



Islamic University of Technology

Automated Garbage monitoring system with hand sanitizing system

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Project Proposal

Motivation

In this covid situation, we must prevent ourselves from touching objects as much as possible. We also must sanitize our hands on a regular basis. Again, Dustbin is a vital necessity which we use very frequently to keep our surroundings clean and safe. Unmaintained dustbin at home or any public place can cause an unhealthy environment which would eventually create pollution affecting our health. So a smart dustbin system can play an essential role in this regard. So our objectives behind the project are-

1. To make a smart garbage system which will work without any touching involved and more conveniently to keep the surroundings cleaner.
2. To make an automated hand sanitizing system which would not require touching the sanitizer and ensure easy use.

Recent work

Several projects had already been built on these two concepts. But typically, the systems are built separately. In our project, We will try to integrate these two systems together for more convenient usage.

Features

1. The upper lid of the garbage bin will open and close automatically when any object is kept at a certain distance. We will need to measure the distance of the object (trash) using an ultrasonic sensor and move the upper lid using a servo motor.
2. The garbage level inside the can will be maintained so that it can send a signal to notify that the can is filled and it needs to be emptied. The garbage level would be measured using IR sensor.
3. After dropping any trash, a message to sanitize hands will be displayed on the LCD screen.
4. The sanitizer would disperse when the hands are brought under it. We will use an ultrasonic sensor here.
5. It would notify when the sanitizer bottle reaches a certain level indicating that it needs to be refilled. It may give the indication using a buzzer or display.
6. We would also try to send messages to mobile phones to notify them that the dustbin is full or the sanitizer needs to be refilled.

Equipments

Hardware

- Arduino
- Servo motor
- Jumper wires
- Bluetooth Modules
- Lithium Ion Battery
- Breadboard
- LED Light
- LCD Display
- Piezo Buzzer
- Relay Module
- Water Pump

Sensors

- HC-SR04 Ultrasonic sensor
- IR Sensor
- Liquid Level Sensor

Challenges

1. As a beginner, working with hardware tools for the first time.
2. Measuring liquid level in the sanitizing system.

Components With Description



Fig: Required hardware components and sensors

Hardware:

Arduino Uno: Micro controller for controlling the whole system.

9V Battery: Batteries will power the arduino board.

Servo Motor: It used to control the position of objects, rotate objects. It is used in this project to rotate the position of the lid of the dustbin. After getting the signal, the servo motor will rotate and open and close the lid accordingly.

Jumper Wires: These are used for interconnecting the components.

Breadboard: It is used for interconnecting the components to build the prototype

LCD Display: It is used to display the message.

Piezo Buzzer: It is used to give the signal when the dustbin is full and needs to be emptied.

Bluetooth Module: It is used to notify the user by sending a message that the dustbin is full.

Water Pump: To irrigate the liquid from the sanitizer bottle.

Relay Module: It is used to control the water pump, switching it on/off.

Sensors:

HC-SR04 Ultrasonic Sensor: This sensor is used to measure the distance. It is placed on the front side of the dustbin to measure the distance of the person standing in front of it, so that the lid can be opened and closed accordingly.

IR Sensor: it can measure short distances. This sensor is placed on the upper portion of the lid from inside, so that it can detect the presence of the trash when the dustbin is almost full.

Liquid Level Sensor: It can measure the level of liquid.

Software:

Tinkercad: It is used for drawing the circuit diagram and to observe the simulation of the system for testing purposes.

Arduino IDE: To setup and upload the code on Arduino.

Tool:

Glue gun
Scissor
Anti cutter
Cardboard
Double Sided tape
Scotch tape

Project Setup and Workflow

Simulation of the system:

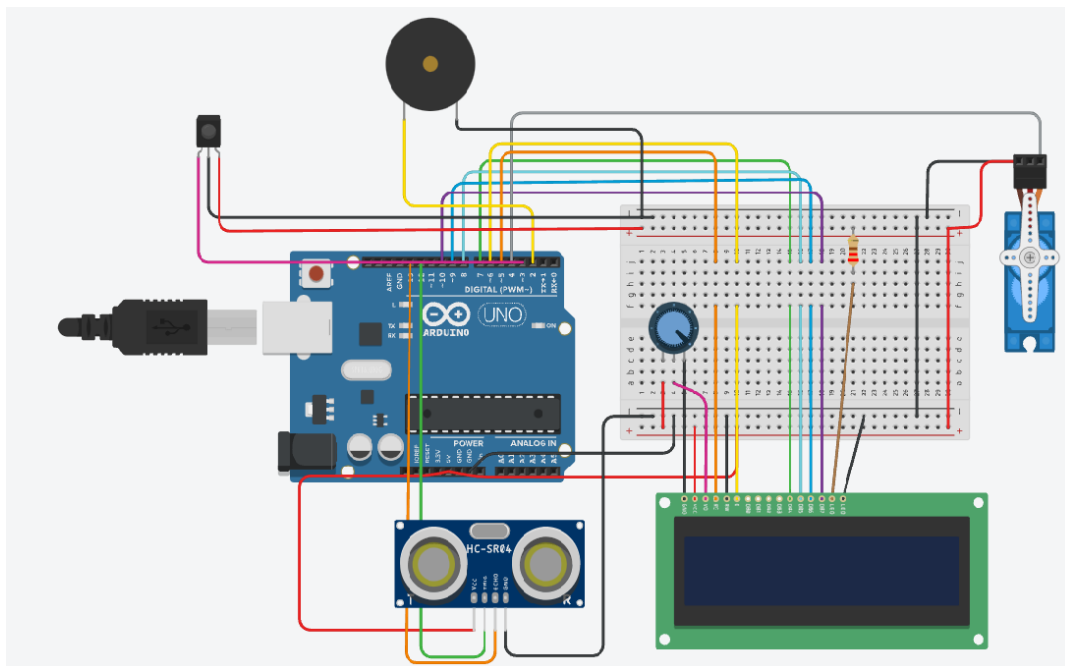


Fig : Circuit diagram of automated dustbin

At the very first step, we created the circuit using tinkercad to visualize the simulation of the system so that we can understand better before uploading the arduino code on the physical device, we simulated it first so that we can fix any error beforehand.

Constructing the model

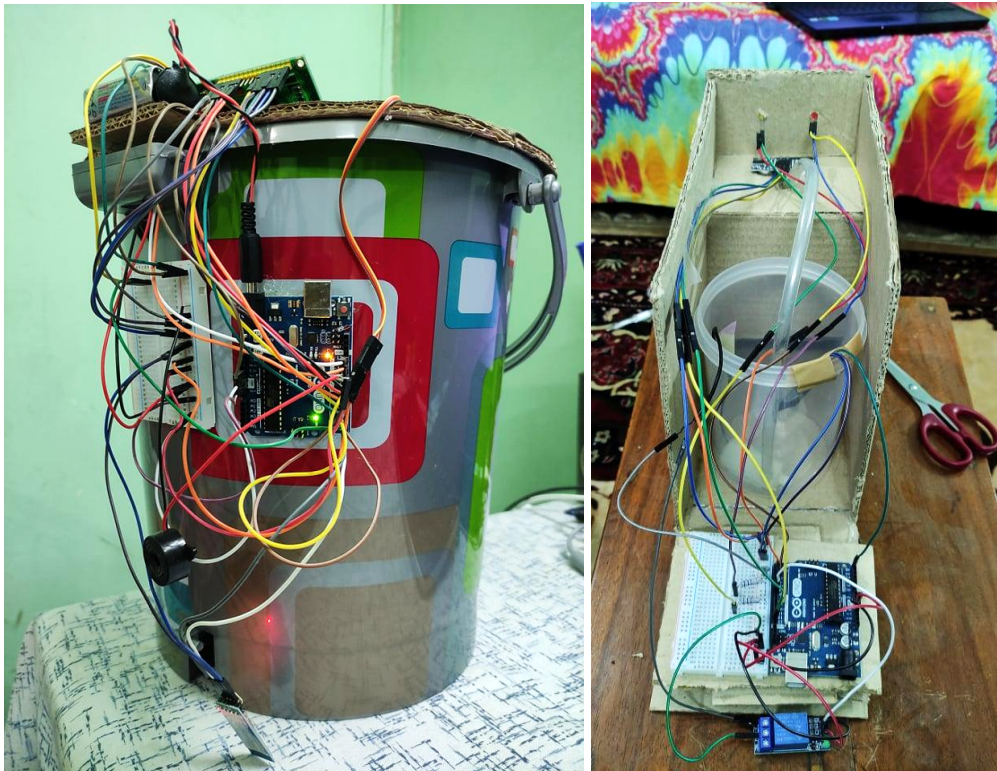


Fig : placing the connected components on the dustbin (left) and sanitizer (right)

Constructing the Dustbin:

Connecting Ultrasonic sensor to Arduino:

VCC - 5V

GND - GND

Trigger - Pin 12

Echo - Pin 13

Connecting LCD Display to Arduino:

RS - Pin 5

E-Pin 6

D4 - Pin 7

D5 - Pin 8

D6 - Pin 9

D7 - Pin 10

VSS - GND

VDD - 5V

V0 - Pin 11

RW - GND

A - 3.3V

K - GND

Connecting Servo motor to Arduino:

Power- 5V

GND - GND

Signal - Pin 4

Connecting IR sensor to Arduino:

Power- 5V

GND - GND

Output - Pin 3

Connecting Piezo Buzzer to Arduino:

GND - GND

Positive - Pin 2

The ultrasonic sensor is placed at the front side of the system, so that it can measure the distance of the standing person and take actions accordingly. The IR sensor is placed inside the upper lid so that it can detect the presence of trash when the dustbin is full. The connected arduino and breadboard is placed behind the dustbin with the help of a glue gun. The bluetooth module is kept behind. We used the bluetooth module to send notification to the user's mobile phone when the dustbin is full with trash. We implemented this feature using a mobile app called 'Arduino Bluetooth Terminal'. We have also used a piezo buzzer to give the signal that the bin is full and it needs to be emptied. So the overall idea of the dustbin board is when it detects an object the lid will open automatically and also close automatically after the trash is put inside. A text to sanitize hands will be displayed on the lcd display. Finally when the dustbin will be full with trash it sends an alarm through a piezo buzzer and sends a notification message to the user's mobile phone through the app.

Constructing the sanitizer:

Connecting Relay to Arduino:

VCC - 5V

GND - GND

IN- Pin 7

COM - 5V

NO - VCC wire of Water Pump

Connecting water Pump to Arduino:

GND - GND

VCC - NO of Relay Module

Connecting Liquid Level sensor to Arduino:

VCC - VCC

GND - GND

AOUT - A5

Connecting Ultrasonic sensor to Arduino:

VCC - 5V

GND - GND

Trigger - Pin 12

Echo - Pin 13

Connecting LEDs to Arduino:

Red led:

Negative - Connected to 1k resistor

Positive - Pin 3

Yellow led:

Negative - Connected to 1k resistor

Positive - Pin 5

There are two LED bulbs(red and yellow) placed at the front side of the system. Yellow bulb will be on while the sanitizer starts dispersing. On the other hand red light is used to give the alarming signal that the level of the sanitizer is almost finished. The liquid level sensor is placed inside the sanitizer bottle so that it can measure the sanitizer level. We have used a water pump to disperse the liquid from the sanitizer bottle. To control the water pump we used a relay module. This relay module works as a switch for the water pump to turn on and turn off. Finally we used an ultrasonic sensor to detect the hand. So the overall idea of the sanitizer board is when the ultrasonic sensor detects a hand the yellow bulb will be turned on. Relay module will switch on the water pump and then the water pump will disperse the sanitizer on the detected hand. Yellow bulb will turn off when the hand is removed, and the relay module will turn off the water pump. Finally the red bulb will be turned on when the liquid level will go beyond a certain level.

Programming and code upload

We wrote the code in arduino IDE and then uploaded the code via USB.

Testing and debugging

Finally we tested our system to observe the result. We tested the system in module by module,maintaining the edit-test-debug cycle. When any error occurred, we performed debugging and tried to fix the error and tested it again.

After uploading the arduino code, the dustbin worked accurately.The lid was opening and closing in proper conditions. The reminder message was shown on the LCD.



Fig : Reminder message on LCD display

When placing the hand below the IR sensor from inside the dustbin, the piezo buzzer played for a while and then stopped to give the signal that the dustbin is full and needs to be emptied. Moreover, a text notification was displayed on the mobile phone to notify the user.



Fig : Text message to notify the user

After that we tested the result of the hand sanitizing system. When the hand is placed below it, The sanitizer gets dispersed on hands and at that time, the yellow bulb gets lit up.

So, both of our systems are now ready to use!

User Manual

Using our system is very easy. Here are some short instructions to use the system-

1. Stand in front of the dustbin and bring the trash near 60cm of the dustbin lid. The lid will open up automatically.
2. Drop the trash into the dustbin and move aside. The lid will be closed automatically.
3. The display will give a reminder message to sanitize the hand. So stand in front of the sanitizing system now.
4. Simply bring your hands below and liquid sanitizer will automatically disperse.

This way our system keeps the environment clean, reduces human effort to monitor the garbage system and your hands totally germ free!

Demo Video

https://drive.google.com/file/d/1TngIrvfNT12Zt7VyhJitXstXVmI9dO8_/view?fbclid=IwAR2UXx6MAni9e9o76rJO2TUuRVH1cFB14UIAW0ZiYsuAPWddneydPXhql0c

Git Repository

<https://github.com/MaeeshaMeem34/Automated-Garbage-monitoring-system-with-hand-sanitizing-system>