VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY, NAGPUR

Electronic Product Engineering Workshop

Submitted by :
Sunil Yengantiwar BT21ECE115
Siddhesh Shenoy BT21ECE118
Drishti Diwani BT21ECE120
Submitted to :
Dr. Ankit A. Bhurane
(course Instructor)
Department of Electronics and Communication Engineering , VNIT Nagpur

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1.1 Abstract

The main objective of the project is to design a smart dustbin which will help in keeping our environment clean and also eco-friendly. We are inspired from Swaach Bharat Mission. Nowadays technologies are getting smarter day-by-day so, as to clean the environment we are designing a smart dustbin by using on the micro controller-based system having ultrasonic sensors on the dustbin. If dustbin is not maintained than these can cause an unhealthy environment and can cause pollute that affect our health. In this proposed technology we have designed a smart dustbin using Arduino UNO, along with ultrasonic sensor, servo motor, and battery jumper wire. After all hardware and Smart Dustbin program will be run. Dustbin lid will when someone comes near at some range than wait for user to put garbage and close it. It's properly running or not. For social it will help toward health and hygiene, for business for we try to make it affordable to many as many possible. So that normal people to rich people can take benefit from it.

1.2 Components

1. Arduino UNO
2. Ultrasonic sensor
3. Servo motor
4. Jumper wires
5. Power Supply (battery of 5V).

1.2.1 Arduino Uno

The Arduino Uno comes with USB interface, 6 analog input pins, 14 I/O digital ports that are used to connect with external electronic circuits. Out of 14 I/O ports, 6 pins can be used for PWM output. It allows the designers to control and sense the external electronic devices in the real world.

1. LED: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.

2. Vin: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

3. 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.

4. 3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

5. GND: Ground pins.

6. IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the micro controller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.

7. Reset: Typically used to add a reset button to shields that block the one on the board.

Figure 1: Arduino Uno

1.2.2 Ultrasonic sensor

Ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception.
Working of an HC-SR04 Sensor:-
Ultrasonic sound vibrates at a frequency above the range of human hearing. Transducers are the microphones used to receive and send ultrasonic sound. HC-SR04 and like other ultrasonic sensor module use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to the target by measuring time lapse between sending and receiving of the ultrasonic pulses.
Distance=(time taken×speed of sound)/2
The HC-RS04 Ultrasonic sensor module has 4 pins, two pins for power supply and one pin for sending out ultrasonic sound waves(TRIG) and one pin for receiving ultrasonic sound waves(ECHO).

Figure 2: Ultrasonic sensor

1.2.3 Servo motor

Servo implies an error sensing feedback control which is utilized to correct the performance of a system. It also requires a generally sophisticated controller, often a dedicated module designed particularly for use with servomotors. Servo motors are DC motors that allows for precise control of angular position. They are actually DC motors whose speed is slowly lowered by the gears. The servo motors usually have a revolution cutoff from 90° to 180°. A few servo motors also have revolution cutoff of 360° or more. But servo motors do not rotate constantly. Their rotation is limited in between the fixed angles.

Figure 3: Servo motor

1.3 Code uploaded in Arduino

To make the servo motor rotate as we put our hand in front of the sensor we need to upload a code in Arduino to make the lid of the smart dustbin to move as we want. We have written the code in software called Arduino IDE and then uploaded the code in the Arduino. The code is as follows:

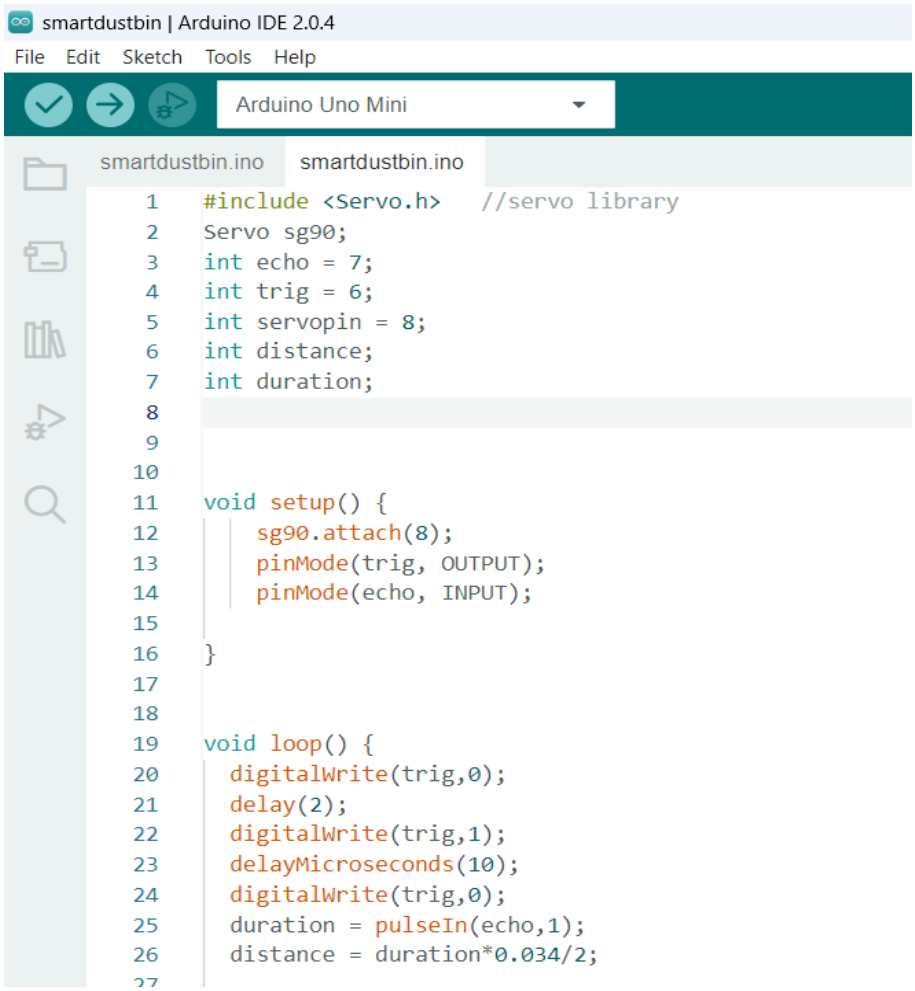

Figure 4: Code uploaded

```
28
29  if ( distance<30 ) {
30   sg90.write(0);
31   delay(4500);
32   Serial.print(distance);
33  }
34   else{
35    sg90.write(180);
36    delay(50);
37   }
38  }
39
```

Figure 5: Code uploaded

1.4 Connecting Arduino with Servo motor and ultrasonic sensor

As per the code we need to connect trigger and echo pin of ultrasonic sensor to 6th and 7th pin respectively of the Arduino.Vcc pin is to be connected with 5V pin and ground pin with the ground itself.
For the servo motor we need to connect yellow wire with 8th pin of Arduino and rest red wire with 3.3V and black wire to the ground as shown in figure below.

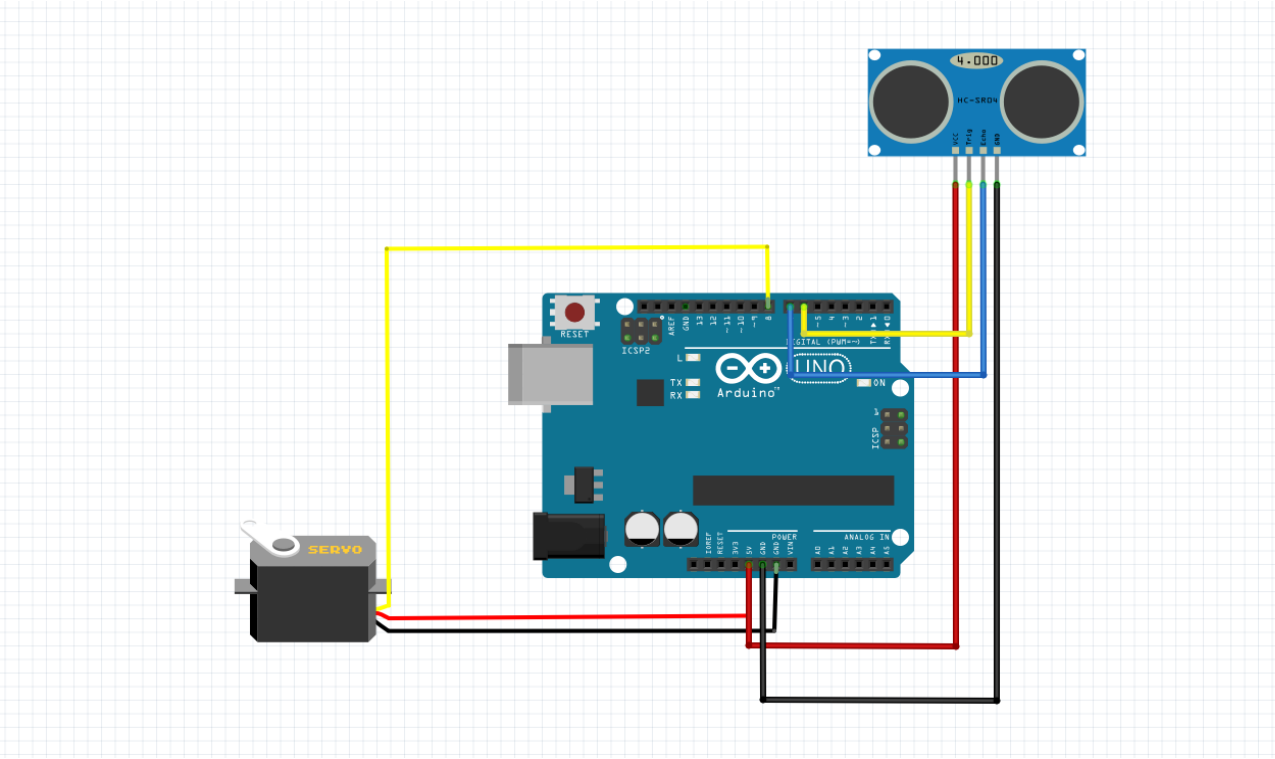

Figure 6: Circuit Diagram

1.5 Working of smart dustbin

After wiring and attaching all the devices and setting up to the Smart Dustbin, now observe all the important setup whether they are well connected or something missed. After connection set up now next step is to submit/upload code in Arduino and supply power to the circuit.When system is powered ON, Arduino keeps monitoring for any things that come near the sensor at give range. When Ultrasonic sensor detect any object for example like hand or others, here Arduino calculates its distance and if it less than a certain predefined value than servo motor get activate first and with the support of the extended arm of the lid. Lid will open for a given time than it will automatically close.

1.6 Testing the circuit

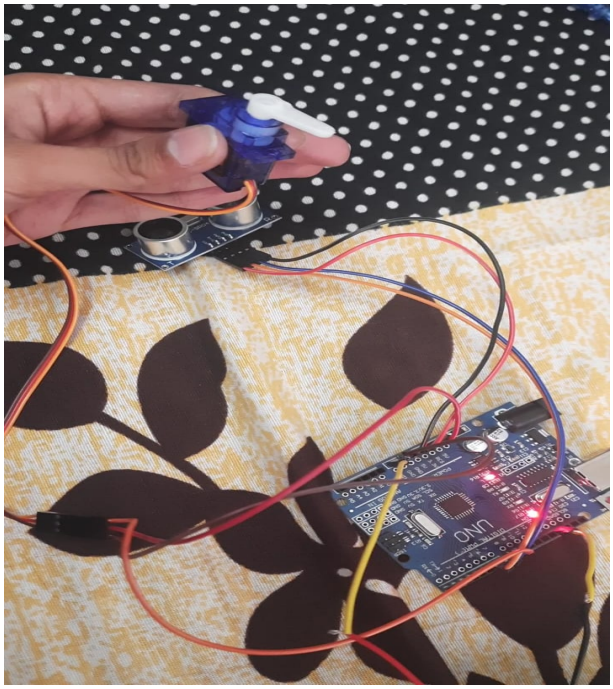

Figure 7: Servo motor test

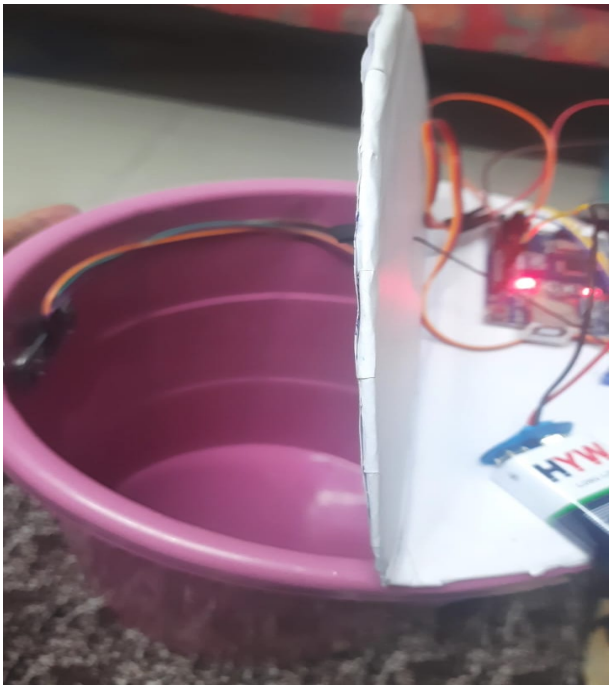

Figure 8: Dustbin flap test

1.7 Cost

1. Arduino UNO costs around 450 rupees.
2. Servo motor SG90 costs around 150 rupees.
3. Ultrasonic sensor HC-SR04 costs around 350 rupees.
4. Overall with dustbin approximate cost is around 1000 rupees.

1.8 Advantages

1. A reduction in the number of waste collections needed by up to 80 percentage, resulting in less manpower, emissions, fuel use and traffic congestion.
2. A reduction in the number of waste bins needed.
3. Maintain environment hygiene(i.e.no overflowing of waste and less unpleasant odor).

4. It will help in bringing evolution by technology in term of cleanliness.

1.9 Results

The dustbin is able to open the lid with the help of servo motor whenever it detects motion. The ultrasonic sensor is giving the details about the waste present in the dustbin. The status of the waste is transferred to the municipal authority whenever it is exceeding the threshold value.

1.10 Conclusion

Here we are going to make an evolution change toward cleanliness. The combination of intelligent waste monitoring and trash compaction technologies, smart dustbins are better and shoulders above traditional garbage dustbin. It is equipped with smart devices like sensor Arduino etc. Lid of the dustbin will automatically open when an object comes near to the dustbin and after certain time period it will close the lid. For society, it will help towards health and hygiene so that normal people to rich people can take benefit from it.

References

[1] Servo motor:
`https:`
`//circuitdigest.com/article/servo-motor-working-and-basics`.

[2] Ultrasonic Sensor:
`https://thestempedia.com/tutorials/`
`what-is-an-ultrasonic-sensor/amp/`.

[3] Arduino uno:
`https://www.elprocus.com/`
`atmega328-arduino-uno-board-working-and-its-applications/`

[4] Smart dustbin:
`https://youtu.be/aqAUIhVwF6o`