THINK INDIA (Quarterly Journal)

ISSN:0971-1260
Vol-22-Issue-4-October-December-2019

Medibox-Iot Enabled Patient Assisting Device

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Abstract- IoT is making strong inroads in the medical industry with the introduction of relevant sensors and devices. IoMT is a collection of medical devices connected to healthcare IT systems for different applications. The growth of IoMT has particularly impacted healthcare for the aged and disabled people, but not just limited to them. One such important activity is to help them to take medications on a daily basis without missing any dose. In the existing system, Pettier based medicine cooling system is implemented. It consumes more power for operating and the battery weight is increase and there is no compact size. It's not easy to carry the med box system . The complexity and cost associated with more elaborate systems led to the development of a new portable device in this paper named as "MEDIBOX"– an intelligent medication dispensing device. It is designed to help the elderly people who often forget to take their medications or take the wrong pills or dosage. It also helps people who used to travel frequently. Hence, we proposed a multi-purpose, portable IoT -enabled MEDIBOX which is used purposely to address those pertinent issues. MEDIBOX is designed to alert the patient at the right times along with the right dosage in prescription. Along with reminding a patient about medication it should be ensured that drugs are consumed without degrading their potency.

Storage is an important aspect of the total drug control system, so in the design of MEDIBOX an appropriate environment is created to maintain the drug efficacy. The history of medications a person consumed is very important, so the consumption details are uploaded to the cloud for further medical reference. MEDIBOX is also capable enough to alert its user about their next appointment with the doctor. Ambient Assisted Living (AAL) encompasses technical systems to support elderly individuals in their daily activities to allow an independent and safe lifestyle as long as possible. MEDIBOX is focused on assisting the elderly and patients in adhering to the medications regularly without fail, thus helping them to avoid any future difficulties. The details of the consumed medicines with specific time interval are saved on a secure cloud that can be used for further analysis.

Keywords – IoT, IoMT, Ambient Assisted Living.

I. INTRODUCTION

When people get older, as their memory may start to decline , they often tend to forget their medicine on time. So some people may need a medication reminder machine. Increased age increases the probability of suffering from multiple medical and chronic conditions such as hypertension ,heart failure and high cholesterol , resulting in increased use of prescribed and over-the-counter medications. According to the Centers for Disease Control and Prevention, more than 76% of people aged over 60 used more than 2 prescription drugs and 37% used five or more.

In this paper ,we propose a smart pillbox system which is used for monitoring patients parameter and detecting whether the patient has taken the tablet or not. Several parameter such as heart rate, temperature of the patient, respiratory rate, of the patient will be monitored using various sensors. Glucose level of the patient will be measured non-invasively. The medicines described in the prescription are placed in the tray of smart pillbox system which will be automatically dispensed according to the timer. Timer is based on real time clock and medicine is dispensed based on relay.

II.EXISTING SYSTEM:

The existing medical kit was unable to dispense medicines automatically. Several body parameters such as the temperature of the patient, heartbeat, respiratory rate, glucose level cannot be measured lively. Upload to IoT about patient health status cannot be done. Patient will not be intimated to take medicines at the right time according to the prescription. Elder patients need to visit doctors everytime for checking their health status regularly.

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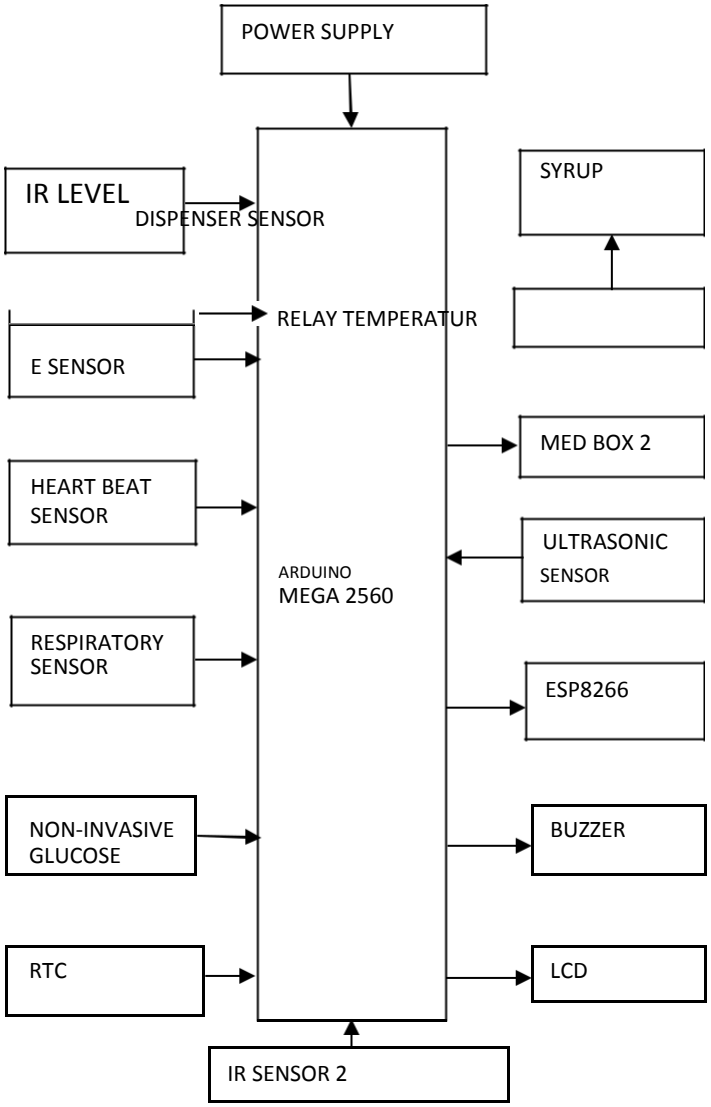
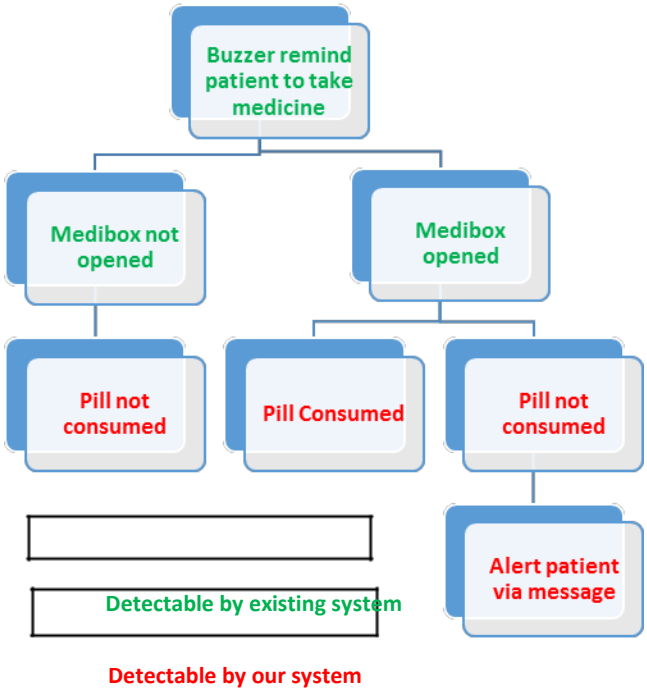
III.PROPOSED SYSTEM:

In the proposed system AI based medibox is developed. The system consists of IR level sensor inside the medibox to measure the amount of medicine in the box. The heartbeat and temperature sensor is used to monitor the heart rate and the temperature of the patient. The respiration sensor and glucose sensor is used to monitor the breath level and glucose level of the patient non-invasively. The system consists of real time clock for calculating the time. Based on the time period the medicine should be taken from the box. If medicine is not taken it will be detected using IR sensor and an buzzer alert will be given. The medibox will be opened and closed at respective time automatically using relay and according to thesyringe dispenser will also be activated. The ultrasonic sensor is used for detecting the level of medicine without any contact with it. All these details will be uploaded in the server using IOT module. So that the care taker or doctor can monitor the patient from anywhere. From IOT we can track the location of the persons.

BLOCK DIAGRAM





IV.HARDWARE ARCHITECTURE:

A.TEMPERATURE SENSOR

The first slave connected to a temperature sensor LM35. This senses the temperature of an engine and provides the level of temperature**.** The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The temperature sensor is an easy way to measure temperature interfacing it with arduino. It measures the patient's temperature and it is displayed in LCD. The value is also stored in IoT for future reference.

B.ARDUINO MEGA

Mega2560-CORE is a small, complete and breadboard-friendly board base on the ATMega2560. Its design is based on the Arduino Mega2560, so we can use it as a Arduino Mega2560 development board. In a different place, it lacks only a 6-foot download port and a reset switch. Reducing the hardware circuit that can we reduce the power consumption and the cost. Mega2560-CORE has a matching download line and the other one end of the download cable is a USB interface, so it is very convenient for use. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. All the sensors are interfaced with the microcontroller board. The arduino board is able to read inputs and turn it into an output. The board is used to perform a specific set of tasks using the Arduino programming language(based on wiring), and the Arduino Software(IDE), based on Processing.

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C.IR MODULE

IR sensor/Object Detection sensor comes with on board potentiometer to adjust the sensitivity. The output is digital signal, so it is easy to interface with Arduino Mega microcontroller. It offers obstacle detection via infrared detection, it a non contact detection. It is interfaced with Arduino and programed to detect the presence of tablet in the medibox kit.

D.HEART BEAT SENSOR

Heart beat sensor is designed to give digital output of heat beat when a finger is placed on it. When the HEART BEAT detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM)rate. It works on the principle of light modulation by blood flow through finger at each pulse.

E.REAL TIME CLOCK

The purpose of an RTC or a real time clock is to provide precise time and date which can be used for various applications. Real time clock is used to indicate time on the LCD in smart medibox system. According to the time set by the user, the buzzer is activated inorder to remind the patients to take medicines regularly.

F.SERVOMOTOR

Servomotor is a rotary actuator that allows for precise control of angular or linear position and velocity. It consist of suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often dedicated module design specifically for use with servomotor.

Servomotor are not a specific class or motor although the term servomotor is often used to refer to a motor suitable for use in closed loop control system. The medibox kit is automatically dispensed with the help of servomotor for easy access. Both forward and reverse direction is programmed for a certain time period.

G.LIQUID CRYSTAL DISPLAY

A liquid crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light modulating properties of liquid crystal. Liquid crystal do not emit light directly, instead using a back light are reflector to produce images in colour or monochrome.

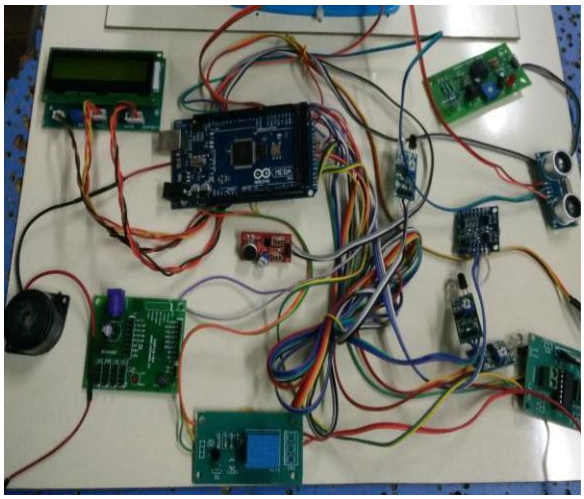
Since LCD screen donot use phosphors, they rarely suffer image burn-in when a static image is displayed on a screen for a long time.

The resolution of an LCD is expressed by the no. of columns and rows of pixels. Each pixel is usually composed three sub pixela, a red, a green, and a blue one Contrast ratio is the ratio of brightness of a full-on pixel to a full-off pixel. The LCD itsef is only a light valve and does not generate light. The light comes from the back light that is either fluorescent are a set of LEDs. Brightness is usually stated as the maximum light output of the LCD, which can vary greatly based on the transparency of the LCD and the brightness of the backlight.

100-125mg/dL

126

130



H.RESPIRATORY SENSOR

Respiratory sensor detects chest and abdominal expansion/contraction and outputs the respiratory waveforms. Respiratory sensor is connected to the digital pin of the aurdino board and it is used to display the respiratory rate of the patient. Output displays whether the respiratory rate is normal or abnormal.

I.ULTRASONIC SENSOR

Ultrasonic sensor is used to measure the distance of the target objects using non-contact method. They emit short, high frequency pulses at regular intervals. If they strike an object, then they emit echo signals to the sensor, which itself computes the distance of the target based on the time span between emitting the signals and recieving the echos.

V.RELATED WORK

The medibox kit consists of the sensors interfaced with the microcontroller(Arduinomega2560).Thesensors(Respirator y sensor, Temperature sensor, Heartrate sensor, IR sensor, Ultrasonic sensor) are given as input to the Arduino. Relay, WiFi Chip, Buzzer, LCD are for displaying output through Aurduino.

A.PARAMETERS MEASUREMENT

Body paramters of patient is measured from home. Temperature sensor is given as input to the arduino in Analog pin and the output is displayed in LCD. Formula used for measuring temperature of humanbeing : **cel=(temp-32)*0.5.**

In the same way other body parameters such as the heartrate, respiratory rate, glucose level is measured using various sensors.

B.LCD DISPLAY

The values obtained from the various sensors are displayed on the lcd through programming in the arduino IDE. The LCD displays the time and intimates the user to take tablets in the morning , afternoon and night. Along with the time body parameters are denoted.

C.IoT UPLOAD

The status of the body parameters such as NORMAL/ABNORMAL are uploaded to the IoT. This

ISSN:0971-1260
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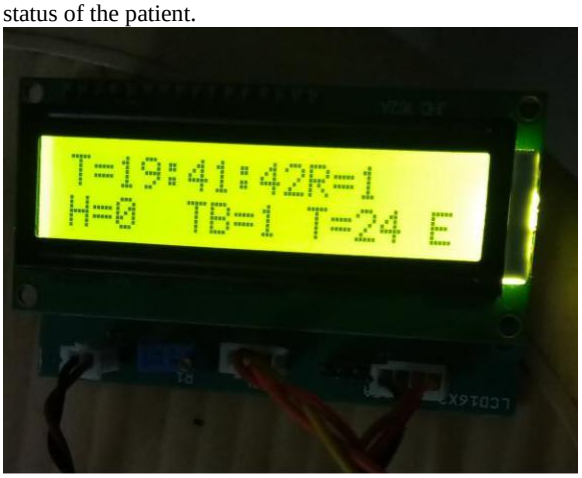
can be viewed by the doctor while monitoring the health status of the patient.



D.MESSAGE TO PHONE

When the patient is not available to take the medicine at right time it can be intimated to the patient through message using GSM. At the same time, when the tablet is not detected by the IR sensor message is sent to the patient.

SENSOR	EXPERIMENTAL VALUES	THRESHOLD VALUES
TEMPERATURE SENSOR	36°C(Normal) 45°C(Abnormal)	36.1°C - 37.2°C
RESPIRATORY SENSOR	1(Normal) 0(Abnormal)	12-20 BREATHS PER MINUTE
HEART BEAT SENSOR	66 +	60-100 BEATS PER MINUTES
GLUCOSE LEVEL	140	100-125 mg/dL(pre diabetic patient) >126 (diabetic patient)

VI.CONCLUSION:

This design proposes a home use medibox kit that helps us to measure the body paramaeters like heartbeat rate, temperature, respiratory rate, glucose level, tablet count.Thus if tablets are not taken by the person or in case of abnormality of the person, then it will be indicated by the buzzer.And it helps to take the medicines properly at right time as prescribed.the parameters will be displayed in the lcdwith morning or evening or night. Along with this, it upload the status of various parameters using wifi chip. Message can be sent to patients when tablet not taken at the pescribed time. Hence it is of great use to senior citizens nd heart patients. In the future design, the medibox kit senses the body parameters and if abnormal it tracks the patient's location to the surrounding.

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