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AUTOMATED AND MOVABLE WASTE SEGREGATOR

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Abstract: The problem of improper waste management is becoming increasingly critical in many urban areas around the world. To address this issue, an automated and movable waste segregator is proposed. The segregator can be moved to different locations to collect waste from various sources, such as households, offices, and public places. This project presents Smart Dustbin-Separation of metal and non-metal by using IOT and ROBOTICS. Now a day, due to the busy work schedule people are not able to separate metal and non -metal waste. As we know, metals get corroded due to moisture, these moisture's are naturally obtained by decaying process of fruits and vegetables. This leads to diseases. Finally, we are step forward to keep the environment hygienic and clean. In this project, we are using conveyor belt along with the robotic arm assembly for separating the metals and non -metal wastes. These wastes are stored in different bins. When the dustbin is about to reach the full capacity this frame work sends a message to the operator. This process is done by using telegram application. The proposed automated and movable waste segregator offers a promising solution to the growing problem of improper waste management. By automating the waste segregation process, it can significantly reduce the amount of waste that ends up in landfills and improve the efficiency of waste collection and management.

Keywords: Robotics, IOT, Robotics, Dry, Wet and Metal.

I. INTRODUCTION

Ten million ton of garbage is generated in metropolitan cities. The landfills of most of these cities are overflowing with no space for fresh garbage waste. The philosophy of "waste management hierarchy" has been adopted by most nations as the step for developing municipal solid waste (MSW) management strategies. So we decided to separate waste in the home itself with the help of using sensors. Here we are going to use ultrasonic sensor and inductive sensor. in this project we are separating the waste at our home itself with the use of sensors. By separating the waste at home itself we can reduce the work done by the our municipality. This helps our government to recycle our waste in very simple manner.

According to a sanitation survey called ministry of urban development under the mission, it was found that about 50% people in India face the problem of improper waste collection and management. According to center of science and environment, innovative disposal and recycling methods must be introduced instead of landfill sites. Waste segregation and recycling are effective ways of reducing dumped trash. Unfortunately, these practices are not widely implemented in the country. People have been negligent when it comes to proper waste disposal, ignoring labels and throwing recyclables that can still be reused. Most of the people are unaware or ignore the fact the waste segregation and recycling can reduce cost, reduce drain in our resources, and lessen the waste being produced. Typical composition of garbage people throw in are 5.8% metals, 3.5% glass, 1.6% plastic, 12.9% papers, 1.8% textiles and 53.7% biodegradables which means only the remaining 20.7% of the wastes should really be going to our landfills. In our country, recycling centers do manual process of sorting wastes so it increase human interface. For this we implement a system which minimizes human interference in the waste collecting and segregation process. Materials such as paper, glass and metals are the wastes that need to be segregated in this project.

II. LITERATURE SURVEY

Increasing urbanisation, fast rate of migration to cities and development have resulted in a steady growth in consumerism. An inevitable side effect of this is exponential increase in waste generation. Different types of waste needs to be handled differently for reasons like hygiene, non-spreading of disease, cleanliness and toxicity. The model[1] consists of Node MCU(ESP8266) as a microcontroller, Ultrasonic sensor, Servo motor and Blynk app. Blynk app is used for referring attentive messages to the disturbed authorities thereby speedy act would be taken to vacant the bins. Blynk app requires high internet connectivity on both the sides. The model[2] consists of DC motor, Stepper motor for the robot to move if it detects a metal, it collects it and rotate 180 degrees with servo and drop it in a bin. From this work we came to know that metals can also be segregated by a sensor called metal proximity.The components used in this work[3]is Arduino UNO, ultrasonic sensor, GSM module, PIR sensor, LED's, Servo motor. Here we came to know that PIR sensor detects the human motion whereas ultrasonic sensor detects only object. They have implemented LED's to know the dust level instead of LCD.LEDS can't sustain for longer periods compared to

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LCD. The work[4] have been done using Esp8266 module, ultrasonic sensor, Raspberry-pi, Servo motor. Through Raspberry-pi which is connected to monitor via the HDMI cable displays the information on the cloud server. They are displaying the house numbers once the trash limit has exceeded the threshold limit. By just knowing the house number it is difficult for the authorities to reach exact location. The model[5] introduces GPS module that is easy for tracking of the house location with this one can overcome [4], the difficulty of identifying the house numbers.
The aim of the work [6] is to establish a smart receptable which can be used in all type of premises. The receptable is placed above the line follower kit which directly route the trash bin outside the premises once it is filled. We came to know that a recept able (dustbin) can be moved with the help of a line follower robot which is capable of carrying the over weighted receptacle outside with the help of 4 dc powered motor operated by 4-channel relay. From the work[7],we came to know about capacitive proximity sensor detects liquids such as petroleum, oil and water and all kinds of other solids such as plastics, cardboard and animal materials such as leather, stainless steel etc. The rain sensor-based system[8] functions only when water falls on the rain sensor directly. The cost of overall system increases as additional components are needed along with rain sensor . LDR sensor detects dry waste. So, it's better to use moisture sensor where it detects both dry and wet waste and hence the complexity of the system reduces. A smart and automatic waste segregator unit [9] has successfully been implemented in the reported work. The AWS system separated the dry (recyclable) and wet (residual) waste efficiently using a raspberry pi, moisture sensor, and raindrop sensor as the main modules. The project[10] mainly segregated 3 kinds of waste Metal, Dry and wet waste. The Metal is segregation is done using magnets. The remaining waste is passed through medium solid blower which blows away the dry waste. The rest waste is passed through the moisture sensor to get wet waste. The blower segregates low weight dry waste only.

From the paper[11] , Laser and LDR model have been usedfor the detection of plastic waste., the model also consists of open-close feature in it. When the dustbin reaches its limit, the open-close feature is disabled. Smart Bin works on a simple yet efficient methodology. It may be customised for domestic or public use. The model uses dual motor and tray mechanism. The mechanism or the working[12] of the model is that a waste kept on a tray is detected using IR sensor. Once the waste is detected the now it is segregated with the help of moisture sensor. In this model [13] the waste is segregated using into 3 categories i.e, dry, wet and metal waste. The waste is passed through compartment, compartment 1 mainly consists of metal sensor and an IR sensor, IR sensor is used to detect if the waste is present or not and metal sensor is used to check if the object is metal or not. If the object detected is metal then the object is sent to the bin 1,else it is sent to the compartment 2 where the waste is detected using IR sensor and differentiated whether the waste is dry or wet using moisture sensor, if the waste is wet then bin is rotated and the waste is sent to wet waste bin and if it's dry waste then the bin is again rotated and the waste is sent to the dry waste bin. With the help of NODEMCU the level of the bin is known and sent to the respective authority. The model[14] is quite unique as there is no usage of conveyer belt. Just by using dc motors the dustbins are rotated in such a way that the waste detected by respective sensors are sent to respective bins. The component used in the model[15] are Ultrasonic sensor is used to check the level status of dust bin so to determine if it is full or empty, while Load cell senses the weight of the garbage present in the dustbin and to determine if the threshold limit is reached or not. Active status of dustbin is shown on web page using connections through Ethernet shield.. The controller used here is Microcontroller PIC 16F8778. HTML is used to create web page . Web page provides information regarding location of dustbin placed, its status, name and contact details of the coordinator in that respective area. Real time status i.e., full or empty is shown on the web page and if it is full SMS is sent via GSM module to coordinator.

III. METHODOLOGY

In this system at first the IR sensor is used to detect the waste in front of the smart bin. Along with this we integrate a robot system to deliver the process of collecting the waste that is to be sorted by the Automated and Movable Waste Segregator, to minimize the human interference. The Robot Arm System is composed of dc motors and gear drivers that is able to mechanically pick up the waste and put it on a conveyor belt. Conveyor belt is run by dc motor and a relay. Sensors like moisture sensor to detect dry and wet wastes, also proximity sensor to detect metallic waste. If the moisture sensor detects the wet waste then divider pushes the waste to the bin 1. If it is not wet waste then inductive proximity sensor detects the metal and then divider pushes the metal waste to the bin 2. If it is not both wet and metal waste then it is considered as dry waste and it falls into bin 3. Also ultrasonic sensor placed at bin detects the level of waste inside bin and sends notifications to empty it once it is full via telegram app. IR Sensor is used to detect the obstacle. Ultrasonic Sensor is used to detect the level of waste in dustbin. Moisture Sensor is used to detect the moisture content in waste and distinguish between dry and wet waste. Inductive Proximity Sensor is used to detect metallic waste. Telegram app is used to send message alert to the concerned authorities when the dustbin is full. H-BRIDGE (L293D) is a motor driver which allows DC motor to drive on either direction.

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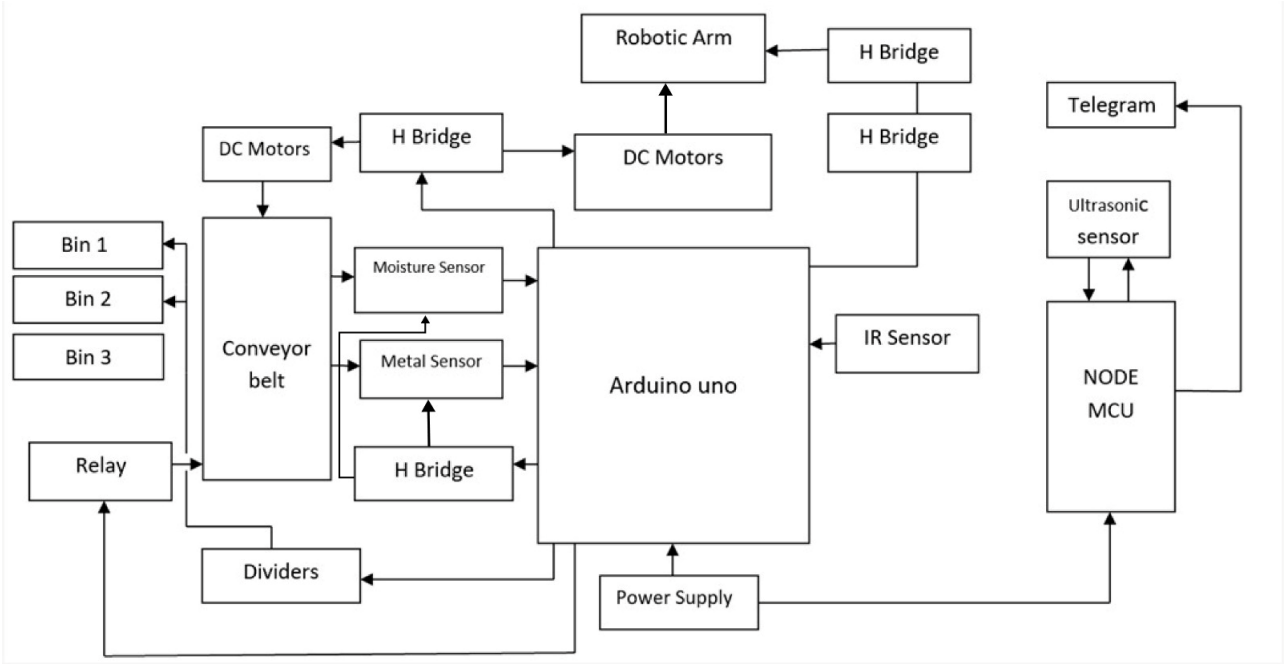

Figure 1: Block Diagram

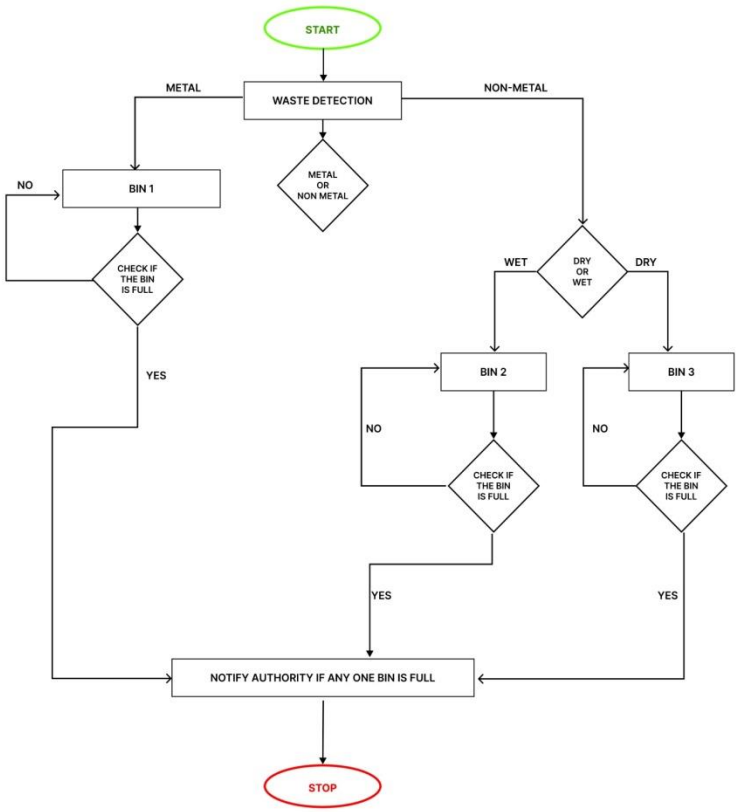

Figure 2: Flow chart of the working model

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IV. RESULTS

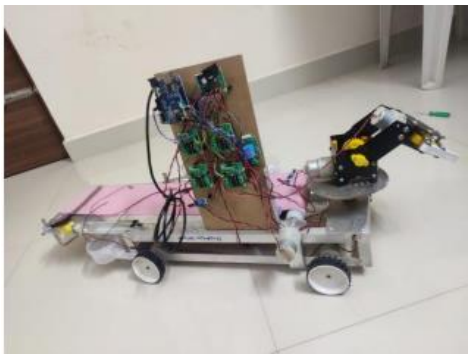

Figure 3: Overall working model

The above figure shows the overall working model of our project which is an automated and movable waste segregator.

Figure 4: Robotic arm picking the waste

Once the power supply is given to the model its starts moving and whenever it detects an obstacle its picks the waste as shown in the above figure.

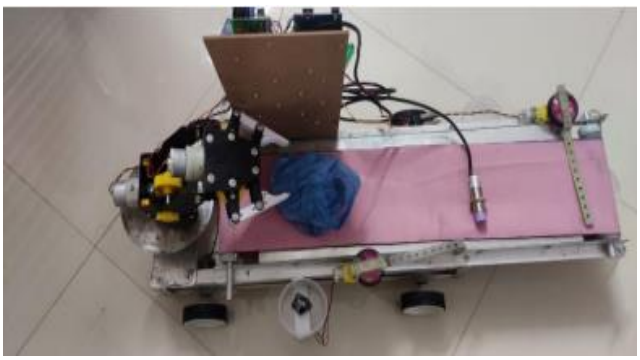

Figure 5: Robotic arm dropping the waste

Robotic arm after picking the waste it drops it on a conveyor belt as shown in the above figure. Then the conveyor belt starts to move.

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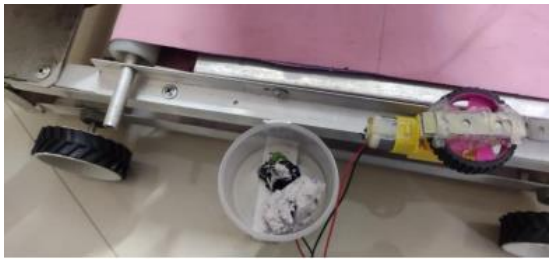

Figure 6: Wet waste bin

The conveyor belt after detection of wet waste stops for few seconds. In the above figure a wet paper is detected by moisture sensor and then divider pushes it to bin 1. Again, the conveyor belt starts to move.

Figure 7: Metal waste bin

Again, the conveyor belt stops for few seconds once the metal waste is detected. In the above figure a key is detected by a inductive proximity sensor and then divider pushes it to bin 2. Again, the conveyor belt starts to move.

Figure 8: Dry waste bin

If it is not both wet as well as metal waste then at last the conveyor belt moves and the waste falls into the dry waste bin. In the above figure a dry paper is fallen into bin3.

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Figure 9: Message alert

Once the bins are full a message alert will be sent to the concerned authority through telegram application as shown in the above figure.

V. CONCLUSION

The Trash management system is a step forward to make the manual collection and detection of wastes automated in nature. It would pioneer work for solid waste collection, monitoring and management processes. This project for the management of waste is efficient and time saving process than the currently employing method in which concerned municipal employee has to look for the filled waste bins manually across different spots in an area/street for checking regularly whether the waste bin is filled or not. Communication in emergency situations between soldier to soldier and providing adequate control room navigation,so we can conclude that this system will act as a lifeguard for military personnel around the globe. Although the final AMWS (Automated and Movable Waste Segregator) was a relative success, the team has created an outline for future improvement in terms of research and theory, implementation, and program management. On a high level, more research should have been done regarding the interfacing between modules so that a specific implementation plan could have been created. This would have allowed the team to avoid on-the- fly creation of code with limited functionality and debugging. In addition, more time should have been spent researching mechanical design of the robotic arm, whose problems led to a limited functionality of the robot.

VI. FUTURE SCOPE

Automated and movable waste segregator is an innovative solution that can help address the growing problem of waste management. This technology has a promising future scope, especially in urban areas where waste management is a significant challenge. Here are some of the potential future applications and benefits of automated and movable waste segregator:

1. Integration with AI and machine learning: Integrating AI and machine learning algorithms can help improve the efficiency of waste segregation. The technology can learn from past data and improve the accuracy of waste segregation over time.
2. Use of renewable energy: The movable waste segregator can be powered by renewable energy sources such as solar or wind power. This can make the system more sustainable and reduce its carbon footprint.
3. Enhanced sensors and sorting mechanisms: The technology can be improved by enhancing the sensors and sorting mechanisms. For example, sensors can be added to detect hazardous waste, while sorting mechanisms can be improved to segregate waste more accurately.

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