A Modern Health Care System Using IoT and Android.

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Abstract—A modern healthcare IoT platform with an intelligent medicine box along with sensors for health monitoring and diagnosis is proposed here. Health care services based on Internet of Things have great potential in medical field.In thispaper,anintelligenthome-based medicine box with wireless connectivity along with an android application (Health-iot) that helps patients and doctors to be in a more close communication. The proposed platform has an intelligent medicine box that gives alerts for patients to take their medication at the right time. The box is wirelessly connected to internet to make timely updates about medicines which will be notified in the android application with in patient's smartphone. The system automatically gives alarm so that the patient take the right medicine at the right time. And if there are any vital signs noticed SMS alerts are given to the predefined guardian.

IndexTerms—Health-IoT, intelligent medicine box,Internet-of-Things(IoT).

I. INTRODUCTION

Nowadays, a promising trend in healthcare is to move routine medical checks and other health care services from hospital to the home environment [2]. With that patients gets health care more easily especially in case of emergencies. Moreover hospitals can reduce their burden by shifting the possible and easy tasks to the home environment. One major advantage is in reduction of expenditure. Patients could avoid the fees charged by hospital each time they went to visit doctor.Therefore,itisurgentthat in the near future a trending technology need to be implemented in the health industry to develop advanced health care techniques and technologies and use them for the easy monitoring of patients from anywhere else. Patient monitoring include checking the physical conditions of the patient and their medication details.

If the right medicines are taken at right time there are less chances that the condition of a patient getting worse. Especially for elderly people taking medication at the right time is a great challenge. There are chances that they could forget it at times. So poor medication adherence is a major problem for the population and medicine providers.

The concept of the Internet of Things first became popular in 1999. If all objects and people in daily life were equipped with identifiers, computers could manage and inventory them. The **Internet of Things** (**IoT**) is the network of physical objects —devices, vehicles, buildings and other items embedded with electronics , software, sensors , and network connectivity — that enables these objects to collect and exchange data.[1] The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, [2] creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids , smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.

With the use of IoT, embedded sensors, tags etc. have developed rapidly.Wearable sensors could be integrated with IoT to get more clear details. An android application could be used along with medicine box to make the system more user-friendly. Incorporation of different technologies at the right time like IoT could make a drastic change in any field especially the medical field.
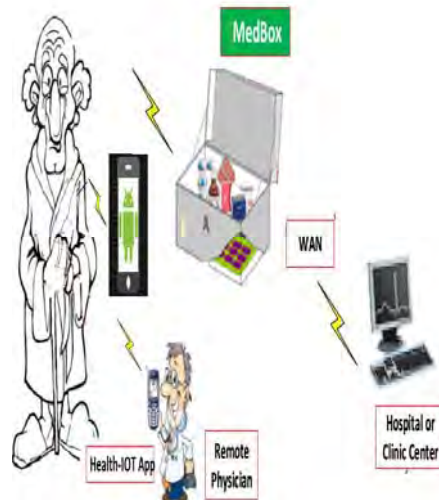
Fig 1.Overview of Application

Our system include a featured medicine box which is wirelessly connected to the hospital administration.Hospital administration monitors the routine details through a webpage which is managed at the hospital side.An android application is installed on the patients smartphone as well as in doctors smartphone.Through this application patients could view their prescriptions,could make appointments and get notofications regarding medicine intake.Doctors could view their patient details,could apply for leave.Another intersting feature is the chat option provided.Both doctor and patient could chat using the application . Medicine box is provided with different compartments . Whenever patient opens a wrong comaprtment,a buzzer will get activated.The medication history will be automatically updated in the hospital webpage.An LED on top of each compartment denote the correct box. When its time,the LED glows.If wrong compartment is open a buzzer will get activated.

II. LITERATURE SURVEY

David Niewolny in his paper describes,How the Internet of Things Is Revolutionizing Healthcare [3] is discussing about the reasons for emergence of IoT and designs of applications where IoT is used. The main issue is people have only limited time, awareness and accuracy, which means they won't be able to capture data about things networked in the real world consistently. The answer is empowering devices to collect information on their own, without any human interference. A smart health monitoring chair is introduced by H. Baek , G. Chung, K. Kim, and K. Park for non-invasive bio-signal measurement. However, these solutions are almost exclusively implemented using off-the-shelf components. Its physical size, rigid nature, and short battery life become limiting factors for potential long-term use. Remote monitoring[4] of medication uses Zigbee technology was proposed by A. J. Jara, M. A. Zamora-Izquierdo, and A. F. Skarmeta for getting sensor values. Zigbee can transfer sensor values effectively but when there is a need of continuous data transmission zigbee cannot be used. Reducing sampling rate solves the above problem but affects the quality of signals.

III. BASIC ARCHITECTURE

I.MEDICINE BOX

People often forget to take their medicines at the right time in this busy world especially elderly people. Medicine box has three compartments. An LED is attached with each compartment. When it's time to take medicine LED from the right compartment glows. If wrong compartment is opened then the buzzer will get activated. A wifi shield is attached to the arduino board which automatically updates these details to the hospital webpage. The Medbox could be integrated with sensors. A temperature sensor is integrated here with the box. It reads patients temperature value and notifies if it goes beyond a limit.
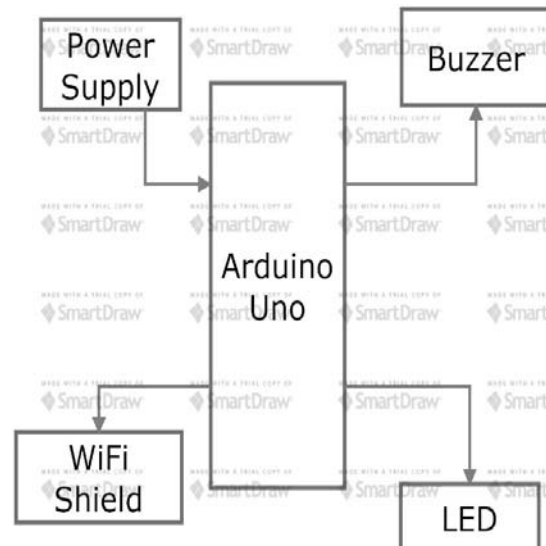
Fig 2.Block diagram of hardware.

Different components used in the box are:

i)Microchip Arduino Uno: The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simplyconnect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

ii) WiFi shield: The Arduino WiFi Shield allows an Arduino board to connect to the internet using the 802.11 wireless specification (Wifi). It is based on the HDG204 Wireless LAN 802.11b/g System in-Package. An AT32UC3 provides a network (IP) stack capable of both TCP and UDP. Use the WiFi library to write sketches which connect to the internet using the shield. TheWiFi shield connects to

an Arduino board using long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allows another shield to be stacked on top. The WiFi Shield can connect to wireless networks which operate according to the 802.11b and 802.11g specification.

iii) LED and Buzzer: Both Buzzer and LED need a

pin each on the Arduino board. They act as the output of our system giving alerts.

iv)Temperature Sensor: The LM35 is a common TO-92 temperature sensor. The LM35only produces voltages from 0 to +1V. The ADC uses 5V as the highest possible value. The LM35 is only guaranteed to be within 0.5 degrees of the actual temperature.

ANDROID and WEB

An android application Health Care is developed and installed on both patients and doctors smartphone. Both applications have slight difference in their features. Patients can view their personal details, can view their medicinal details, can book appointments with the doctor and can chat with doctor. At the same time doctor can view his patients details, his appointments, can apply for leave, can view his appointments with corresponding patients and can chat with patients. Both applications need the user to login. Login ID and password is the same as given at the time of registration in hospital. Health IOT also provides notification at the time of medication. Patients and doctor register at hospital. Hospital server will contain all records of patient and doctor. It will store medicinal details, prescription details and history of medicines picked by each patient. The values from temperature sensor is also recorded in the hospital server. If temperature goes beyond the limit SMS alerts and sent to the concerned person. This helps to take the required measures at emergency situations. Hospital administration can view and check patient's records anytime.

IV.WORKING THEORY AND DEMONSTRATION

The main focus of the medicine box is to regulate and optimize the accessibility of medicines and to

implement remote prescription in simpler and user friendly way. The key functionalities include:

a)   *Hospital Server:*

Patient registers in the hospital by giving their required details. They are saved in the server.

Doctors corresponding to each patient will be registered to the hospital site. Doctor can view detailed patient information about each of their patient . Administrator manages prescription details, appointment details. When

there is change in dosage of medicines, it will be notified in the server and notifications are updated in the patients android app.

Fig 3.Hospital WebPage

b) Android Application and Alert:

Patient and doctor need to install an android application Health-IoT. Login details are provided at the time of registration. Both patient and doctor could view details easily. They can see their personal details, corresponding doctors detail/patient details. Patient can select a date for appointment while doctor can apply for leave. Admin checks with these details and confirm appointments. Another interesting functionality is the chat application which helps in doctor and patient communication. When there is a change in the dosage of medicine it will be updated through the application. The app also provides alerts when its time to take medicine. These details are updated automatically from the sever.
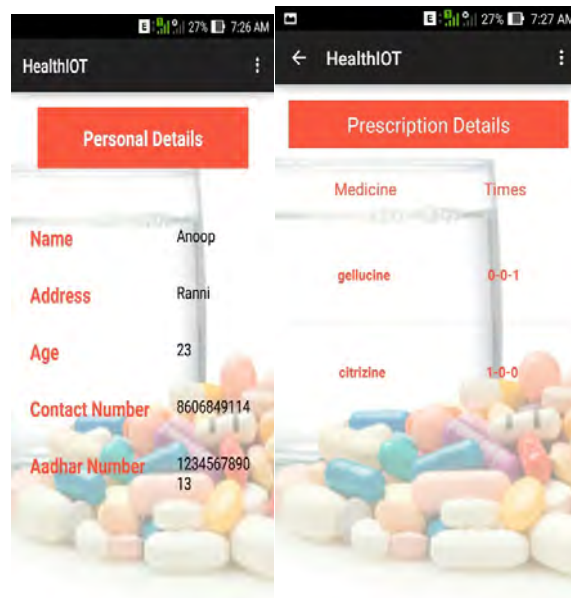

Fig 4.Android Application Interface.

Fig 5.Hardware Unit.

c) Hardware Unit

The hardware unit comprises of three compartments each with an LED to indicate which box to be taken. Each box has a reed switch and magnet to ensure whether box is closed or opened. An arduino board with Ethernet shield is present. A buzzer get activated whenever a wrong compartment is opened. Sensors can be attached with box to note vital signs of patient.

V. CONCLUSION

Health IOT thus helps the hospital authorities to have continous monitoring on the patients as well as it reminds the patient to have the medicines on time.

So the doctor can have direct view over his patients by this.Thus the medication procedures can be shifted from hospital centric to home centric. As a future work it is possible to incorporate lcd screens on to the medicine box that could be made as an interface between the patient and the doctor to have a video conference and also provide details regarding the changes in the consumption of medicine without consulting doctor directly.

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