



Smart Waste Segregation and Management System

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ABSTRACT:

The world population reached 8 billion, and the need for smart cities has increased. We need to keep our cities clean and hygienic. A huge world population has led to the production of a large amount of waste. And the procedure to process this waste is very tedious. Modern problems require a modern solution. Technology has always helped mankind with its problems. Automation helps to prevent the accumulation of waste. The sorting of the waste is designed in a way to allow the easy disposal of collected waste. Waste is collected in basically three categories. Wet waste, dry waste, and metal waste. Artificial technology is being used to detect incoming waste and classifies it as metallic, dry or wet using various sensors connected to the system and divert the waste to the appropriate bin. After the sorting is done, the waste is deflected using servomotors, which are programmed according to the requirement. The rising level in the container bin is monitored using the ultrasound sensor present in it. Authorized personnel is notified of the rising waste in the container. The personnel then empties the bin. Automation reduces human interference in the process and thus ensures the successful collection of waste in the appropriate time.

Keywords: Segregation, Recycling, Rapid industrialization, Improper waste management, Automated trash bin, waste Segregation.

1. INTRODUCTION

Cities all over the world are facing major problems due to urbanization, one of the biggest problems is the increase of waste and waste products due to the high demand for food and other important substances. General rubbish collects faster than usual, and many are not disturbed before collection. In many developed countries, garbage collection systems are good enough to prevent major disasters, while in some cities, local governments' neglect of sanitation has killed at-risk people. In today's waste management, many people are assigned to deal with the large number of bins; this is done periodically throughout the day. This leads to a very dirty and inefficient situation where some buckets will overflow and others will not be half full. Due to rapid population change or some decisions, it is not possible to say which parts of the city require urgent intervention. There are many specific procedures for the management and disposal of waste. But the lack of knowledge is very difficult. This inequality hinders the development of many countries in urban areas and increases the need for urban protection.

2. LITERATURE SURVEY

Populations in developing countries are growing, and proper management of accumulated municipal solid waste (MSL) is becoming increasingly important to create and maintain green spaces and safe spaces. Dr. N. Satish Kumar, B. Vijayalakshmi, R. Jenifer Prartana, A. Shankar (2016) [2] is a traditional approach that uses the tremendous power of RFID technology and represents the development of electronic monitoring systems (electronic monitoring). The electronic monitoring system is an embedded system consisting of RFID technology combined with an Arduino microcontroller and a fully computerized web-based. We developed a smart cart that locks when a threshold is reached. An ultrasonic sensor measures the amount of debris. The microcontroller reads the data from the sensor and reports it to the server. During the verification process, the RFID tag (manager ID) interacts with the RFID reader, and the ultrasonic sensor checks the bin's status and sends it to the web server. An Android application is used to view alerts and statuses on the server side. RFID technology requires no line of sight, and RFID waste tags can be read without looking.

3. PROPOSE METHODOLOGY

Waste management in major cities or towns is a difficult task facing many countries around the world. It is important for green environmental management that there should be an appropriate disposal system. There are many specific methods that exist for waste management and disposal.

But the lack of knowledge is very difficult. This inequality hinders the development of many countries in urban areas and increases the need for urban protection. Prototyping is a major challenge in waste management due to the lack of cooperation between the government, people, and local organizations in waste handling and treatment. Currently, waste collection is a common practice, which is a laborious and time-consuming process. RFID detects the authorized person and opens the waste container. The presence of garbage can be detected using an infrared sensor, and wet/dry waste can be detected at a later stage using a moisture meter. Move to separate areas depending on the wet or dry nature of the waste. Wet waste will be transported to the wet area and dry waste will be transported to the dry area. Above the two sections of the base are ultrasonic sensors to measure the distance. This measures the amount of garbage in the container and if the container is full an alert is sent to the garbage management website.

Different Types of Sensors are Required:

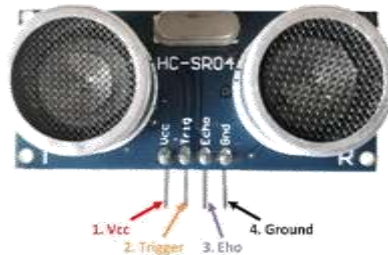
Hardware	Software
1.ESP 32.	1. Arduino IDE
2. Ultrasonic Sensor.	2. Firebase
3. IR sensor.	3. AAP inverter
4. Servo Motor.	
5. Moisture Sensor.	
6. RFID card and reader.	
7. Inductive proximity sensor.	

Hardware:

1. ESP 32: The ESP32 is a series of low-cost, low-power MCU systems with built-in WiFi and dual-mode Bluetooth.



2. Ultrasonic sensor: An ultrasonic sensor is connected to the front of the waste container. The garbage level in the waste bin is continuously monitored by ultrasonic sensors installed inside the bins.



3. IR sensor: Infrared (IR) sensors are electronic devices that measure and detect infrared radiation in the environment. Infrared light was accidentally discovered in 1800 by an astronomer named William Herschel.



4. Servo Motor: A servo motor is a type of motor that can rotate very precisely. Typically, these types of motors consist of a control circuit that provides feedback about the current position of the motor shaft, and this feedback allows the servo motor to rotate with great precision.



5. Humidity sensor: The moisture sensor recognizes the amount of moisture obtained by subtracting the dry load from the basis weight, and determines the moisture content as the amount of moisture released from the dry weight or total weight according to the notification strategy.



6. RFID cards and readers: An RFID reader is a device used to collect information from RFID tags used to track individual objects. Radio waves are used to transmit data from the tag to the reader. RFID is theoretically a technology similar to barcodes.



Software:

1. Arduino IDE: The Arduino IDE (Integrated Development Environment) is a software application used to program Arduino microcontrollers. It provides a convenient interface for writing, compiling, and uploading code to Arduino boards. Arduino IDE provides a user-friendly and beginner-friendly environment for programming Arduino boards. It simplifies the process of writing, compiling, and uploading code, making it accessible to a wide range of users, from beginners to experienced developers.

2. Firebase: Firebase offers many cloud services that range from authentication, storage, and cloud functions to hosting your web application. In this article, you'll use 2 services: Realtime Database and Hosting. Firebase offers a hosting service that you can use to host your app rather than managing your own web server and dealing with deployment and networking configurations. The good thing is that it is free (yet limited) and pretty easy to use. Firebase is a platform for creating mobile and web applications developed by Google.

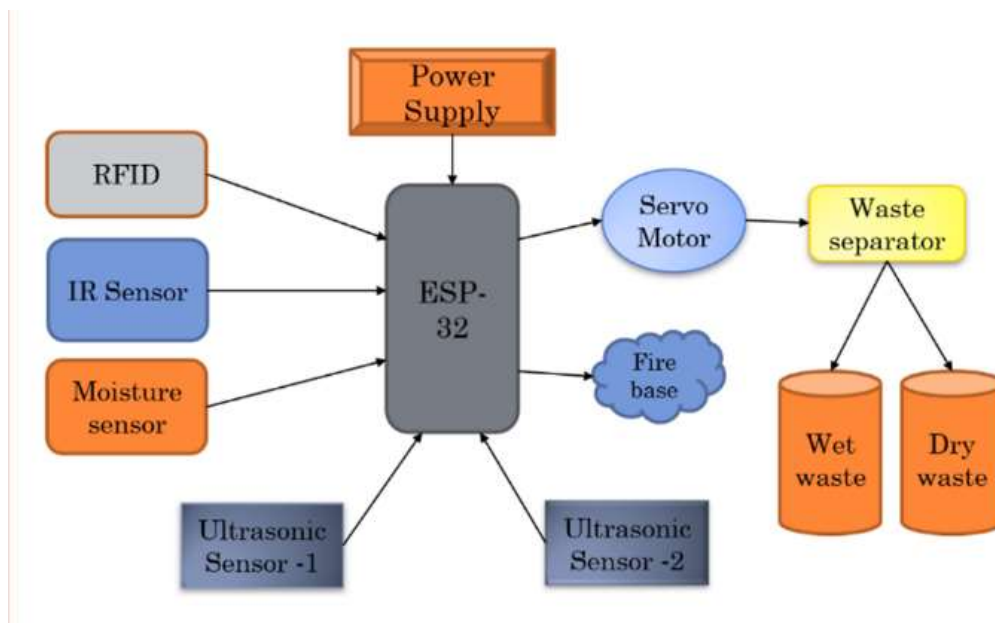


3. APP inverter: MIT App Inventor is a web application integrated development environment. It uses a graphical user interface (GUI) very similar to the programming languages Scratch (programming language) and the Star Logo, which allows users to drag and drop visual objects to create an application that can run on Android devices, while an App-Inventor Companion (The program that allows the app to run and debug on) that works on iOS running devices are still under development.

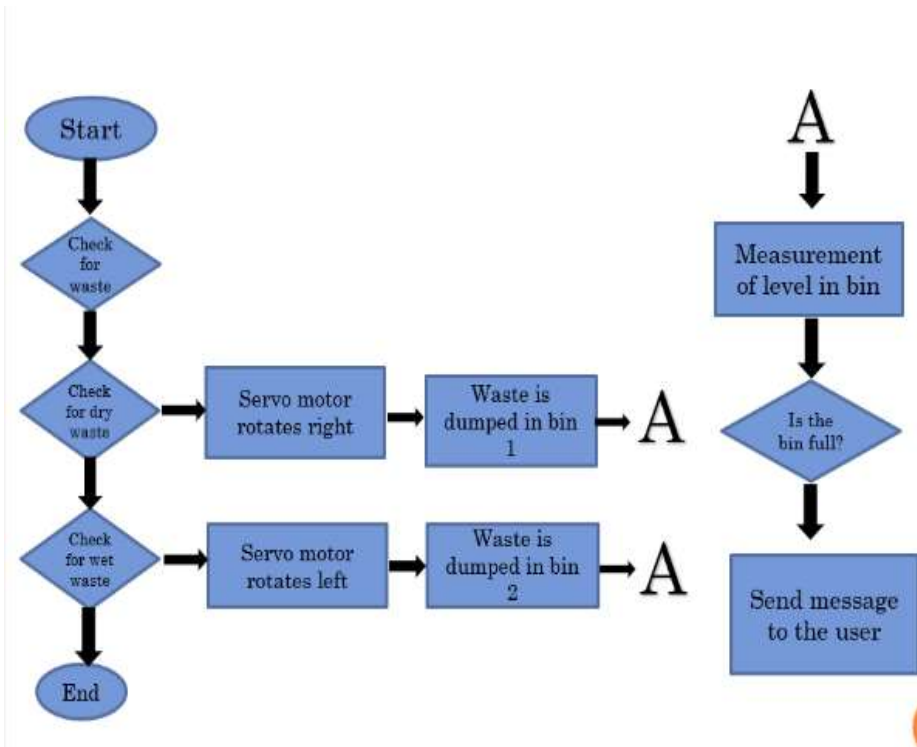
Working:

Leaving the door open invites many insects and bacteria that can cause bad odors and diseases. It has also been observed that dogs regularly have trouble opening the litter box and spread the waste around. To overcome this, the cover will only be opened when the authorized person appears. For employee identification, RFID cards will be issued to eligible employees for employee disposal. Separating waste from wet and dry waste before disposal will help to separate and reduce the workload of cleaning and waste management personnel. Humidity sensors will be used to separate the waste according to the current moisture content. The type of litter is determined and the litter is transferred to the relevant section. Taking care of the litter in your litter box is important to avoid excess water and save it for next time. Therefore, an ultrasonic sensor will be used to measure the liquid level. When the level crosses the threshold, it sends a notification to the appropriate person to remove the base. We contribute to a healthy environment by regularly separating and cleaning trash cans.

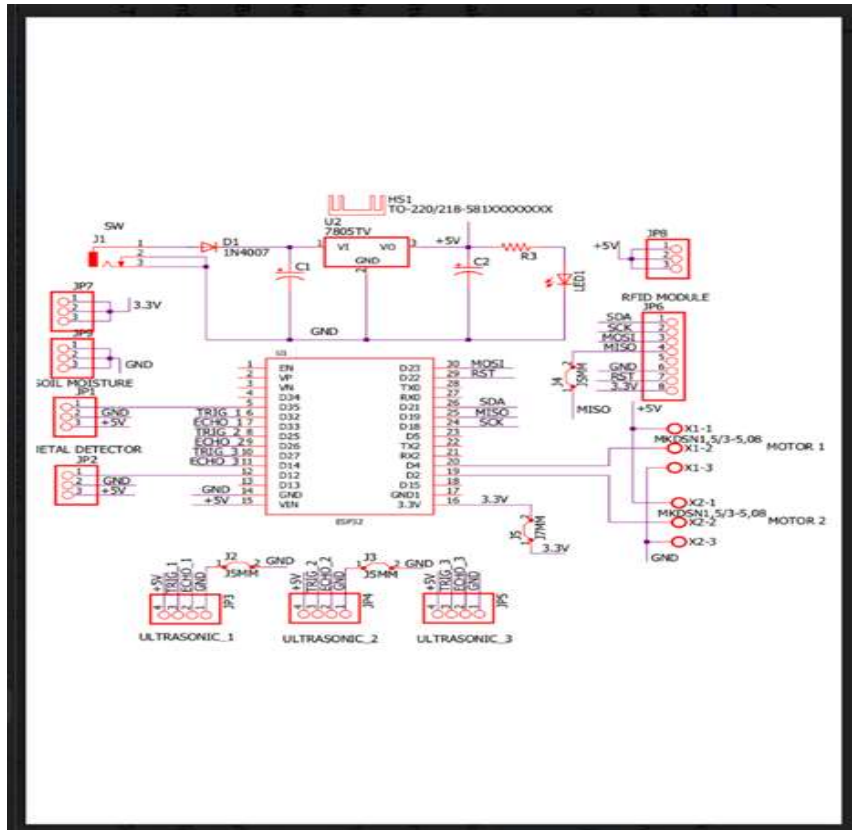
Block Diagram:

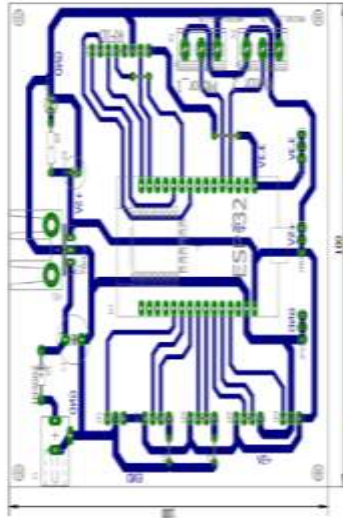
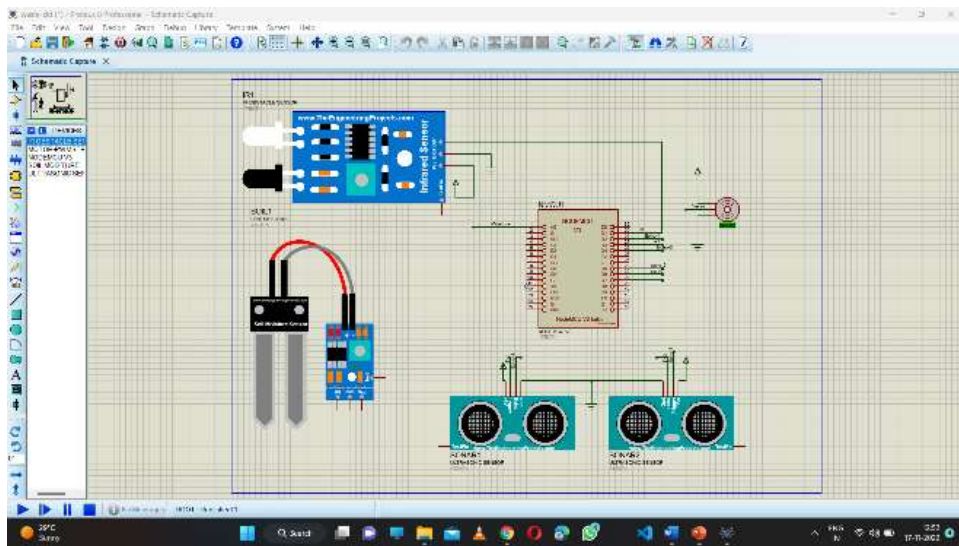


Flow Chart:



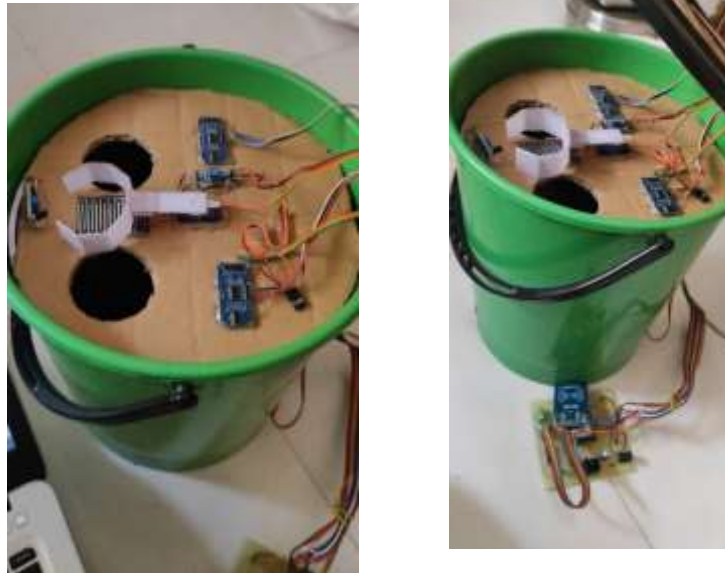
Circuit Diagram:



PCB Design:**Simulation:**

We use Proteus 8 software for simulation to run the simulation circuit of our intelligent waste separation and management system. We have the essential libraries needed for testing, including libraries for the ESP32, humidity sensor, ultrasonic sensor, infrared sensor, and servo motors. The downloadable library enables these devices to work effectively in a simulated environment.

4. Working Modal:



5. Conclusion

The behavior of waste products is very dangerous not only for the present generation but also for the future generations. People need to be educated and encouraged to recycle, reuse and reduce rather than create waste. Waste management should be a priority for cities and governments.

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