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CONTACTLESS OBJECT SENSING SMART DUSTBIN TO BEAT POST COVID-19

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Abstract: ***Dustbin is a familiar term for all householders as well as every people. Dustbins are being globally utilised in public places, within bathrooms of any school, college and offices. An open dustbin is very unhygienic as mosquitoes, flies fly around it. Sometimes a very bad smell creates a lot of health problems. It also creates very unhealthy and unhygienic environment. Keeping in the view of these big problems, it will be a good idea to use smart dustbin for public wastages. Contactless dustbin will also help the society to fight against pandemic diseases. The designed dustbin has been presented in this paper. With the help of ultrasonic sensor, the dustbin automatically detects the human motion and gives the necessary response to servo motor. The detail working and necessary diagram are presented below in this paper.***

Key words: ***Arduino Uno, Microcontroller, Servomotor and Ultrasonic Sensor***

1. INTRODUCTION

While increasing the population, there is an increase in the garbage around urban areas. Management of waste material is a major challenge that is faced by most of the developed or developing country. Here the proposed dustbin operates automatically, with the help of Microcontroller based sensor associated circuitry. When open dustbins are used in public places, it leads to various hazards. Bad odour & ugliness to that place may be the primary cause of spreading various diseases. The proposed dustbin opens the lid by pressing the lever by foot and

then people throw garbage. This proposed dustbin works all of these by itself. The proposed system consists of an ultrasonic sensor in order to detect obstacle by human being [1]. When it detects the presence of human, the lid of the dustbin will open automatically.

Solid waste management is one of the biggest concerns in the world. Every day waste material produced from different sources need to be properly collected and treated to keep the environment pollution free and hygienic. Various researchers are presently working on different kinds of solid waste management projects. One such solid waste management method has been proposed by Prasanth Kumar A P [2] that uses an automatic garbage collector. This garbage collector produces an alarming sound and display the status on LCD display mounted on it when overflown by the waste material.It sends message through the GSM module installed in it to the concerned authorities mobile phone unit. The transmitted message bears the location information of the dustbin including street number, ward number, condition of dustbin indicating the status of overflown, degraded or damaged is transmitted to the concerned authority.The method presented by Mahesh Chandra Bhatt, Dharmendra Sharma, and Ashish Chauhan in his research paper [3] introduces Internet of Things that uses a group of sensors to send requisite information to the authority for cleaning it off. This system uses infrared sensors to measure the depth level of dust bin while filling up by the waste. It uses ultrasonic sensor to measure the distance of the person coming to disposal of the waste and opens its lid automatically when the person is at a specific distance from the bin. A servo motor with proper arrangement of connecting gears, helps to open the lid. The Wi-Fi module attached with the dustbin uses TCP/IP stack to communicate with nearest Wi-Fi network to send the requisite information to concerned authorities while the dustbin is filled up with solid waste. Though this proposed method is highly usable, but still it is not usable in places where proper Wi-Fi network is not present. Also, opening the lid every time when somebody comes in close allowable premises of the dustbin while the dustbin is spill with the waste, is also a matter of concern due to spreading of foul smell and bacteria.There is no arrangement of indicating the user about the status of the dustbin so that the user can take necessary measures. Varun Chaudhury, Rohit Kumar et.al [4] have proposed another method of solid waste management that employs ultrasonic sensor, servo motor, circuit switched system and Arduino uno hardware board. In stead of Wi-Fi network, this system uses the GSM network for sending SMS alert to concerned authority. Hence this system is quite accepted in cities where internet of things technology has not arrived. All the above research methodologies have their

own advantage regarding applications in different areas. But for use in small inhouse applications, some energy efficient design is required. The author of this paper has proposed an energy efficient method that runs on battery of 9 volt and can last up to weeks with a manual switch outside. This proposed system does not open when once the switch is off. Hence, in small home town areas when there is a lack of service from the end of authorities, manual override is possible in this system.

The important components other than Arduino Uno board used in this project to make it happen are HC-04 ultrasonic sensor and a SG90 servo motor. Object Detection is the mechanism of used ultrasonic sensor [5-6]. Thus, the methodology implemented here, uses ultrasonic sensor which is placed on top of the dustbin's lid and when it detects any object like a human hand or presence of obstacle, it will trigger a signal to the arduino to open the lid.

2. DESIGN PROCEDURE

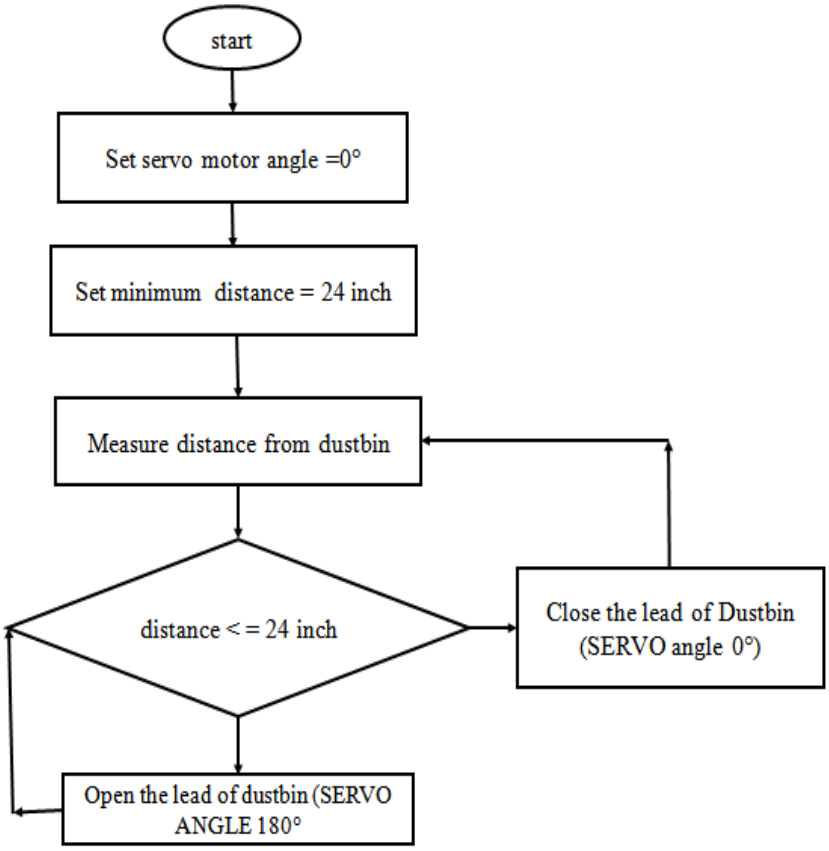

Figure 1 Flowchart of the Operation

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3. CIRCUIT DIAGRAM

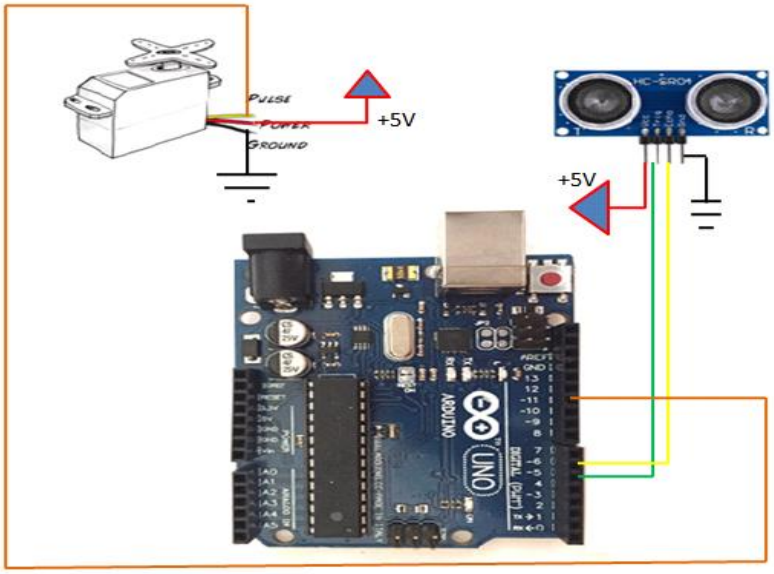

Figure 2 Connection Diagram

4. CONSTRUCTION

This section explains setup and building procedure of the Smart Dustbin using Arduino. First, to open the lid a Servo Motor (SG90) has been used for this purpose. In order to open the lid, a small tube made with plastic material and connected to the servo has been placed using some glue. This mechanism works when the lifting arm is parallel to ground under closed lid condition. Once the servo is in positioned, then moved onto the Ultrasonic Sensor.

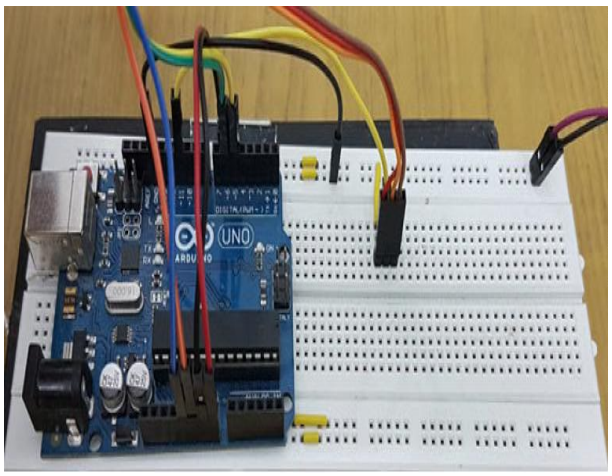

Figure 3 System Design

Second, the build process provides the required connections using connecting wires as per the circuit requirement and fixing these wires in such a wire with glue gun so that they don't mess around.Wires from the components such as ultrasonic sensor and servo motor are connected to the dedicated pins of Arduino. Thus, the process finishes up and makes the required Smart Dustbin.

5. WORKING

After completing the model of Smart Dustbin as shown in Figure 3, connection of the hardware as per the circuit diagram shown by Figure 2 has been done. Finally, the entire arrangement is looked like in Figure 4 for the hardware components. We have uploaded the program code to Arduino development board that follows the flowchart shown by Figure 1. Arduino development board has been provided with the required +5V power supply to the circuit. Once the system is switched on, the microcontroller keeps monitoring for object near the ultrasonic sensor within 24-inch distance. If ultrasonic sensor detects any person within the specified distance, Arduino Uno controller will automatically supply the command signal to the servo motor to open the lid. After some time, the lid will automatically close when the person is out of the range of ultrasonic sensor as set into the program.

6. FUTURE WORK

The work can further be progressed with the generation of IoT. Automatic alarm system can also be included with the smart dustbin system, so that the system will send a message to the local authority for cleaning. A level sensor with wifi-module will be able to do the job. Implementation of the work with GSM module can add fuel to the burning fire. Implementation of automatic alerting system with ultrasonic sensor, buzzer, piezoelectric device, arduino uno and wi-fi module will help the authority to take proper action about the concerned matter. It will ultimately help to keep cleanliness of the city.

7. CONCLUSION

A low-cost Contactless object sensing smart dustbin to beat post covid-19 has been designed and implemented. The system works fine without any problem and delay in response. It would provide a smart way to use the dustbin without touching the lid. The aim of this project is to reduce human involvement directly to touch and open the lid to the dustbin with a smart city

vision as well as to protect contagious diseases. It has been seen so often that garbage spilling over from dustbins on to streets and many animals like dog or rat enters inside or near the dustbin and it creates a bad scene. Some birds also try to take out garbage from dustbin and sometimes it creates pollution to the environment and health hazards to the animals due to toxicity.

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