



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 10, October 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

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SMART BIN

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ABSTRACT: The smart dustbin system in this project, powered by intelligent technology, is really important for making cities cleaner. Despite the presence of public dustbins in urban areas, inadequate waste management leads to environmental pollution, which in turn leads to ongoing deterioration and harmful effects on human life. These days, automation is the most sought-after feature. The best strategy for this is to use smart dustbins. Establishing smart cities and adopting eco-friendly practices would be advantageous. To achieve this goal, it is essential to design an automated smart dustbin capable of detecting its current fill level. It ultimately contributes to maintaining hygiene in society, and slows the spread of diseases brought on by trash.

KEYWORDS: Smart Bin, Arduino Ide, Arduino Uno, Ultrasonic Sensor, Servo Motor, Moisture Sensor.

I. INTRODUCTION

The call for Smarter Cities seems to be on everyone's lips these days. People want better security, smoother transportation, and greater energy efficiency. Smart technology offers solutions to these problems, but we are still just scratching the surface of what is possible. A smart dustbin is basically your usual trash can where anyone can toss their garbage, but it's got some extra hardware to make it more efficient. We have used component like an Arduino UNO, a servo motor, ultrasonic sensors, a battery, a buzzer, Moisture Sensor and LEDs all working together to make it a Smart Dustbin. The bin uses an inbuilt ultrasonic sensor to determine how full it is. This clever trash can is a really creative device that will contribute to maintaining clean cities. This device keeps an eye on the trash cans and provides information on how much waste has been gathered inside of them which will help local people to maintain the surrounding cleanliness in their society. In order to accomplish this task, the system employs ultrasonic sensors that are strategically placed above the garbage bins. These sensors emit ultrasonic waves, and by measuring the time it takes for these waves to bounce back after hitting the trash, the system can determine the depth or distance of the trash within the bin. This data is then compared to a predefined trash level, enabling the system to assess how much space in the bin is occupied by waste. This process allows the system to effectively monitor and manage the fill level of the garbage bins.

II. LITERATURE SURVEY

Waste management poses a significant challenge in our country at present. The Smart Dustbin emerges as a solution to address these waste management issues. The concept is straightforward and user-friendly. In the context of smart cities, intelligent trash cans become indispensable. In India, the concept of smart cities is still relatively new. A crucial aspect of adopting a smart lifestyle is maintaining cleanliness, and dustbins represent the initial step in this direction. Proper placement and organized collection of dustbins are essential for a society to effectively dispose of its waste.

In a [1] researcher's proposal for an innovative smart waste bin aimed at improving waste management, the technology outlined in the paper relies on sensors to gauge both the quantity and weight of the waste present in the bin. To facilitate short-range communication, Bluetooth connectivity is used

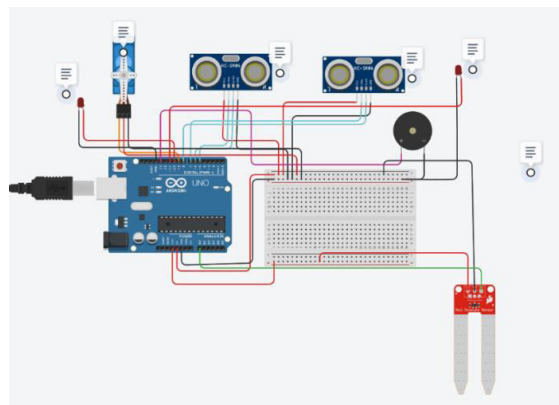
The researchers propose the following waste management strategy [2]. In this paper, an Arduino UNO is employed to track the trash levels in the dustbin. If the bin reaches full capacity, an alert is sent to the municipal website. To confirm that the trash has been emptied post-cleaning, the driver uses an RFID tag. RFID, a computer technology, enhances the smart garbage alarm system by automatically recognizing the type of waste deposited in the bin and notifying the server upon completion of the cleanup

The researchers propose a waste management strategy in their study [3]. The system utilizes an Arduino Uno board, LCD screen, and GSM modem to transmit data, powered by a 12V transformer. The LCD panel displays the accumulation of trash in the bins, while GSM is employed to send status updates to the user via SMS, covering information for each type of trash can. The garbage level is also constantly monitored and displayed on the LCD screen by the Arduino board within the system.

In their investigation, the researchers suggest a waste management plan [4]. The garbage can is linked to a microcontroller-based system that includes a central system that displays the trash can's current condition as well as an infrared wireless system. Using Wi-Fi, a mobile web browser can view the status of the system and see an HTML page. A Wi-Fi module is utilized for data transfer, and a weight sensor is used to save costs. It's vital to remember that the weight sensor just measures the weight of the trash in the bin; it does not determine the quantity of waste.

III. METHODOLOGY

Nowadays people are more conscious about their health and hygiene, by using our smart dustbin there will be no physical contact with dustbin & no fear of infecting with bacteria. Therefore, in this project we have come up with idea of automatic opening and closing of the dustbin lid, segregation of wet and dry material and level indication system using Arduino uno, servo motor, ultrasonic sensors, moisture sensor, buzzer, LED.



1. Component Description:

- **Ultrasonic sensor :-** A device that utilizes ultrasonic sound waves to measure the distance of an object is referred to as an ultrasonic sensor. It employs a transducer to send and receive ultrasonic pulses, enabling it to ascertain the closeness of an item.
- **Arduino :-** Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a small cost and start over again.

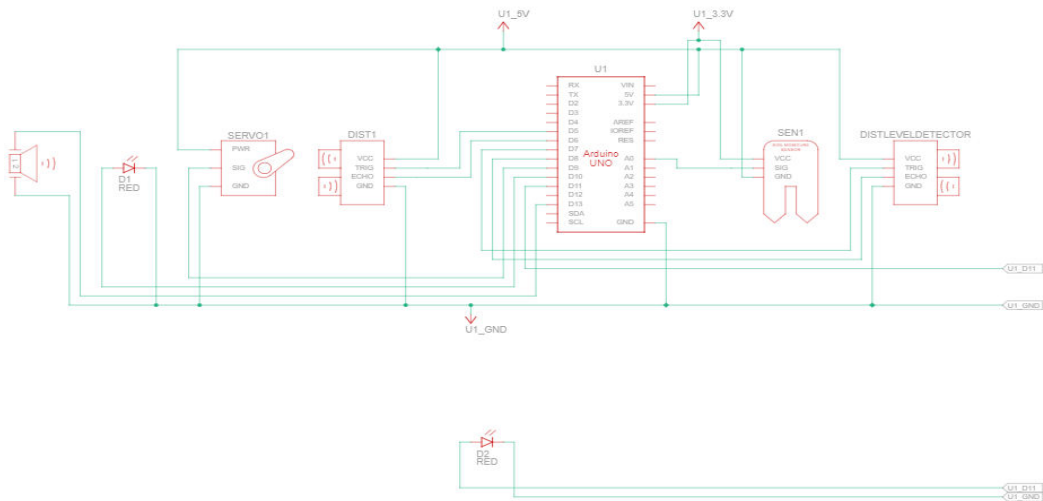
- **Servo Motor :-** The TowerPro SG90 9g Mini Servo is a servo with a 180° rotation capability. Classified as a Digital Servo Motor, it excels in swiftly receiving and processing PWM signals. This servo is equipped with advanced internal circuitry, delivering impressive torque, holding power, and rapid updates to external forces.
 - **Buzzer :-** It's a component used in generating sound waves. When its output is in a high state, this digital element, which can be connected to a digital output, produces an audible tone.
 - **Moisture Sensor :-** Moisture sensor is the sensor which will detect or measure the wet and dry materials and it will give command to the Arduino for the next command.
 - **LED :-** This LED serves as an indicator that the dustbin has reached its full capacity, signalling that it's time to empty the waste inside.
2. **Software used :-**
- **Arduino IDE :-** It's a compact programming tool enabling you to write and upload your code to the Arduino board. Packed with user-friendly built-in features, it's easy to understand and use. Plus, it comes at no cost, making it highly accessible.
3. **System Design :-**
- Create the general layout of the smart dustbin system, taking into account the Arduino board, servo motor, LED indication, ultrasonic and moisture sensors, as well as their positioning and integration on the board.
4. **Testing and Calibration :-**
- Conduct sensor thorough testing of the entire system under various conditions on Arduino to ensure accurate sensor readings of the circuits and proper servo motor functionality, and reliable LED indications. Verify all the sensors properly as per sets of instruction.

IV.WORKING

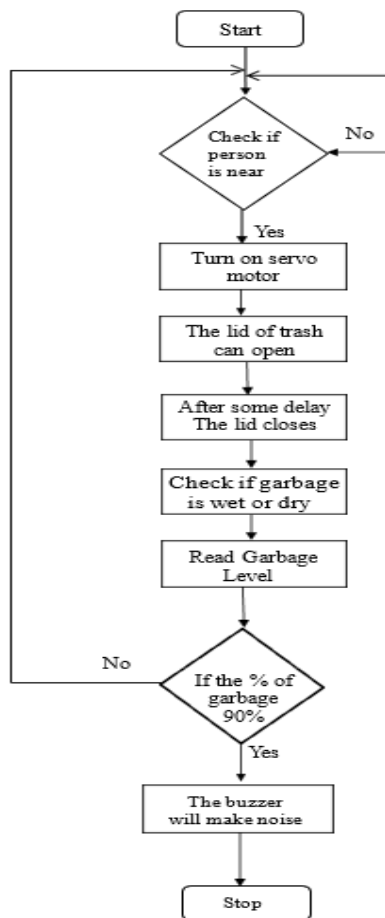
After successfully configuring the Smart Dustbin and establishing the necessary connections, proceed to upload the code to the Arduino board and ensure a stable 5V power supply for the entire circuit. Upon powering up the system, the Arduino initiates continuous monitoring of the surroundings, particularly the Ultrasonic Sensor.

Upon detecting the presence of an object, such as a hand, the Arduino performs distance calculations. If the measured distance falls below a predefined threshold, the Arduino triggers the Servo Motor. The motor, assisted by an extended arm, facilitates the controlled lifting of the lid. Following a predetermined time interval, the lid is automatically will be closed.

The moisture sensor in the system enables the identification of whether the disposed garbage is wet or dry. By segregating this data, the smart dustbin is equipped to segregate the waste accordingly. Furthermore, an additional ultrasonic sensor dedicated to level sensing is incorporated within the dustbin. This sensor continually assesses the garbage level and automatically detects when the bin requires attention. The status of the dustbin, including its fill levelled, then the Buzzer will generate the sound detection at certain level of the garbage overload. This comprehensive system not only facilitates automated lid control but also ensures efficient waste segregation and continuous monitoring of the dustbin's fill status.



V. FLOW CHART





VI. CONCLUSION

A simple yet efficient smart dustbin project, powered by Arduino, has been developed. This project ensures the dustbin lid remains closed, keeping waste contained and deterring flies and mosquitoes with the help of moisture sensor. The lid seamlessly opens automatically when it's time to dispose of the garbage when level sensor will detect the level of garbage and buzzer will get on.

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