Medbox: Medicine Reminder And Health Monitoring

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Abstract- *Medication at appropriate time is the primitive solution for prevention and cure for most of the diseases. By taking medicines at proper time, diseases can be cured and prevented. Therefore it is very important and essential to take medicines at exact time prescribed by the doctor. Medication adherence is pivotal for effective health outcomes. One of the main reason behind the poor adherence is forgetfulness. So for proper medication, medicine reminder system along with heath monitoring is there. MedBox will alert patient or caretaker about their medicines by giving audio-visual alert and monitors patient's health by IoT through different sensors which includes heartbeat monitoring sensor, temperature sensor and sweating probe. This system uses Arduino module, GSM module, LCD display and RTC module.*

Keywords- IoT; Medicine Reminder; Medication adherence; Arduino module; healthcare;

I. INTRODUCTION

Day to day advancement in new technology and medical science field gives need for the efficient system which comprises of both new technology as well as medical science. This fusion will give large scope in medical science field providing improvement in patient healthcare. The main objective of the proposed system is to ensure user friendly design which will alert the patient to take medicines at proper time prescribed by doctor. The alert will be in both audio and visual form. Audio alert will be given by a buzzer and for the visual form we use a LED. The proposed system uses Arduino.

Along with the Arduino module we are also using one novel technology Internet of Things (IoT) which continuously display patient's data measured by sensors. IoT is the new generation of internet service which enables physical components to communicate with each other through World Wide Web. It can be used as framework to collect information from different devices like mobile devices and sensors. This information is then forwarded to the network layer after that it is given to application layer. The nodes present at IoT needs to be identified, controlled and must have ability to interact with humans and other devices within Machine-to-Machine environment. It enhances lifestyle as it can be implemented in wide range of applications such as smart cities, automation, agriculture, healthcare and many more.

II. CHALLENGES AND NEED OF THE SYSTEM

Most of the elders have multiple chronic diseases, and they use medicines to stabilize their health conditions. Pharmacists Association advised that the family should be more concerned on medication safety of the elders. Most patients with chronic diseases need to take medications over a lengthy period of time in order to stabilize their health conditions; confirming that the patients consume the right medication at the proper time becomes crucial. For the pregnant ladies also it is important to take medicines at proper time and also for all individuals who are busy in their lives. For them it is very difficult sometimes to remember the name and dosage of medicine at proper time. The Challenges are such as:

[1] Irregularity in taking medicines due to busy life schedules. The main reason behind that is forgetfulness. Forgetfulness is due to fatigue or distraction at the time of medication intake.

[2] Regimen complexity: Patient find it more difficulties with prescriptions that were more complicated than a simple once-a- day regimen. Pills taken in the middle of the day, every other day, weekly, etc. were cited by participants as more difficult to remember. Complexity was further increased by medications associated with mealtimes (taken either with an empty stomach or with food) or in conflict with other medications taken by the participant.

[3] Change in routine and medications: Complex or changing schedules also contributed to missed medications. Different routines for weekends, shifting meal times, or travel/vacations all affected participants' ability to keep to a medication schedule.

[4] Challenges in the logistics of taking medications: The logistics of medications, such as remembering to refill prescriptions and pillboxes, also presented a challenge as a diligence task for participants. In addition, participants sometimes found it difficult to take medications with them when they needed to be taken away from home, such as in the middle of the day at work or during a meal at a restaurant.

Therefore there is a urgency and growing need in the healthcare devices and technologies in order to provide patients with the electronic tools to support medication self management.

III. RELATED WORK

In order to stabilize the health of patient it is very important to take medicines at proper time regularly as per the prescribed dose and duration. In early days medicine boxes are used and now many modifications are done in that medicine boxes.

Many times patient forgot to take medicine on time once they discharged from hospital and due to this negligence it may causes to death. So to avoid such situation HSU CHUN-LIANG developed such system who reminds the medicine on time. For such system he uses local web-net, LCD Display, GSM communication, voice-DSP, and sensors techniques to produce a medicine-box and its co-related monitoring mechanism suitable for both in hospital and patient's house. Mei-Ying Wang et. Al. proposed in 2009 Wedjat System [1].This can be used to take the medicine on correct time and also take the record of intake of medicine. Wedjat has two important features. First is it can alert patient about the right medicine with proper intake with food instruction and second is it can revised the amount of medicines when dose was missed.

G.Mougiakakou et. al. [2] presents the modular system for management of medicine, medical image archiving, tele matics cooperation and diagnosis support. Guanling Chen et. al. [3]suggested Mobile-phone based Patient Compliance System(MPCS) that can reduce the time-utilization facility and error prone processes of existing self- regulation practice to facilitate non-compliance detection, self-reporting, and compliance reminders.

An automated short message service text (SMS- text) developed by this system that arrive at a mobile phone anywhere on a cellular network. Lanlan Huang et. al. introduced the location based mobile health system on which system prototype was developed [4].

Gomes and Benjamim et.al, proposed a system which used visual features matching in the identification of medicine boxes for visually impaired people. It uses a camera device, available in devices like computers, televisions and cell phones, to identify relevant features on medicine box. After the medicine box detection, related audios are played to inform about dosage, indications and contra indications of the medication. For each medicine separate audios are recorded.

This vision system can help many visually impaired people to take the right medicine at the right time prescribed by the doctor. Experiments with 15 blind folded volunteers demonstrated that 93% of them believe that the system was useful to identify the medicine box [5].

IV. PRODUCT PERSPECTIVE

The major functionalities of the MedBox system are as follow:

a. It will generate alert for patient in both audio visual form.
b. SMS will be sent to the caretaker of the Patient if dosage is missed by him/her
c. Collects data from patients body by sensors and display continuously on PC

V. HARDWARE AND SOFTWARE INTERFACES

A. Arduino Mega 2560

The Arduino mega 2560 is a microcontroller based on the ATmega2560. It has 54 digital input/output pins(of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It requires USB cable or AC-to-AC adapter or battery to get started.
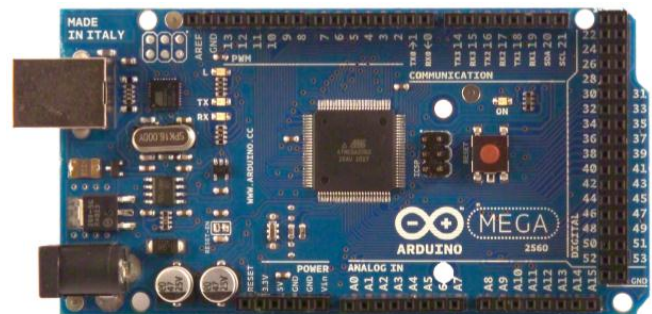

Fig -1: Arduino Module

B. Wi-Fi Module

ESP8266 is a Wi-Fi module for adding Wi-Fi functionality to an existing microcontroller via a Universal Asynchronous Receiver/Transmitter serial connection. Microcontroller can access the Wi-Fi network by using the TCP/IP protocol stack. ESP8266 requires 3.3V power and can be pre-programmed so we can hook this up to Arduino device.

C. RTC Module

RTC (Real Time Clock) DS307 is 8-pin device which uses I2C (Inter Integrated Circuit) interface. It has automatic power-fail detect and switching circuitry. It has 56 byte of non-volatile RAM memory for data storage.

D. GSM Module

GSM (Global system for mobile)/GPRS(General Packet Radio Service) isSIM900 Quad-band GSM/GPRS device, works on frequencies 850MHz, 900MHz, 1800 MHz and 1900MHz. it is very compact in size and easy to use as plug in GSM modem. The modem is designed with 3V3 and 5V DC TTL interfacing circuitry which allows user to directly interface with 5V controllers (PIC, AVR, 8051, Arduino, etc.) and 3V3 controllers (ARM, ARM Cortex XX, etc.).

E. Temperature and Heartbeat Sensor

LM35 is used as the temperature sensor which gives output gives output voltage which is linearly proportional to Celsius temperature. It gives low output impedance as well as low self heating. Heartbeat sensor provides a simple way to study the function of the heart which can be measured based on the principle of psycho-physiological signal used as a stimulus for the virtual- reality system. The amount of the blood in the finger changes with respect to time. It provides a direct output digital signal for connecting to a microcontroller. It possesses compact Size.

F. Arduino Software (IDE)

Arduino Software has text editor for writing code and the programs, called as sketches. These sketches along with the extension '.ino' are stored in a standard place called sketchbook. Once the sketch is written that can be uploaded to the arduino board. The Arduino IDE software will display a message if the upload is successful or it will display an error.

VI. PROPOSED SYSTEM DESIGN

MedBox is the Medicine Reminder System consists of the box which contains the compartments for morning, Afternoon and Evening timings. It is designed in such a way that people of any age group can use the system easily without any complication. The system consist of three LEDs which gives visual indication about medication. Buzzer present in the system gives audio alert. RTC present in the system will keep track of timing. When patient get alert through the system, there is a period of down counting, if person fails to press the confirmation button after taking medicine then message through GSM will be sent to the caretaker of patient. Also, the system contains three sensors namely temperature sensor,

Heartbeat sensor and sweating probe which collects data from patients body and send it to the website through Wi-Fi module ESP8266. If the values are more than the reference values then alert will be given in the form of message or we can see it directly on website. LCD is displaying name of the medicine to take. RTC module is interfaced with the system through I2C interface. GSM and ESP8266 is interfaced with Arduino through UART interface. Temperature sensor and sweating probe are giving analog output whereas Heartbeat sensor provides digital output.

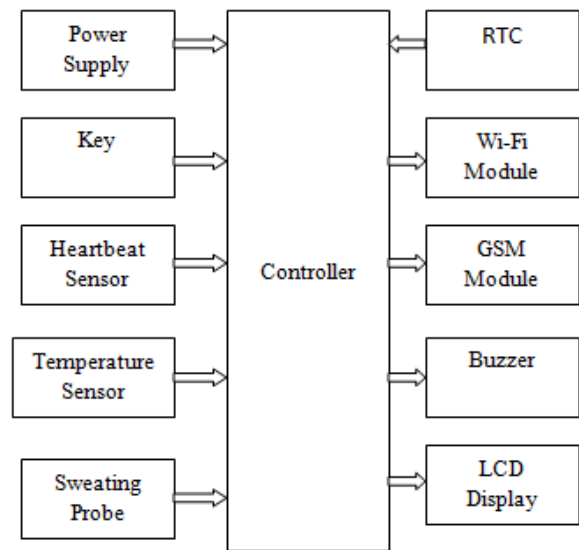The block diagram of proposed system is given below:

Fig -2: Block diagram of proposed system

VII. CONCLUSION

The MedBox system is beneficial for every age group, it will timely alerts the patient and monitors health of patient. It reduces efforts made by patient for remembering all names of medicines with their timings. It is safe and economical system for all.

VIII. ACKNOWLEDGEMENT

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