CS 321

PERIPHERALS LAB

Pill Scheduler

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INTRODUCTION

About one third of older adults are prescribed to take eight or more medications each day. With such a large amount of prescriptions, the consequences of forgetting to take medications at a particular time or, worse, accidentally taking the same medication twice are significantly high. It is noted that greater than 80 percent of elderly hospitalizations due to harmful drug reactions are caused by dosage errors.

To combat such situations, our project pill scheduler employs a method to segregate the medicines at the start itself and remind the user about the medicines through an alarm and open the appropriate slot according to the schedule.

HARDWARE MODULES

Sensors

2 Ultrasonic proximity sensors:

> ## Why is it used?

To check if the presence of medicine in the opened slot. If the user takes and medicine and forgets to place it back buzzer goes off as the new distance measured by ultrasonic sensor will approximately be equal to the length of the slot.

> ## What is it?

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

Motors

2 Servomotors:

➢ *Why is it used?*

To open and close the lid of the slot, a servomotor is used for each slot.

➢ *What is it?*

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.

Switches

2 SPST Switches:

➢ ***Why is it used?***
We have used an on/off switch to reset the time at which a particular slot should open every day.

Buttons

1 Push Button:

➢ ***Why is it used?***
We have used a push button to open all slots at the start to segregate the medicines.

Microcontroller

1 Arduino Board (Arduino Mega 2560)

> ## *Why is it used?*
To control the servomotors and ultrasonic sensors and switches we have used Arduino mega 2560.

> ## *What is it?*
The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

SETUP

A thick cardboard box with a cardboard partition for slots and rotatable lids is made for the pill scheduler. Slots are divided as morning and evening. A servomotor is attached to each slot and an ultrasonic sensor is attached to each slots wall. Switches are assigned to each slot. When a switch is turned on buzzer goes off three times and the corresponding slot's motor rotates and the lid of the slot opens.

The ultrasonic sensor assigned to the particular slot checks the presence of the medicine and according to the situation buzzer either goes off or doesn't go off.

CIRCUIT DIAGRAM

Servomotor and Arduino connection

Ultrasonic Sensor and Arduino connection
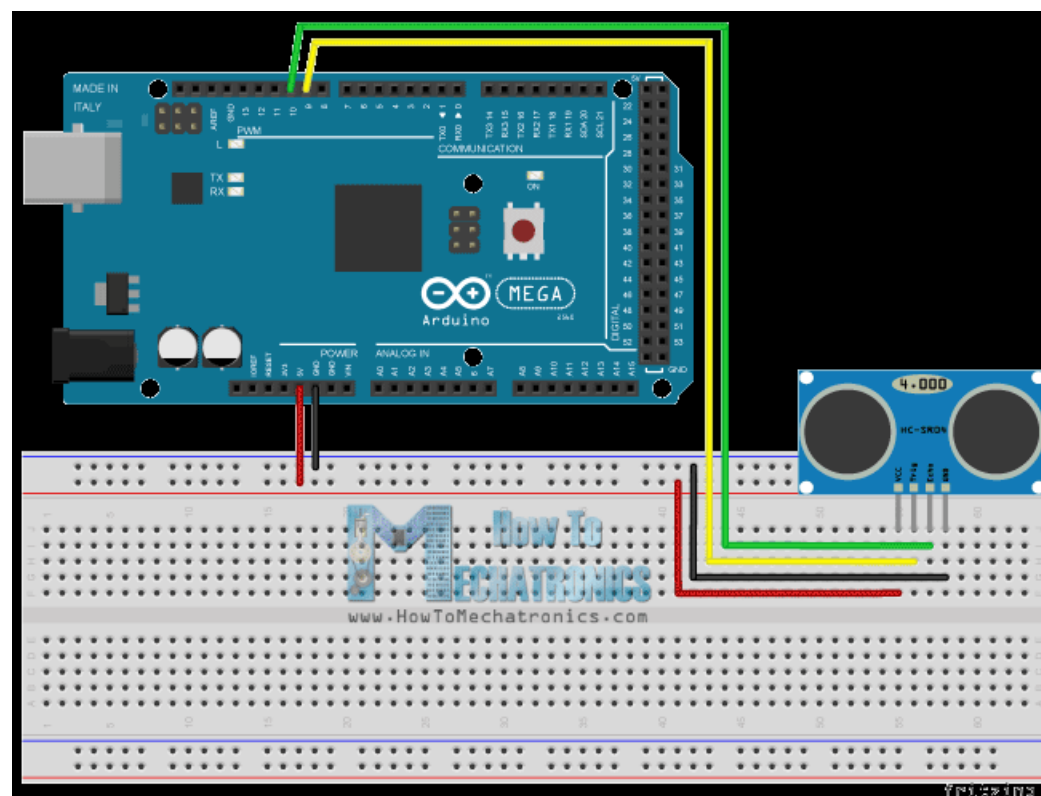
SALIENT FEATURES

I2C PROTOCOL

We have implemented **Inter-Integrated Circuit (I2C) Protocol** which provides two-wire interface to connect low-speed devices which are: -
i. **SDA** (Serial Data) – The line for the master and slave to send and receive data.

ii. **SCL** (Serial Clock) – The line that carries the clock signal.

I2C is a **serial** communication protocol, so data is transferred bit by bit along a single wire (the SDA line). Simple master/slave relationships exist between all components. Each device connected to the bus is software-addressable by a unique address.

In **our project** Arduino Mega 2560 acts as the master which communicates with two slave devices i.e. the HCSR04 sensor for both the slots using the I2C bus.

Automatic slot opening

A buzzer goes off for three times at appropriate times according to the prescribed schedule and the corresponding morning or evening slot is opened automatically using servomotors.

The opened slot closes again automatically after some time.

If the user forgets to place the medicine back, then a buzzer goes off with 15min interval to remind the user.

To reset the time at which evening slot or morning slot should open, the corresponding switch can be used.

PRECAUTIONS

(i) All voltage supplies should not be more than 5V (except DC motor) to ensure safe functioning.

(ii) The setup needs to be handled with care as it is fragile.

(iii) The medicines should be taken from the slot carefully without disturbing the servomotors orientation.

LIMITATIONS

(iii) If the medicine is not placed back, the buzzer goes at 15min interval for three times and even after that, if medicine is not placed nothing can be done.

(ii) If the user does not hear the buzzer at any interval, medicine will not be taken.

(iii) Slot opens and closes after some time, user should take the medicine in that time, if not, he should wait for the next opening time or press the switch.

FURTHER SCOPE

(i) Notifications and data regarding the medicines to be taken etc. can be shown on a LED display.

(ii) We can use plastic instead of cardboard as cardboards are very fragile and difficult to handle, also they provide more friction. we can also bring more stable setup using ply board.

(iii) A market based low cost model can be developed.

(iv) An alternative to buzzer can be established to remind the user about the medicine such as sending a notification to the user's personal device.

Thank you

Pill Scheduler