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Design of Iot Based Smart Health Monitoring and Alert System

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ABSTRACT

This paper presents a reconfigurable sensor network for structural health monitoring. Real-time and periodic structural health monitoring can reduce the probability of collapse and the consequences of potential life-threatening conditions. Computer communication systems and Internet plays an important role. NFC technology to fetch patient complete information automatically when doctor approaches patient. Biosensors interfaced with the microcontroller will monitor patient's vital health. If any of the sensor's preset threshold value is exceeded beneath, an SMS will be sent to doctor and the patient's caretaker.

The monitoring system comprise of web server part: The sensor network in which the sensor nodes are equipped with different biometric sensors, sensor data will be regularly transferred to hospital database from which it is upload to hospital's webserver continuously. doctor can monitor the patient condition from any place.

1. INTRODUCTION

Most of the developing countries have very poor healthcare infrastructure there are very few hospitals in compare to booming population those few hospitals are inadequately equipped very few doctors are present the basic diagnostic equipment for the diagnosis of life threatening diseases are absent. if we could build a low-cost portable health sensing device, comprising of several sensors, capable of measuring the vital attributes of a human body, and has the ability to communicate with the hospital data base, we could provide with quality medical advice. The medical service is provided after one of the specialist doctors from a group of specialized doctors present all over the globe evaluates those health parameters on the hospital database (acts as private cloud).

Moreover, if the health sensing device is made to communicate with a portable computer like a tab or a smartphone which has the default ability of communicating with Cloud (hospital database), then the whole system would be much more cost effective. This is because nowadays most people have access to portable communication devices, and these devices have become quite cheap. The system can also be made IoT (Internet of Things) enabled and M2M (Machine TO Machine) compatible. In this paper, implementation of such a healthcare monitoring system is presented. Thus, we can potentially benefit a large population. For the healthcare monitoring system to be reliable, each sensor should timely measure the data following the prescribed sampling rate of the parameter, and the data should be sent to the data processor without any overlap. Each sensor has varying requirements in terms of data length or size and sampling rate the sensor data collected without overlap by data processor we can replace notepad at patient bed with smart device by using NFC technology and patient details can be extracted from smart device automatically by using NFC.

Remainder of the paper is organized as follows. In Section II, Internet of Things and its applicability in health-care domain are discussed. III Section design of an IoT based health-care system is proposed. IV

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NFC technology and its applicability in health-care domain is discussed v. implementation of NFC discussed c VI.results and discussion .Finally, we conclude the paper with a direction for future work in Section VII.

2. INTERNET OF THINGS

Internet of things is defined as Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts. It can be considered the Future of Internet [5], where every object is connected to other objects. Every object is given a unique identity in the network. This allows remote access of devices through the network, anytime and at any location. IoT enabled objects communicate with each other, access information over the Internet, and interact with users creating smart , pervasive and always connected environments. IoT also enables machine to machine (M2M) communication which allows machines being controlled by the Internet and by other machines. This can revolutionize the way technology is used, as machine takes control of machines overcoming the constraints that people face while communicating withdigital systems. Machines can monitor sensors all over the world to generate vast quantity of valuable information that would take a human years to achieve.

IoT makes the concept of pervasive computing and ubiquitous computing a reality by allowing objects of our everyday life like cars, roadways, pacemakers, pillshaped cameras in our digestive tracks, billboards that adjust to passersby, refrigerators and even cattle's equipped with sensors to communicate with humans and assisting them in every step

The application of IoT in health-care system is highlighted in the following section.

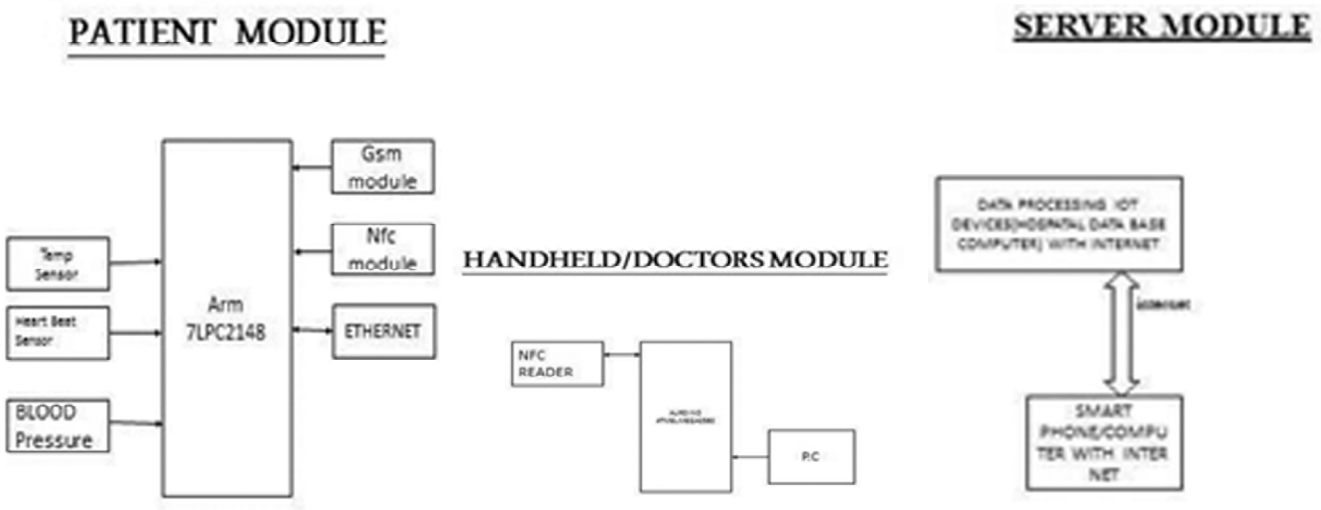
2.1. IoT in Health-care

IoT enabled remote health monitoring system has huge advantages over traditional health monitoring system. Health sensing components have become very compact and portable, allowing patients to wear them round the clock for monitoring. If these monitoring devices are equipped with unique identifiers like RFID, then those devices can be uniquely identified over the Internet. It acts as an information retriever, retrieving information from the physical world to the digital world . An IoT enabled health monitoring device connected to a patient can be considered as a virtual patient in the digital world. The virtual patient has the exact physiological conditions as the real patient. A doctor can monitor a patient only a few times a day but critical health issues can occur at any moment. So 24/7 monitoring of health data is necessary. As IoT enabled patients can be accessed over the Internet and by other machines, the health condition of a patient can be monitored uninterruptedly, allowing critical illness to be detected at the right time so that proper actions can be taken. Also, IoT can help to collect health records. Generating statistical information related to health condition, can be performed by machines. It is faster and voluminous and error free collection of data that is possible manual methods could never achieve. Generating statistics, surveillance, risk mapping of diseases can be done using remote health data.

3. DESIGN OF IOT BASED HEALTH MONITORING SYSTEM

In this section, a health monitoring system based on IoT is described. A health monitoring system comprises several sensors connected to a person and they communicate with a data aggregator and processing unit. The data aggregator and processing unit may be a specialized device and p.c. The aggregator unit has the responsibility of collecting each sensor data following strict sampling rate, it forms the Body In our design we have used an ARM7LPC2148 microcontroller as an aggregation. hospital computer used as a processing unit for our health monitoring system. The aggregator uses wired USB serial connection to communicate with the data processing unit.

The data received from the aggregator unit processed on the data processing unit, i.e. on the computer. The data can be used for drawing graphs and charts (e.g. graph for ECG monitoring data) and interactive



services be provided to the users based on this data. This system can receive valuable medical advice from the doctors for the patients and can set alarms or reminders for timely medications and appointments and graphic files

Figure 1 shows the design of the Health monitoring system. The system consists of three parts: patient module , doctors module server module . server module consists of two units : local and remote. The remote unit enables storing and distributing the data to doctors and. The local unit deals with processing of collected information from the sensors connected to a patient. It processes the collected raw data to generate meaningful information that can be understood by specialists and doctors. It then displays the processed information and sends it to hospital servers, sensor data from hospital sever was continuously upload to webserver*A. ARM(LPC2148)*

ARM LPC2148 microcontroller is used as a data aggregator unit. Arm lpc2148 was 32 bit processor with 32k of flash memory and 2kb of RAM. It has 6 analog input pins and 14 digital pins on which various sensors and actuators can be connected. It has good data handling capacity, so various sensors and communication units can be connected with this device, making it ideal for this application and related Wireless Sensor Network based applications. The Arm is connected to data processing and communication unit via a serial connection. The channel between the ARM and the portable data processing unit is shared, so the communication through this shared channel be made discrete for each and every sensor

4. NFC TECHNOLOGY

Near field communication is a communication protocol that enable two electronic devices, to establish communication when they approaches each other within 4 cm.

Near Field Communication establish a generally supported standard protocol. When one of the connected devices has connectivity with internet , the other device can exchange data through online services.

Near Field Communication enabled portable devices can be provided with applications, like read electronic tags or make payments when connected to an Near Field Communication compliant apparatus. Earlier close-range communication used technology that was proprietary to the manufacturer, for applications such as stock ticket, access control and payment readers.

Near Field Communication devices can work in three modes:

Near Field Communication card emulation enables Near Field Communication enabled devices such as smart mobile phones to act like smart cards, allowing users to perform transactions such as payment or ticketing.

Near Field Communication reader/writer: In this mode Near Field Communication , enabled devices to read information stored on inexpensive Near Field Communication tags

Near Field Communication peer-to-peer: In this mode two Near Field Communication enabled devices to communicate with each other to exchange information in an adhoc fashion.

Near Field Communication tags are passive data storages, which can be read, and can also be written , by an Near Field Communication device. They typically contain data, and are read-only in normal use, but may be rewritable. Applications include secure personal data storage. Near Field

Communication tags can be encoded by their manufacturers or use the industry specifications.

The Near Field Communication Forum provided the standard. The forum responsible for promoting the technology and setting standards and certifies device compliance. Secure communications are available by implementing encryption algorithms as is done for Credit Card and if it fits the criteria for being considered a personal area network

Near Field Communication standards cover communications protocol and data exchange formats are based on existing radio-frequency identification (RFID) standards including ISO/IEC 14443 and FeliCa. The standards include ISO/IEC 18092 and those defined by the Near Field Communication Forum. In addition to the Near Field Communication Forum, the GSMA group defined a platform for the deployment of with in mobile handsets. GSMA's efforts include Trusted Services Manager, Single Wire Protocol, testing/ certification and secure element.

4.1. NFC in Medical devices

Healthcare is seeing a growth of Machine to Machine connectivity in its medical devices. As these devices become smart and interconnected, there is an increase in the demand for data transfer between device's which are present outside the body and inside the body .

In medical devices domain, there is need for a secure communication channel that cannot be over-stressed, and it is an overriding priority. Hence, Near Field Communication become a choice for wireless communicating between two medical devices. The FDA and other regulatory bodies are also quite vigilant regarding the security aspects of the devices that must be approved before hitting the market.

Further, the data size generated by medical devices are within the capability of Near Field Communication to transmit without any delay, so it can easily fit the profile for a wireless channel for medical devices. Even if there is a requirement for data transfer rates exceeding its capacity, the NFC protocol can be used as an authentication procedure before other wireless standards take over the function of actual data transmission at higher transfer speed.

There are a lot of medical use cases, such as implanted devices which should reside in the body for years, and have to be highly energy efficient and conserve as power as possible. Near Field Communication protocols are well suitable for such applications, as the reader can activate the tag only when necessary and can also transfer power wirelessly.

NFC brings mobility and versatility to a range of medical and lifestyle devices and is perfectly suitable for remote-baseddisease monitoring and management. Near Field Communication is also more intuitive and easy to understand for elderly patients, this make it easier for adoption and usage than other wireless technologies.

Since NFC in its passive form acts just like any other RFID tag, it can be used to keep tabs on pill boxes, blisters and other drug dispensing solutions. This utility has good scope for compliance monitoring, and

anti-counterfeiting measures particularly for the elderly and for pharmaceutical companies doing clinical trials.

The benefits of NFC are not restricted to small, implantable devices alone. Large devices used for In-Vitro Diagnostics (IVD), imaging, molecular diagnostics and other applications can also use NFC for wireless data transmission.

5. IMPLEMENTATION OF NFC

NFC tags will be provided to patients at the hospital and a threedigit unique tag ID will be linked to the patient's health status information and will be cross referenced to fetch the same from the webserver.

The doctor's device will be interfaced to the NFC reader via UART which will be gathering the NFC tag details when approached and fetches the corresponding information that is logged historically from the web server/PC.

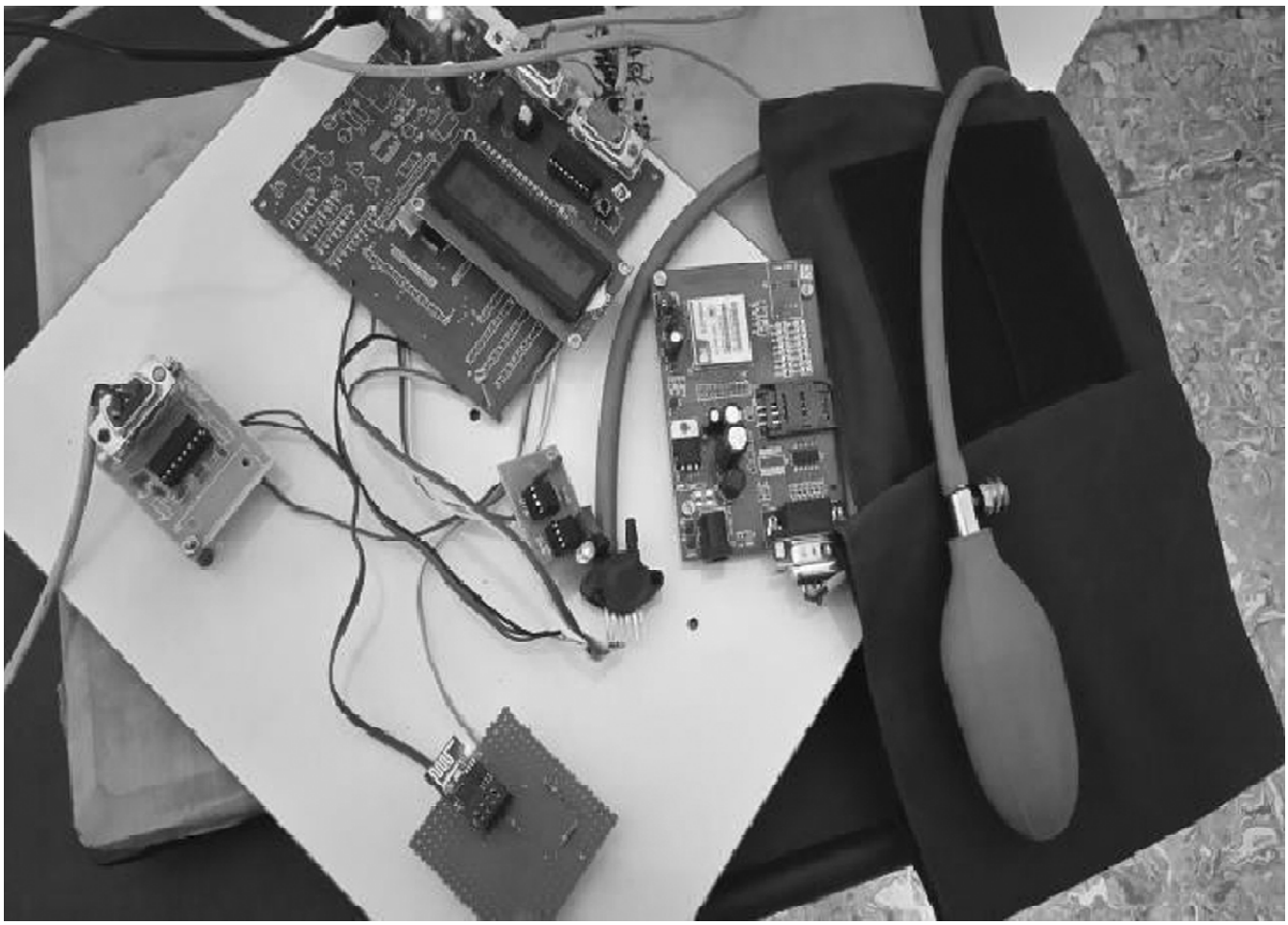
The fetched data from the PC/webserver will be presented to the doctor in a format readable.

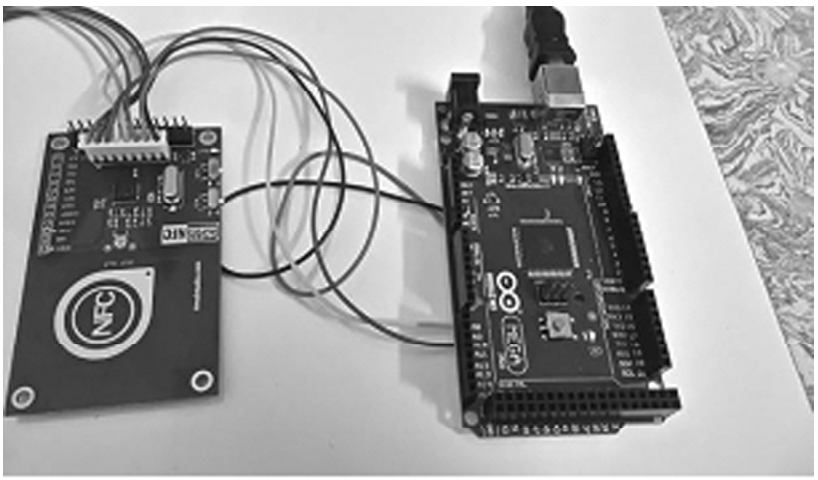
6. RESULTS AND DISCUSSION

6.1. Hardware design and results

Below fig 2 show hardware setup of monitor system it consists of different biometric sensor attached to m.c which act as collector this sensor data was transferred to data processing

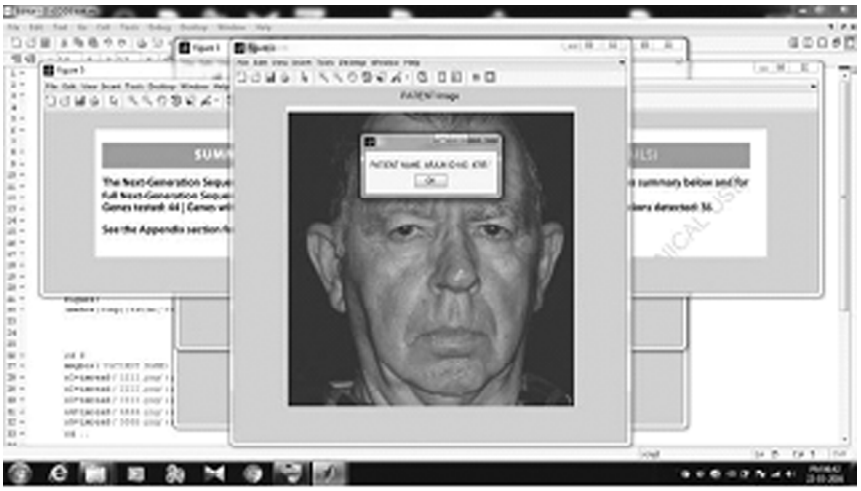
Above fig shows hardware setup of doctors system its consists of NFC reader and arduino m.c



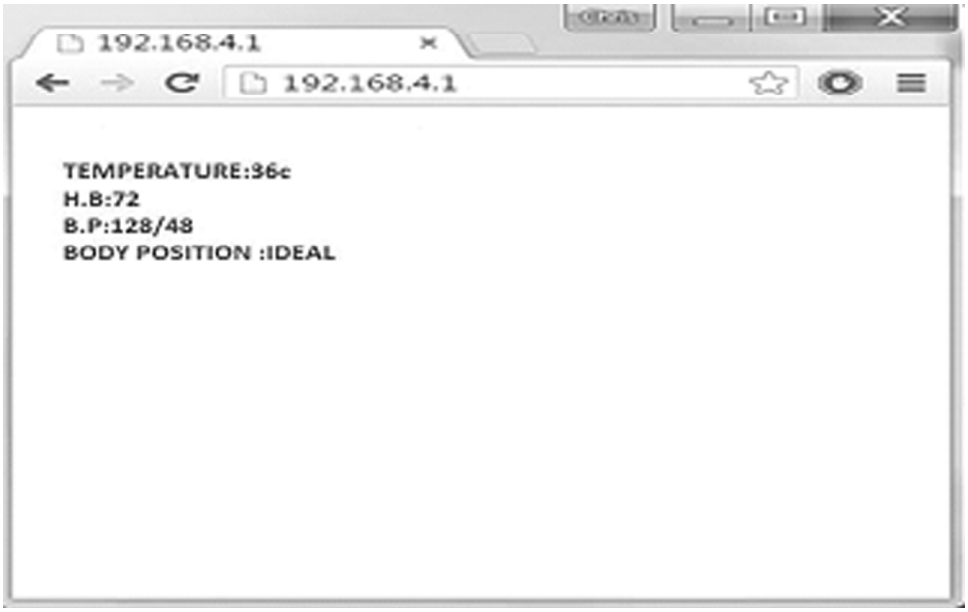


RESULTS

Below fig show matlab output of doctors unit



In below fig sensor values are displayed on webpage by using IOT technology



7. CONCLUSION

By this project it is observed that with the combination of electronic sensing, NFC and internet of things, the medical services can be improved significantly by continuously monitoring the patients, consolidating reports and alerting concerned doctors in case of emergencies.

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