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Automatic Personal Medicine Dispenser

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17BCE0850

Final Project Review

CSE2006 – Microprocessor and Interfacing

SLOT: A1 & L41 + L42

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Introduction:

The progress in medical technologies is one of the main contributions to the aging population. Most of the elders have chronic diseases and they need to take medications for a prolonged period of time in order to stabilize their conditions. So, medication safety for the elderly is extremely vital. The most commonly encountered situations of drug abuse are excessive drug usage and disobeying the medication instructions. In this project, I have developed a device called " Automatic Personal Medicine Dispenser " to help the people in need to consume the right medication at the appropriate time according to their requirements. This system improves the existing system by alerting the user at the particular time again by setting the count each time and if the user is unable to take the medicine a message is sent to his/her relative.

Abstract:

This project proposes "Automatic Personal Medicine Dispenser" with remind and consumption function which is used to give alerts to the user to take pills at the scheduled time. Smart pill box can reduce the guardian's responsibility of giving the correct medicines at the prescribed time. It is a medicine dispenser, it uses a micro-controller to keep track of medications of the user. It displays the time for the next medicine and when the time arrives, it generates audible messages as well as LED message. When the patient opens compartment, a sensor detects this and resets the time. "Automatic Personal Medicine Dispenser" will send a message to the user as well as his/her relatives in case the medication is missed.

Objectives:

- Stress free remainder system to take tablets in time.
- It is easy to store medicines.
- The box will never go missing.
- Alert messages which help to take medicines in time.
- The box has display and announcement which helps all kinds of patient.

Literature Survey:

According to World Health Organization, over 80% of the people above the age of 60 years are prescribed medicines that are to be administered 2 - 4 times a day. With the increase in Cardio vascular diseases and Diabetes among the peer group regular medicine administration has become a necessity. But among this another 40-60% is having the issues related to forgetting the taking of medicines at right time. Unintentionally, people do not check for overdose and wrong dosage. The survey for various modes of sensing and alarming has been performed analytically and practically.

Existing System:

In reference [1], a pill box based on a MCS-51 micro-controller was proposed; that pill box can send out medicine using a stepper motor at a scheduled time, but there was no provision to record the time when the patient actually took the medicine. Apart from the abovementioned disadvantages, the other disadvantages of these previous systems are as follows:

- The family members or patients need to fill the medicine in the pill box manually; this is an additional responsibility for family members of the elderly, or even the patients.
- Manually filling the medicine in the pill box may cause the medicine to dampen easily.

In reference [2], an intelligent pill box (IPB) was proposed. The IPB is based on the medicine bag system, and the IPB sends a medicine bag out of the box at the appropriate time. If the patient does not take the medicine bag away, the IPB would notify the caregivers via Skype. The IPB system improves the interactivity between patient and caregivers, but it works well only if an internet connection is available.

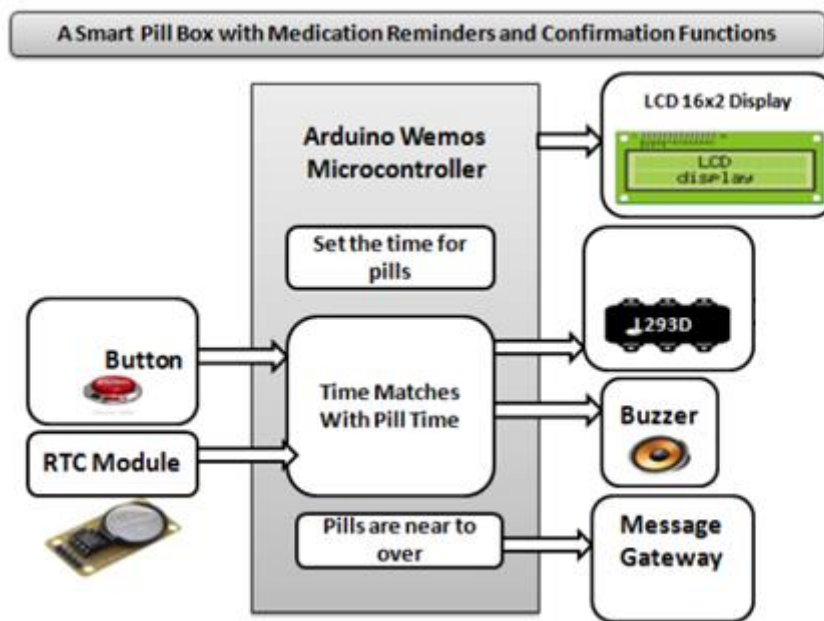
In reference [3], an electronic pillbox called MedTracker was proposed; in the MedTracker, the time at which each lid was opened or closed is recorded, and transmitted to PC via a Bluetooth link. However, the MedTracker does not provide any remind or confirm functions.

Proposed System:

In my project, in order to reduce the responsibility of family members of dividing the medications in the pill box, we assume that the medicine the patients need to take at particular times has been packed into the pill box.

The real-time clock gives continuous time as an output. Monitor the time continuously using a Real-time clock to identify the pill time. If the system time matches with pill time, the system shows that that it is time to take a pill. When the patient opens compartment, a sensor detects this and resets the time. “Automatic Personal Medicine Dispenser” will send a message to the user as well as his/her relatives in case the medication is missed.

System and Design Architecture:

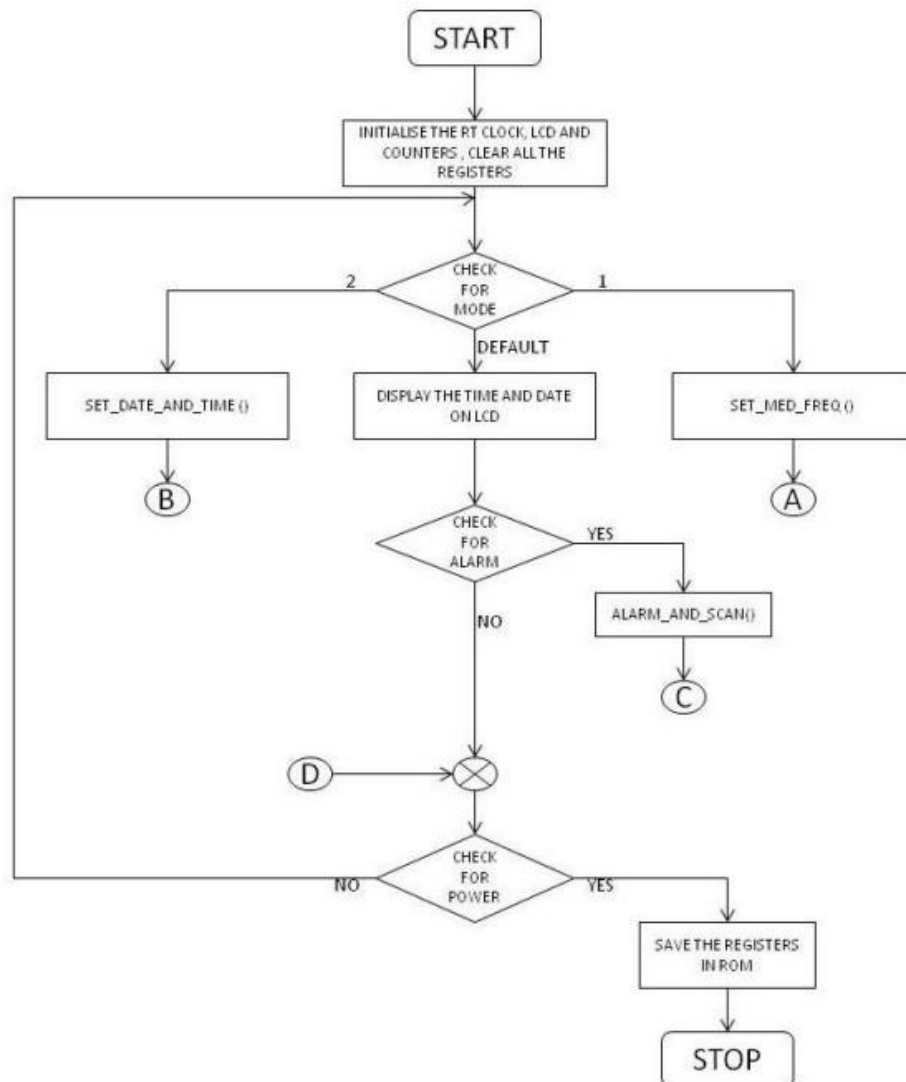


Requirements:

- Arduino Uno
- Arduino IDE
- IR sensors
- Real time clock
- Buzzer
- GSM Module
- LCD Display
- Pill Box
- Connecting wires
- Bread Board

Algorithm:

1. Initially, we will code the Arduino and assemble the components.
2. The LCD display will display the time slot of the medicine intake and buzzer will alarm the user.
3. Now if the user takes the pills on time, i.e. opens the lid, the IR Sensor attached to the lid will detect it and hence will send the message to Arduino to stop the buzzer.
4. In case the person fails to take the medicine (lid is not opened), the buzzer will automatically stop after a fixed time and will be put on snooze. If a person again misses the medicine, the output will be sent to GSM module which in turn will send a message to the person reminding him that he has to take his medicine.
5. And if once again the person misses the pill, a message will be sent to family members.



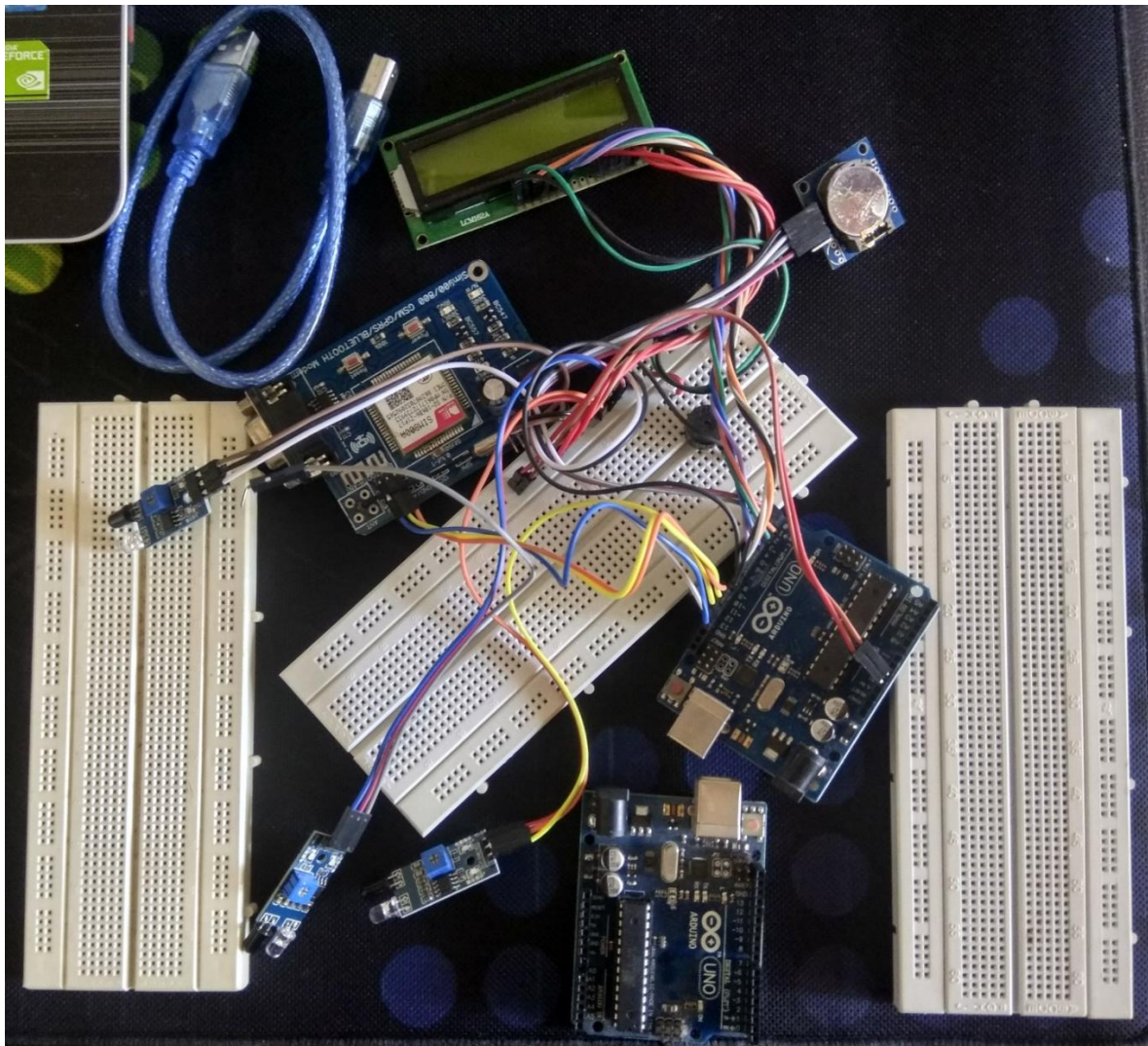
Conclusion:

Elderly people play an important role in the society. They are part of the priority group of healthcare. Therefore, it is necessary to create new devices using the emerging technology in order to improve their lives quality.

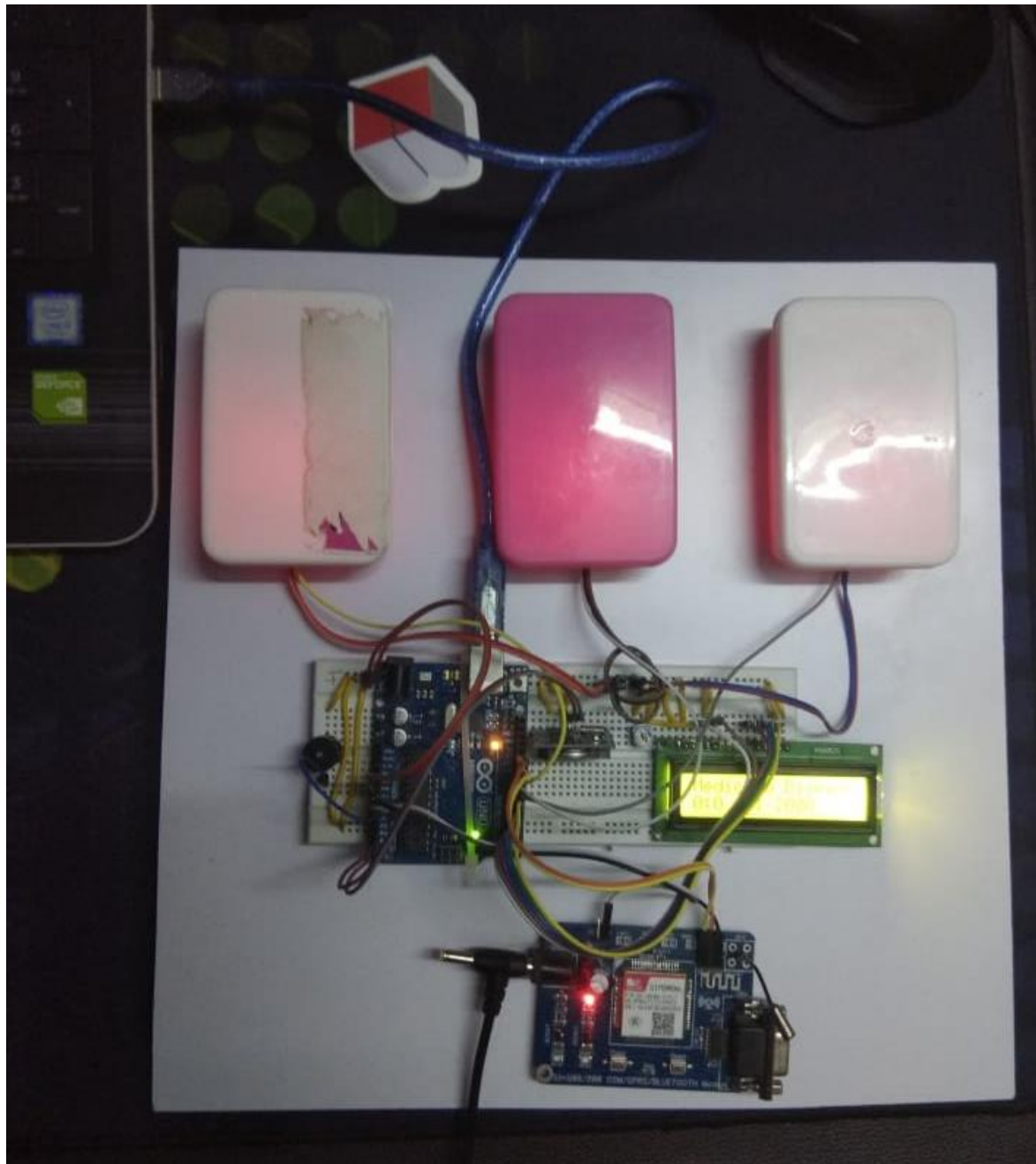
Based on open source solutions, a new alternative to remind medicine dosages is proposed. Arduino as main controller works totally right and give many other opportunities to develop. The objective of creating a device that allows the organization of several medication schedules, automatic opening system and an effective notification system, is reached. This system reduces family member's responsibility towards ensuring the correct and timely consumption of medicines by alerting the user to get the pill at the particular time. If the user is unable to take the medicine, a message is sent to his/her relative.

Result:

Before assembling



After Assembling:



References

1. G H.-W. Kuo, "Research and Implementation of Intelligent MedicalBox," M.S.thesis, Department of Electrical Engineering, I-Shou University, Kaohsiung, TW, 2009
2. S.-C. Huang, H.-Y. Chang, Y.-C. Jhu and G.-Y. Chen, "The intelligent pill box-design and implementation," in proceedings of the IEEE International Conference on Consumer Electronics, May 26-28, Taiwan.
3. T.L. Hayes, J.M. Hunt, A. Adami and J.A. Kaye, "An electronic pillbox for continuous monitoring of medication adherence," in proceesings of the 28th IEEE EMBS Annual International Conference, Aug. 30-Sept. 3, 2006.

Full code on my Google Drive

<https://drive.google.com/open?id=1IJmoeOLjS6IFXulMQ2Jm96mHQNqC-qz7>

Modular Code:

Libraries included:

```
#include "PinChangeInterrupt.h"
#include <Wire.h>
#include <Time.h>
#include <TimeLib.h>
#include <DS1307RTC.h>
#include <gprs.h>
#include <LiquidCrystal.h>
```

Setting date and time:

```
#if TIME_SET

    tm.Hour = 20;
    tm.Minute = 58;

    tm.Day = 27;
    tm.Month = 3;
    tm.Year = CalendarYrToTm(2018);
    lcd.print("Time Set Mode!");
    Serial.println("Time Set Mode");
    RTC.write(tm);
    while(1);
#endif
```

Reading sensor input and waiting for action

```
void smartDelay(int d){
    while(d--){
        delay(1);
        if(nottaken){
            if(!(!digitalRead(SENSOR1) && !digitalRead(SENSOR2) && !digitalRead(SENSOR3))){
                Serial.println("medicine taken!");
                lcd.setCursor(0, 1);
                lcd.print("Medicine Taken!");
                nottaken = 0;
            }
        }
    }
}
```


GPRS GSM Module Status:

```
#if GPRS_E
  gprs.preInit(SOFT_BAUD);
  lcd.setCursor(0, 1);
  lcd.print("Searching Modem!");
  while(0 != gprs.init()) {
    delay(1000);
    Serial.println("GSM ERROR");
  }
  lcd.setCursor(0, 1);
  lcd.print("Modem Found!");
  gprs.deleteAllSMS();
#endif
```

Date and Time Display:

```
  lcd.setCursor(0, 1);
  lcd.print("          ");
  lcd.setCursor(0, 1);

  tmElements_t tm;
  RTC.read(tm);
  lcd.print(tm.Hour);
  lcd.print(':');
  lcd.print(tm.Minute);
  lcd.print(' ');
  lcd.print(tm.Day);
  lcd.print('/');
  lcd.print(tm.Month);
  lcd.print('/');
  lcd.print(tmYearToCalendar(tm.Year));
  delay(1000);
```

Error displaying:

```
if (RTC.read(tm)) {
  Serial.print("Time = ");
  print2digits(tm.Hour);
  Serial.write(':');
  print2digits(tm.Minute);
  Serial.write(':');
  print2digits(tm.Second);
  Serial.print(", Date (D/M/Y) = ");
  Serial.print(tm.Day);
  Serial.write('/');
  Serial.print(tm.Month);
  Serial.write('/');
  Serial.print(tmYearToCalendar(tm.Year));
  Serial.println();
}else {
  if (RTC.chipPresent()) {
    Serial.println("The DS1307 is stopped. Please run the SetTime");
    Serial.println("example to initialize the time and begin running.");
    Serial.println();
  } else {
    Serial.println("DS1307 read error! Please check the circuitry.");
    Serial.println();
  }
  delay(9000);
}
}
```

Information Display:

```
unsigned long current = millis();
current = current - lastTaken;
current = current / 1000;
RTC.read(tm);
//if () {
  //if((tm.Hour == 8 || tm.Hour == 14 || tm.Hour == 21) && tm.Minute == 59 && tm.Second < 10) || (current > 10 && nottaken)){
  if(tm.Hour == 20 && tm.Minute == 59 && nottaken){
    lcd.clear();
    lcd.print("Time for Medicine!");
    Serial.println("TIME FOR MEDICINE!");
    int trycount = 15;

    Serial.print("medicine not taken!");
    while(trycount && nottaken){
      if(trycount % 5 == 0)
        Serial.print("!");
      digitalWrite(BUZZER, HIGH);
      smartDelay(500);
      digitalWrite(BUZZER, LOW);
      smartDelay(500);
      trycount--;
    }
    Serial.println();

    if(!trycount){
      Serial.println("Message Sent");
    }
  }
  #if GPRS_E
    gprs.sendSMS("8825264428", message);
  #endif
```