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Design and Implementation of Smart Medicine Box

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Abstract

The project aims to create a smart box for those who take medicines regularly. This research primarily supports the elderly people who suffer from chronic illness such as diabetes, blood pressure, cancer, heart attack and other health issues. This cabinet will be connected to mobile applications that, when the drug is about to stop, will trigger multiple alert. It also provides warning signals to the caretaker when the patient fails to take the medication in time. In addition, when the medication is to be ordered, information will be sent to the medical store through GPS system.

Keywords*: Smart box, Old age people, GPS system.*

1. Introduction

We face many challenges in our everyday lives, and one of the challenges is our health problem. People are expected to take multiple drugs nowadays because of other health conditions such as diabetes, cancer, heart problems, etc., [1]. But we are busy with this fast and modern world, we don't have time to regularly take medicines. We face many health issues because we forget the medicine at the right time. Our project is to build a smart medicine box based on Arduino Uno that uses the clock in real time [2]. The new function expected in our project is that our device is aware whether the patient has or has not taken the medication, the patient cannot delay the period he/she has to take pills. This is important for the patient to take pills out of the package at the right time or our systems will continue to warn until the drug is taken from package. This notification feature adds to the patient's life years.

According to the International Health Organization, more than 80 per cent of individuals above the age of 60 are recommended to be treated 2-4 times a day. [3-5]. With the rise in cardiovascular diseases and diabetes among peers, periodic medication administration has become a prerequisite. However, about 40-60 per cent of these individuals have trouble dropping to take drugs at the correct moment. The most common consumer rest solutions include a regular pill box detector. This does not, however, check for toxicity and improper dosage of patients It just uses a clock that generates an alert at a specified point in time. Sometimes, there is no timely warning to the user to replace the container with a pill, which creates breaks during treatment. Pill box slots can be detected using both the load sensing and the light sensing technique. [6-7]. The advantages of slot-based sensing are that it is possible to distinguish person moment sensing over dosage problems and inaccurate dosage problems. Analytically and practically, the study of multiple slot sensing methods was conducted, and comparisons between modes were made.

2. Proposed System

The proposed system is to assist the elders and the uneducated taking their medicine correctly. Power supply is attached to the Arduino module and to the , LED, Real Time Clock ,Liquid crystal display.

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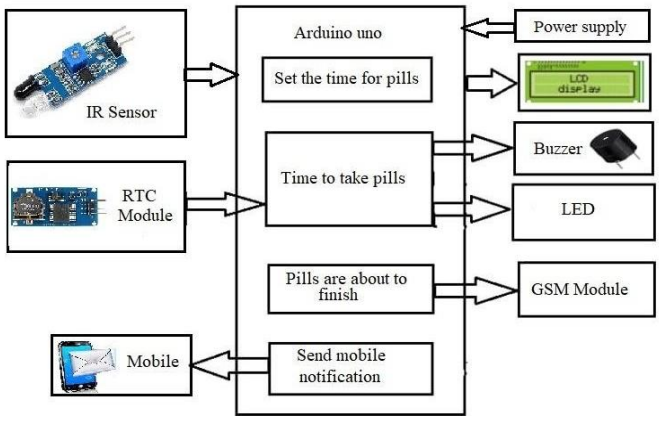

Fig 1. Block Diagram

Buzzer and IR Sensor are also connected to the Arduino Uno. Without power supply, real time clock can be worked because it is battery backup power clock, it will still work whether or not external power supply added to it.RTC module is composed of a 3V CMOS cell. There is a link to some medicine box in which consumer can load the pills. After starting the device the time and date will appear on the LCD screen. The Buzzer will ring at the time specified by the user, and the LED will blink the appropriate box to remind the user that it did. Buzzer and LED will alert the consumer continuously before the pills are taken from desired drug box if the medicine is about to finish, it will send a message to the medical store to order the particular medicine and it will also send the message to the caretaker to notify whether or not the patient has taken the medicine through GPS.

3. Hardware Description

A. Arduino UNO

Arduino Uno is a 8-piece ATmega 328P microcontroller based board with microcontroller. Alongside ATmega328P, it comprises of different segments to help the microcontroller, for example, gem oscillator, sequential correspondence, voltage controller and so on. Arduino Uno has 14 computerized input/yield pins (6 of which can be utilized as PWM yields 6 simple information sticks, a USB interface, A Power barrel jack, ICSP header and a reset button. The special structures of Arduino Uno ATmega328 comprise the following. It can operate at 5 V with input ranging from 7 V to 12 V.14 dedicated digital input and output pins with 6 analog input pins are available.it has flash memory of 32 Kb and EEPROM of size 1 Kb.

Fig 2. Arduino Uno

B. Real Time Clock

Real Time Clock or RTC is an mechanism that retains path of current time and is capable of being used in any computer that needs to maintain accurate time. By using RTC systems it also keeps monitoring the exact time. Here are some of the advantages:

- Low power consumption
- High accuracy.

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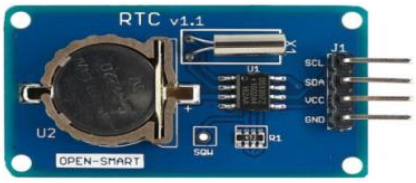

Fig 3. RTC module

C. LCD

The frequently abbreviated Liquid Crystal Display as LCD is simply a display screen that is designed using Liquid Crystal technology. 7 segment display is the most basic type of electronic display available – which has its own limitations. The most commonly used is pre-2 LCD module that can display 32 ASCII characters in two lines (16 characters in one line). The time and date are displayed on it. Some of the special characteristics of LCD are energy efficient, less radiation, lighter in weight, more reliable, and user friendly.

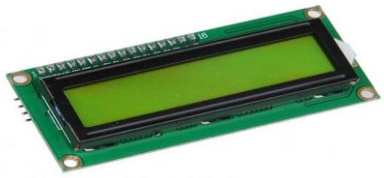

Fig 4. LCD

D. Buzzer

An audio signaling device is a buzzer or beeper, which can be used to provide an alarm signal. Typical uses of buzzers and beepers include alarm devices, timers, and user input confirmation, like a mouse click or keystroke. It means that the patient's time to take medication is over

Fig 5. Buzzer

E. IR Sensor

The infrared sensor is an electrical system that generates a sensation of certain elements of the world. The IR sensor can determine the heat of an object and can also sense motion. This types of sensors test only infrared radiation, rather than the so-called passive IR sensor that absorbs it. Typically, all objects emit a type of thermal radiation within the infrared spectrum. This forms of radiation are opaque to our bodies, and can be measured by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is susceptible to IR light of the same wavelength as the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the received IR light. By using following equation it calculate sense the motion of the object. Based on the data from the SHARP datasheet, you can calculate the linear function:

$$x= 137500x + 1125 \quad (1)$$

With x equal to the output voltage in mV and x equal to 1/distance in cm. This results in the following formula for the distance between the sensor and an object:

$$D = 1/((Vo – 1125)/137500) \quad (2)$$

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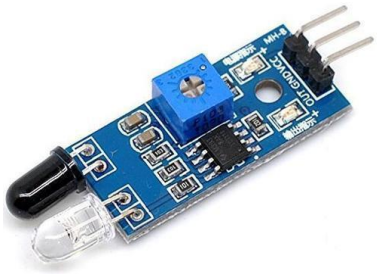

Fig 6. IR Sensor

F. GSM Module

GSM modem is a system that can be called a mobile phone or a modem interface that can be used to connect to a computer or another system over a network. A GSM modem involves the use of a SIM card which works over a network spectrum of which the network provider subscribes. It can be attached to a computer utilizing a serial , USB or Bluetooth connection. A GSM modem may also be a standard GSM mobile phone with the proper cable and device driver for connecting to a serial port or USB port Typically the GSM modem is equivalent to the GSM cell phone. The GSM modem has a large range of applications, including transaction terminals, chain control, protection tools, weather stations and remote data logging via GPRS mode.

$$\text{Efficiency of frequency reuse} = \frac{\text{No.of UC in real system}}{\text{No.of UC in ideal system}} \qquad (3)$$

Fig 7. GSM Module

G. LED

An LED is an electronic device which emits light when it passes through an electric current. Early LEDs have provided only red light, but modern LEDs may emit a range of colors like red , green and blue (RGB). Recent developments in LED technology have also rendered it possible for LEDs to Build white light. LEDs are typically used on mobile systems for warning signals (such as on / off signs). They also have a number of other applications including electronic signs, display of clocks and flashlights. Because the LEDs are energy efficient and have a long service life.

Fig 8. LED

4. Software Description

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A. Ardiuno UNO Software (IDE)

IDE's "Integrated Growth Climate" view. The official program implemented by Arduino.c is used mainly for downloading, compiling and uploading the code to the Arduino Computer. Nearly all Arduino modules are compatible with this open source software and are readily available to install and start compiling the code on the go. Arduino Integrated Development Environment (IDE) is a cross platform application (for Windows, macOS, Linux) written in c and c++ functions. The Arduino IDE is a wiring project program library that includes a variety of standard input and output procedures.

5. Algorithm

ID 3 ((Iterative dichotomiser 3) The ID3 algorithm constructs a decision tree from a specified range of instances. The subsequent tree is used to identify possible tests. The leaf nodes in the decision tree hold the class label, while the non-leaf node is the decision node. The decision node is an attribute test with each branch (to another decision tree) being a possible value of the attribute. ID3 uses information gain to help it decide which attribute goes into a decision node The process flow is depicted in figure 9.

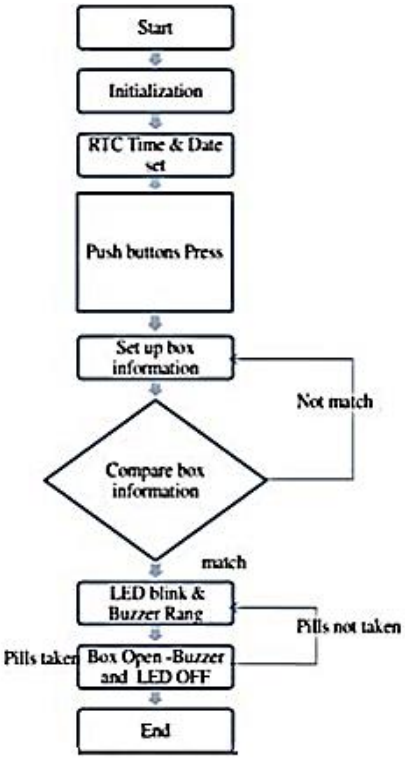

Fig 9. Flowchart

Algorithm:

1) Establish Organization of Attribute using R Table.

2) Calculate types of Entropy.

3) Compute the details of Gain using classification attribute for each attribute in R Table.

4) Select the attribute with high gain to the next Node in the tree

5) Delete the Node Attribute; by framing a reduced table RS.

6) Repeat steps 3-5 till all attributes are utilized, or else value remains same for all classification for all rows in the reduced table.

$$H(x) = -\sum_{i=1}^{n} p(xi) \log p(xi) \qquad (4)$$

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For Set S, Attribute A, Where S is split into subsets based on values of A

$$\sum_S^A Subset\ A\ of\ S \quad (5)$$

I_E = Entropy, P $(\sum_S^A) = \frac{Size\ (\sum_S^A x}{Size\ (S)}$ (6)

$I_G(S,A) = I_E(S) - \sum_0^n (P\ (\sum_S^A) * I_E$ (7)

6. Hardware Result

Fig 10. Hardware Setup

The fig 10 displays the proposed system hardware. In each medication box, the LED and buzzer are installed and are used to alert patients to take medication at the right time. The current time and date ate tracked using the RTC module. In this fig 10 LED is glowing to indicate medication to be taken.

7. Software Result

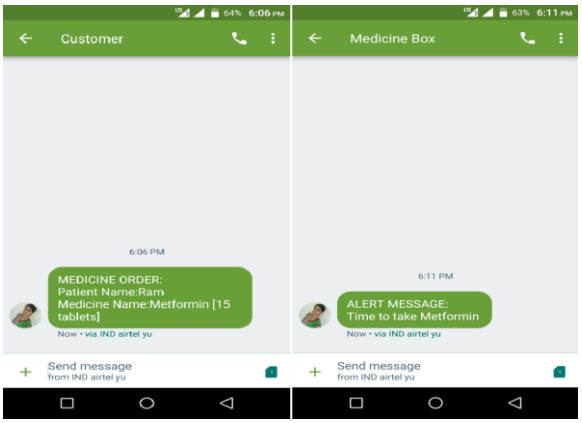

Fig 11. Messages send to medicine shop

The intimation to the nearby medical shop will be sent through the system automatically within a stipulated time duration. Initially an alert message will be sent to the care taker regarding the insufficient of pills in the medicine box and once a acknowledgement is received from the care taker an alert message will be sent to medical shop which is nearby. The fig 11 shows the snapshot view of the message sent to the medical shop.

8. Conclusion

This project has concentrated on the issues that older people face regarding observance to their approved prescription. This not only benefits the elderly who live alone but also the elderly caregivers by at the right time reminding them of the right amount of medication. The smart medicine box which uses the Arduino platform has been proven to function satisfactorily experimentally. This semi-automatic medication box is not only good for geriatrics, but can be a convenient and user-friendly option for all of us. This also aims to make this cost-effective. The other advantage of this box is that it is more user-friendly, and less complex. It means that the elderly patient is administered the correct

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dosage of medicine at the appropriate moment, so that they accept a modern, innovative care procedure. Since the proposed pillbox that contains the user's alarm sound for a specific time and the real-time clock gives continuous time as output .

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