

Smart Dustbin using IOT

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Abstract—Smart Dustbin is a device that can detect the presence of an object and automatically open the lid of the dustbin. The project uses an Ultrasonic Sensor HC-SR04 to detect objects in front. The Arduino understands the signal and sends a signal to the Servomotor to open and close the flap on top of the dustbin. This smart dustbin also includes a depth sensor using a second Ultrasonic Sensor and a Humidity Sensor to detect contamination of the dustbin due to the decomposition of organic matter. These features will be controlled by a separation microcontroller called Raspberry Pi Pico.

Keywords—Arduino, Raspberry Pi Pico, space detection, Humidity detection, IoT

I. INTRODUCTION

Waste management is one of the global issues faced by developing countries. A dustbin is an essential tool that helps to keep our house clean by providing a temporary place to store trash or garbage until it is disposed of properly. But as the world is advancing, people often forget small things in their day-to-day tasks. One of them is emptying their trash which sounds small but it is an open invitation to health problems due to contamination (or decomposition) of organic matter in dustbins. Smart Dustbin can play a major role for those people. Smart Dustbin not only allows us to use it without touching it, but It will also remind us to dispose of waste with the help of IoT implementation. Smart Dustbins can detect contamination and prevent further use of it until it is disposed of. In Smart Dustbin Arduino is used to automate opening and closing (automatic lid). Where Raspberry Pi Pico will be utilized to examine free space and contamination of the bin. A second ultrasonic sense will be used for free space detection and a humidity sensor will be used for contamination detection by detecting moisture released by decomposition of organic matter. The contamination detection will also prevent the further use of the dustbin unless it is emptied by disabling the automatic lid.

II. IMPLEMENTATION METHODOLOGY

After connecting and attaching all the devices, and setting up the Smart Dustbin, carefully inspect all the critical configurations to ensure proper connections and identify any missing components. Once the physical setup is complete, proceed to upload the code to the Arduino and provide power to the circuit. When the system powers on, the Arduino continuously monitors the area around the sensor within the specified range. If the Ultrasonic sensor detects an object (such as a hand or any other item), the Arduino calculates its distance. If this distance is less than a predefined threshold, the servo motor activates, assisted by the extended arm of the lid. As a result, the lid opens briefly and then automatically closes.

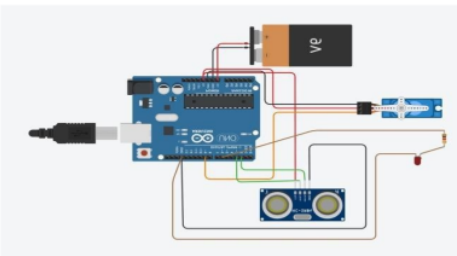


Figure 2.1 Circuit Diagram of a prototype Smart Dustbin.

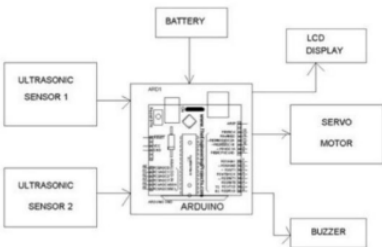


Figure 2.2 Overview of Smart Dustbin

III. LITERATURE SURVEY

Traditional waste management systems face several challenges:

Inefficient collection: Frequent emptying of partially full bins leads to wasted resources and unnecessary traffic congestion. Overflowing bins: Uncollected waste creates unhygienic conditions, attracts pests, and poses public health risks.

Lack of data: Traditional systems lack real-time information on waste levels and types, hindering informed decision-making about collection schedules and resource allocation. These limitations have fueled the development of smart waste management solutions, particularly smart dustbins utilizing the Internet of Things (IoT).

IV. PROTOTYPE MODEL



Figure 4.1 Prototype of a Smart Dustbin using IoT (a) Top view and (b) Front view.

V. CONCLUSION.

Here we are going to make an evolution changes 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 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. Believe this will bring something changes in term of cleanliness as well technology. So our next work will be adding one more sensor which will sense whether our dustbin is full or not. And there will be a display will be added so that user can notify that dustbin is full or not.

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