and Arduino Nano models.

7] Web Server: Web server mentions the server software, or hardware which is used for running software, that can serve contents to the World Wide Web. In the process of Web server, the request is coming from HTTP protocol or other related protocols.The most basic function of server is to store, process and deliver web pages to the users. The interaction between users and server takes place using the Hypertext Transfer Protocol (HTTP). Pages delivered are mainlyHTML documents, which may consists ofimages, style sheets and scripts. If there is heavy traffic website then at that time multiple servers are used.For example, Dell serveris installed together which is used for the Wikimedia Foundation. A user, commonly a Web browser, starts communication by creating a request for a resource using HTTP and the server responds with the content of that resource if the content are not proper then it sends error messages. While the HTTP only includes the contents that are serve whereas it also includes ways of receiving datafrom users. This characteristics is used for submitting web forms and also includesuploading of files. Many web servers also support server-side scripting using Active Server Pages (ASP), PHP, or other languages. The previous data is basically used for recovering or modifying information from databases.

Web servers are not only used for serving the World Wide Web, they are also found inembedded devices such as printers,webcams, routers, and serving only a local network. The web server can also be used as a part of a system for observing or managing the device in system. This actually means that no additional software is required to be installed on the user computer, because the web browser is present (which consists of manyoperating systems).

In theabove system the operation of sensors are like, the digital temperature sensor we will get to know the temperature of patient’s room that will be shown on web page or smart mobile devices. Similarly, the light dependent register will be monitored and controlled be the staff of hospital. The ultrasonic sensor present in system will check the quantity of saline bottle and will provide the values of level on display where the staff can check it. This sensors will create the data and this data will be transmitted to Arduino mega board by

USB (universal data bus). The data is then provided to the server with the help of Wi-Fi module. Whenever one wants to check this data then that person has to subscribe to the WEB server and then hospital staff can monitor the data received. WEB platform is used for controlling the switch which will control electrical appliances an ,light. Whenever the room's temperature increases above decided level, it will send the data to the page and then from the webpage or from the mobile device.

In case of saline bottle, the quantity of the saline bottle is continuously send to the server so that hospital staff does not require to go to each and every patient's room to monitor it. As soon as the level of liquid in a saline bottle falls below from the decided value then nurse can go to the patient's room and change that bottle.

RESULT AND CONCLUSION

Here the hospital is successfully designed with the help of IoT. This project is highly efficient as it uses Arduino AT mega Atmel 328PU microcontroller chip, which has low power utilization. It also uses Wi-Fi module to transmit and receive the data from system. This protocol is a light weight protocol and saves power. It is possible to control the electrical appliances from a webpage or from mobile devices. It is user friendly system. Maintenance of this project is very cheap.

1] Reduction in number of human errors: We have studied how we can build and implement IoT based system to assist in various functions of healthcare industry.

2]Decreases cost of the system: Healthcare solution provider have seamless connectivity to healthcare solutions; thus, patient observation can be carried out in real time, thus drastically reducing number of visits by doctors. Such medical care facilities also help to reduce number of hospital stays.

3]Enhanced Treatment Results: Connectivity of health care solutions through Web server or other infrastructure gives the ability to access real time information that enables them to make proper decisions as well as offer treatment that are required. Thisensures health care provision is timely and treatment outcomes are improved.

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