ARDUINO BASED MEDICINE REMINDER

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ABSTRACT

The main purpose of this paper is to propose the basic idea of automatic medicine reminder based on ARDUINO which will help the patients to take their prescribed medicine at appropriate time. Automatic medicine reminder is novel idea to help the patient to take their medicine on time and hence may reduce the time to recover from their disease. Sometimes, the aged patient takes the wrong medicine and their wrong dosage incorrectly causing the severe problem. This system is not just helpful for an individual but can also have major contribution in hospitals. In today's busy, stressed and scheduled life, people are suffering from lots of disease but are not able to remember their medicine and timing of it and here this system can be of real use. This system uses LCD (liquid crystal display), keypad (push button), ARDUINO module, RTC system and alarm system. This portable and economical system would be helpful to every age group.

Keyword: ARDUINO module, LCD, alarm system, RTC.

A large number of patients fail to comply with their prescribed medication schedules. This can cause disease complications, lower quality of life, and even mortality. To overcome these issues the automatic medicine reminder is used. This system is very simple to operate and update therefore a person of any age group can use it. This system can also be useful in hospital where number of patients is present and sometimes it is difficult to remember the medicine and dosage by the staff. So this system with some updates can also be used in hospitals. The problem such as 1) maintaining the regularity of prescribed dosage is difficult to be remembered in busy schedule 2) remembering the name of medicine to be taken is really difficult 3) due to above two reasons the patient’s life can get more complicated. These above problems are arising to everyone due to non adherence of medications. Therefore, there is a growing need and urgency for in-home healthcare devices and technologies in order to provide patients with the electronic tools to support medication self-management.

A. ARDUINO: The ARDUINO microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The ARDUINO is open source, which means hardware is reasonably priced and development software is free. The ARDUINO project was started in Italy to develop low cost hardware for interaction design. With
the ARDUINO board, you can write programs and create interface circuits to read switches and other sensors, and to control motors and lights with very little effort [6].

Fig 1 ARDUINO Module [6]

B. Steps used to upload program:

Using Arduino

- Write your sketch
- Press Compile button (to check for errors)
- Press Upload button to program Arduino board with your sketch

Try it out with the “Blink” sketch!

Load “File/Sketchbook/Examples/Digital/Blink”

Fig 2 Programming of ARDUINO [7]

LITERATURE SURVEY

Kale Sapna, Bhadane, Ashwini, Pawar Pallavi and P.N.Achaliya have introduced an Android based Medication Reminder System based on OCR using ANN. In this method, an Android based application
is used for the patients. This application will remind their user to take correct medicines at appropriate time by setting the reminders in the mobile which is an automatic manner. These reminders will be spontaneously set by the application per the prescription. This reminder will remind the patients to take medicine competently. This method will help only for young people who are having Android mobile. But for elder illiteracy people it is very difficult to operate and understand it. The device used in this system is costly and the process of creating the application in android mobile is tedious. [1]

Priyadarshini, Ramya, Kalaiyarasi, have investigated a novel approach of microcontroller based Automatic Medication Reminder (AMR) system for patients. In this approach hardware operated using microcontroller is used for the patients. This application will provide a reminder using buzzer and LCD will display the name of medicine. The 4*4 matrix is used to input the data. This system is little complex as it is based on microcontroller which is difficult to embed.

Corey McCall, Branden Maynes, Cliff C. Zou, Ning J.Zhang have proposed an Automatic Medication Self-Management and Monitoring System for Independently Living Patients. This paper describes the development and evaluation of RMAIS (RFID-based Medication Adherence Intelligence System). This system provides an automatic operation for easy medication by using built-in scale for dosage measurement and a motorized rotation plate to bring the correct medicine container in front of patient. This prototype consists of five parts which includes a motorized rotation platform, scale, RFID reader, Microcontroller, user interface panel. The process used in this system is tedious and the RMAIS is an in-home device which is useful only when the patients are in home itself. It can support only up to seven medicines. The device would not be aware and it may introduce errors or wrong alarms until the tray is checked frequently. The scale used in this prototype is expensive and this RMAIS needs skilled persons to operate efficiently.

**PROPOSED SYSTEM**

Now days the people are having busy scheduled life due to which it is common to suffer from disease. More over the environment is also contaminated as lots of pollution particles are present causing lots of illness. Person suffering from small disease but is not able to take right dosage at right time causing late recovery. This can even cause severe health issues. To overcome these problems the medicine reminder can be used. There are number of medicine reminder available for patient, somewhat they are not favourable to the user in the aspect of cost, portability, difficult to use etc. The proposed prototype system consists of ARDUINO module, LCD, keypad (push button), RTC system and alarm system. The brain of the system is ARDUINO module. ARDUINO module consists of microcontroller which controls the function of the system and performs all the tasks. No external peripheral devices and memory devices are required. Initially the ARDUINO interfaces with keypad and LCD display. Basically two process is required to be done 1) enter the name of medicine to group 1 and if the system is used for more than two people then you can also use group two. 2) by using the keypad enter the time for the dosage as prescribed in the prescription.
The RTC system which is one of the feature of ARDUINO is present in it, is used to match with current time. Here the number of medicines and time setting operations are changed frequently as per the prescription schedule given by doctor; but there should not be made any changes in current time. The name of medicine and the group to which it belong is displayed on LCD display unit and buzzer gives the beep on time at which medicine is required to be taken.

Fig 3 Prototype of Automatic Medicine Reminder System
Fig 2 shows the prototype of automatic medicine reminder system which can be handled easily and simple to use. This system makes the work of patient very easy. The user just to need to update the system once and after that system will perform all the tasks itself. This system just not reduces the complexity but is also reliable for use.

**EXPERIMENTAL ANALYSIS**

The simplest experiment was made using this system. This system is used to give the information about the right dosage of medicine at right time as prescribed in the prescription. Initially the data that is the name of medicine and schedule of medicine can be entered by the operator of the system or can even update the system himself. The current time and date can be tracked using RTC. For example the dosage time is 11 am and medicine name is aspirin as prescribed by the doctor. The patient only needs to go to the operator who will update the ARDUINO according the prescription and provide it to the patient. The keypad that is three push buttons are provided to update the time in hour, minute and second according to prescription and the name of medicine needs to be updated in the program. After completion of the process the output device that is alarm system and display system will get alert. According to the time entered the buzzer will give a beep and the LCD will display the name of medicine.

![Fig 4 Prototype of Working Medicine Reminder](image-url)
• **Connection Detail of ARDUINO**: The connection detail can be explained using the pin diagram of IC AT mega 328.

![ATmega328 Pin Mapping](image)

**A. RTC**: RTC stands for real time clock and used to keep the system update with current time and date. This is one of the features of ARDUINO therefore only library and few commands are required to include RTC into the system. The Lithium cell of 5v is used to keep the time running.

```cpp
#include <Wire.h>
#include<EEPROM.h>
#include <RTClib.h>
#include <LiquidCrystal.h>

LiquidCrystal lcd(7, 6, 5, 4, 3, 2);
RTC_DS1307 RTC;
int temp,inc,hours1,minut,add=11;
int next=10;
in INC=9;
int set_mad=8;
```

This is the instructions required to run the RTC. First the library is included that is #include<RTclib.h>. Then the liquid crystal is set to display the current time and date.

**B. Liquid Crystal Display (LCD)**: LCD in the proposed system is used to display the current time, time of intake of medicine and the name and group of medicine. A liquid crystal display is a flat panel display or other electronic visual display that uses the light-modulating properties of liquid crystals.
The LCD is an output device which provides desired output to the given input. Therefore the LCD is interfaced with ARDUINO. To interface the LCD the ARDUINO program includes the LCD library that is #include<liquidcrystal.h> to give the output at LCD. The pin of ARDUINO that are used to interface the LCD are digital pins 2, 3, 4, 5, 6, 7 and ground is common at power pin 4.

Fig 6 LCD

C. Alarm system: The alarm system consists of a buzzer. The buzzer used in proposed system is piezoelectric buzzer. A buzzer is a mechanical, electromechanical, magnetic, electromagnetic, electro-acoustic or piezoelectric audio signaling device. A piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source. A click, beep or ring can indicate that a button has been pressed. The buzzer is also output device and gives a beep when current time meets the set time. The programming is done to interface the buzzer with ARDUINO. The pin of Arduino used to interface the buzzer is digital pin 11 and ground is common at power pin 4.

Fig 7 Buzzer

ALGORITHM FOR INTRODUCED PROJECT

1. Set the prescribed time.
2. When the set time matches the current time, then the command is send to ARDUINO.
3. According to the signal received it sends the HIGH signal to the buzzer.
4. The group and medicine name will be displayed by LCD.
5. If the set time does not match the current time then no signal will be send to buzzer and the system will not give any output.[2]

CONCLUSION AND FUTURE SCOPE

There are many systems which are serving for the same purpose. But these systems are difficult to use, non mobile, expensive and complex processes. The proposed system overcomes these problems. The Arduino Based Medicine Reminder is simple to use, affordable, better accuracy. This system is helpful for every age group and can also be used in hospital for a group of people. This system will definitely reduce the bad effect caused due to wrong intake of medicine.

This system can be made more effective by upgrading its few features. In future due to manual work, the available system can become more time consuming. So in the give future, an attempt can be made to implement fully automatic medication reminder system based on handwritten character recognition. This is achieved with the help of artificial neural network. Neural network is very effective to decipher any character of any language. The accuracy of character recognition is more important. So accuracy of characters needs to improve by adding probability to each character. For example, a character Q is very less easy to find because character Q is more often mistaken with O in most of the OCR systems. The proposed system will only set the reminders in the built-in calendar application of the mobile. This reminder reminds user about their medicine in-take schedule. The system which we are implementing will also give the reminder about doctor’s next appointment. It will also tell the user of the end of the medicines. The scheduled reminder will not suggest any kind of medicine, dose of medicine, etc.

One more feature can be added to the present device that is GSM (global system for mobile). By interfacing a GSM shield with ARDUINO module and editing the program, the system can be made more effective and simple to use. The medicine reminder can be updated using GSM module. The new prescription given to the patient can be send by doctor from mobile to GSM module used in medicine reminder and the system will get updated itself.

REFERENCES


[7] todbot.com/blog/bionicarduino