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Intelligent Medicine Box For Medication Management Based On Iot

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Abstarct

Life threatening diseases gets mixes with the human body in such a way that they can't leave the body ever and they increases in rapid time. The average life time of the people was continuously decreasing due to many diseases which lead to the consumption of various medicines. The problem of forgetting to take pills at right time, taking wrong medicines and accidentally taking of expired medicine causes health issues of patient and this leads to suffer from unhealthy life. Our project is to make Arduino-Uno based Smart medicine box which uses Real time clock. The upcoming feature in our system is that it can monitor the patients for taking medicine and when they fail to do, the buzzer alarms continuously until they take the medicine. This notification feature adds life years to the patient.

***Index terms*:** *Medicine, Pills, Arduino-Uno, Real-time clock (RTC), Buzzer.*

1. INTRODUCTION

In recent years due to the increase of population and aging factors the intake of medication is also elevated as there is an alarming increase of chronic diseases. This leads to frequent consumption of drugs in the treatment phase to overcome the diseases [7]. When the patient has been hospitalized the nurse distributes the medicine on time and sometimes they may forget which leads to unavoidable medical errors [5]. Nowadays most of the hospitals encourage home healthcare by decreasing the stay of patients in hospital, where two significant factors need to be considered- 1) Preventing accidents by real-time monitoring. 2) To check if the patients follow their prescription on time [6]. In proportionate intake of drugs and failure in following the medication norms are the most frequent problems encountered. This leads to ineffectualness and adverse effects where this might affect body organs, when proliferated this may lead to death. These problems cannot be avoided by elderly people due to their memory degradation and cognitive impairment.

In order to overcome the above stated problems we have designed a smart medicine box involving Internet of Things where the patient is intimated by an alarm when the scheduled time is up [1]. The caregivers can restock the drugs into the medicine box while they receive a notification from the system. This paper focuses in developing an intelligent medicine box for medication management using improvised technologies.

2. PROPOSED SYSTEM

Internet of Things (IoT) is a system of inter connected computing devices, mechanical and digital machines that possess their unique identifiers and their ability to transfer information over a network without requiring human-to-human or human-to-computer interface. The purpose of using IoT is to extend the level of transmission of data which enables the transfer of information worldwide where Bluetooth has only a short transmission range. The incorporation of a buzzer is efficient to patients than

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the LED lights as sound makes it easier to indicate people than light. The Real Time Clock (RTC) is used in this system to maintain the duration of medicine intake.

The ATMEGA 328p is an 8-bit micro controller with 32K flash memory, 1K EEPROM and 2K internal SRAM which is used for its high performance and is usually incorporated with the Arduino board. This intelligent medicine box is designed for long term medications for chronic diseases in elderly people. The infrared sensors (IR sensors) are fixed inside the pill box which helps to determine the number of times the pills are taken out from the box. The Global System for Mobile Communication (GSM) is introduced in this system to remind the care-taker if the pill box is emptied by sending an SMS to the mobile of the care-taker. This smart system will continuously monitor the patient's health with the help of a sensor and also simultaneously monitor the patient's daily dosage of medicine. The medicine boxes will have its own set of timing information compared to the real time clock. If the information matches the buzzer rings and therefore the patient is reminded to take his/her medicine. A health data of the patient will also be maintained and their daily intake of medicines.

3. EXPERIMENTAL SETUP

The proposed system mainly constitutes the following components: Global System for Mobile (GSM), Infrared Sensor, Real Time Clock module (RTC), Arduino board, LCD Display, ATMEGA328P microcontroller, Buzzer, Push buttons, Temperature sensor. The following section briefly explains each component.

3.1. Infrared Sensor:

In this setup each box containing the medicine is incorporated with an infrared sensor based on our requirement of number of different medicines. The infrared sensor detects the presence of humans from the waves emitted and received to monitor the number of times the patient has taken the drug from the box. The system is programmed and set to different time intervals according to the prescribed schedule of the patient and if the IR sensor fails to detect the patient at the programmed time, the buzzer continues alarming.

Fig.1.IR Sensor

3.2 Real Time Clock Module:

For real time monitoring and to update the correct time to the system a RTC module is attached to the Arduino board .We used tiny RTC 12C module which uses 12C protocol and has internal CMOS cell so it does not require external power supply to update time and date.

Fig.3.RTC module

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3.3. LCD Interfacing:

Fig.3.LCD module

We used 16*2 LCD module in our project which is connected to Arduino UNO through a LCD interface IC or directly to its address and data bus and few control pins. It displays the time and date which is sent by the RTC module and temperature from the temperature sensor. If any of the boxes is out of pills, the LCD mentions the box's number which has only one or no pills left. When the scheduled time has arrived along with the alarm sound the LCD displays as, "Take medicine along with hot water" to notify the patient.

3.4. GSM Module:

The global system for mobile services is a wireless network which works basically with the help of radio waves. In this setup of intelligent medicine box the external device of GSM module is connected through a serial cable or USB cable. A SIM card is inserted in the module in order to get connected with the other networks. As our system requires instant messaging, the GSM module which handles many transactions in short time through SMS helps out. There is no need of internet connectivity to send or receive large number of messages on our server, instead SMS is sent with the help of signals provided by the network operator [3].

Fig.4.GSM module

3.5. ATMEGA 328p MICROCONTROLLER:

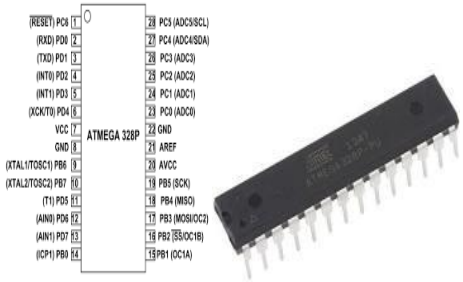

Fig.5.ATMEGA 328p IC

The ATMEGA 328p which has a 28 pin configuration commonly functions as the processor for Arduino board. The inputs can be controlled by transmitting and receiving the inputs from these 28 pins. The

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VCC and GND are the input power supplies. The entire signal is transmitted in the pulsed waveform with the Pulse Width Modulation (PWM). According to the applications the analog and digital inputs of the IC is used.

3.6. ARDUINO IDE:

Arduino UNO board is connected with other modules and thus controls all other modules which make the interfacing easier. The internal EEPROM stores real time data in it. Arduino board read inputs from a press a button- and turns it into an output, turning on an LED and buzzer can instruct the board by sending a set of instructions to the microcontroller in Arduino. Thus the Arduino programming language is used, and the Arduino Software (IDE), based on Processing. The C language programming is coded for this application.

Fig.6.Arduino

3.7. BUZZER AND TEMPERATURE SENSOR:

Fig.7.Buzzer **Fig.8.LM35**

The 5V buzzer is used in this setup that continuously buzzes at a certain frequency to indicate the patients to take medicine. The temperature sensor LM35 is used to monitor the temperature and sends it to display in the LCD module.
The figure below shows the block diagram of the proposed intelligent medicine box.

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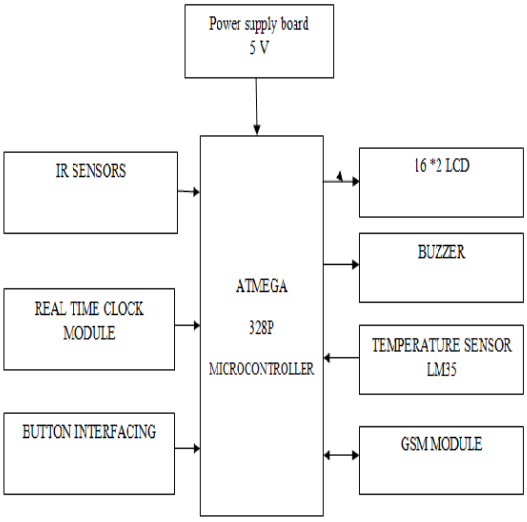

Fig.9.Block diagram of intelligent medicine box.

4. RESULT AND DISCUSSION

The components are connected as shown in the block diagram. A power supply board is connected to the microcontroller in the Arduino board to limit the supply to 5V from the 12V. The IR sensor, RTC, LM35 and push buttons form the input phase and the LCD, Buzzer are used as the output modules. The GSM acts as both input and output. The ARDUINO IDE software is used to code the programme in the microcontroller. The C programming language is use for this process.

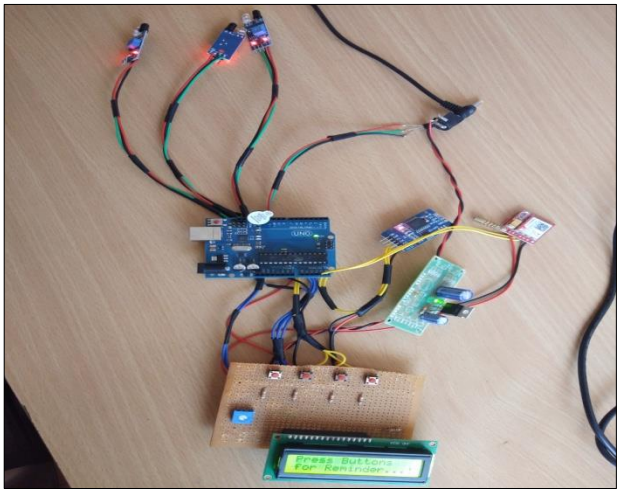

Fig.9.Circuit of medicine box

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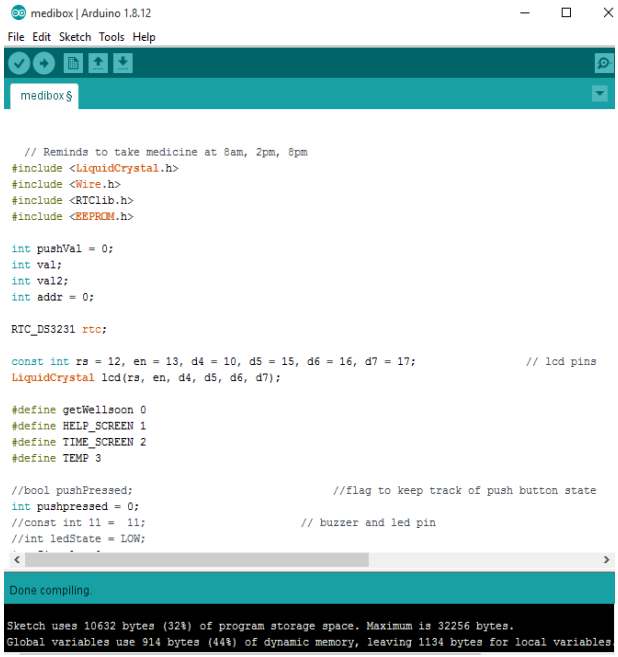

Fig.10.Implemenatation of the program in ARDUINO IDE

5. CONCLUSION

Thus the medicine box would be good in quality and performance and able to be trusted by patients and old age people. The system would be good in quality and performance. The cost would be affordable compared to other products available in the market. User can set the number of times the medicines need to be taken by the patient. The alarm will ring at proper time scheduled. The programming language used is simple and can be modified easily. It can be used in various places such as in hospitals, old age homes, and also for patients who are in homecare with their family since it is user friendly. The product is easy to design and thus requires less maintenance.

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