iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** IV **Month of publication:** April 2023

DOI: https://doi.org/10.22214/ijraset.2023.50780

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Comprehensive Application based Waste Management System

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Abstract: ***In the present world, large number of the problems are caused by unhealthy and dirty environments, since all domestic and outside waste is collected manually, there is always the risk of health hazard for workers doing the collecting and cleaning of waste task. For this purpose, a person have to go at dirty environment, putting their lives in danger and also as long as the waste remain on surface, it give rise in the birth of disease causing insects like Mosquito, Cockroaches, bacteria, viruses etc. This is a very significant issue and needs to be handled with utmost urgency.***
India currently produces 1.45 lakh tones of solid trash everyday, of which 35% is dry waste In Indian scenario the percentage of wet waste is about 60% of total waste.
If the segregation of waste is not done properly at source side, then its micro-separation at other side is impossible and the only way to get rid of it is through incineration.
If the segregation and degradation is not done properly then it leads to such type of situations.
Increase in height of landfills.
Air, water and soil pollution.
Toxic gas explosion in landfills.
Hazardous greenhouse gas emissions.
Labour exploitation and Child labour.
For this purpose, we are proposing an idea of An Application managed waste collection and segregation system. Therefore, the goal of our idea is to develop a system which will collect the wastes from users home and performs the different segregation processes to filter out different type of waste and also performs the decomposition process for the organic waste only . The mobile app is responsible for taking the data from user and location of waste and give it to responsible authority and also it performs the payment of reward and history of waste collection as per the amount of waste collection from users site.
Keywords: Robotic Arm, Segregation, Machine Learning, Waste Collection, Application

I. INTRODUCTION

According to Bloomberg report, in Indian Landfills, about 60% of the waste is organic, such as leftover food, peeling of vegetables etc. India currently produces 1.45 lakh tones of solid trash everyday, of which 35% is dry waste. According to the research, only 15600 tones of the daily average 26000 tones of plastic garbage produced are recycled. There are around 9400 tones that are not collected and end up in landfills or bodies of water.
By classifying the waste into different categories, it is easier to take advantage of its recycling potential.
If you choose to invest in sustainable dry and wet waste management, it will help you reduce:
Air, water and soil pollution.
Labour exploitation and child labour.
Hazardous greenhouse gas emissions.
Landfill waste
Toxic gas explosions in landfills
Recycle bins and separately coloured bins should be used to dispose various types of waste.
Our first duty to maintain a clean and healthy environment is to clean up the waste, but doing so manually would be dangerous to the person's health due of the close contact with various forms of waste Therefore, there is a n eed for technique or soluteons that can reduce human direct connection with waste,. So, we are providing a complete solution for waste collection, Segregation , Recycling and Decomposition. The Scope of the Solution proposed by this project is as follows:

1) To develop a system which comprises of application, waste collection and waste Segregation module.
2) To develop an application which will takes data from user to collect waste from their home, shows the status of waste processing and give warning or rewards to user as per their waste..
3) To develop a waste segregation and decomposition system, which will separate different type of wastes such as metal, dry, wet, plastic etc. and then performs the decomposition process for Organic waste.
4) We are expecting that the segregation of items such as big Paper and big Metals are already done. As paper and metals can be sold for recycling process at very good prices than us.
5) We are also expecting that there is not any harmful or illegal thing present in waste like explosives or animal dead body etc. Also, we are using X-Ray scanners in our waste collection van to detect the presence of such things.

II. LITERATURE SURVEY

Linwei Cui et.al.[1]proposed the development of a road garbage cleaning device based on ZigBee gateway and image recognition is designed, which consist of power module, camera pan/tilt module, robot arm module, ZigBee gateway module, GPS module, MCU control module and vehicle model module.

Md. Nafis Raihan et. al.[2] discuss at providing autonomous control of a robot to collect waste materials. The robot moves accordingly as it is programmed and differentiates between static and dynamic obstacle & uses the sensors to avoid them. It will collect the waste and keep it in its own waste bin.

Kena Patel et. al.[3] discussed the project that is designed to develop a fire fighting robotic vehicle controlled using android application for remote operation. The robotic vehicle is loaded with Water tanker and a pump which is controlled over wire less communication to sprinkle water to extinguish fire.

Supantha Mandal et. al.[4] presents path following two wheeled compact portable robot with Arduino nano as central driving functional unit with novel features of wireless control using wifi and bluetooth module with collision detection, avoidance and control features which provides the unique ability of danger avoidance ,falling from a height with improved stability and précis ion control. Navin Kumar Agrawal et.al. [5] is presenting the process through which robotic arm is made with the help of Arduino and Potentiometer for controlling and coordinating the industrial processes. Here, we realize that the robotic arm has the ability to move in four directions with the help of servo motors. For the movement of servo motor, Arduino UNO is responsible which converts the analog signal into the digital signal which is further received by servo motor. This project discuss about the technical imputation, the issue related with the implications and application of robotic arm in the field of automation of industries.

Ankur Bhargava et.al. [6] is presenting the process through which robotic arm is made with the help of Arduino and Potentio meter for controlling and robotic arm and also pick and place operation.

L. David William Rajet al. [7] discusses about the system avail in rescuing the child from bore well by the use of Robotic arm controlled by Arduino which includes the additional features such as air quality sensor to detect the toxic gases, temperature sensors which is used to measure the temperature and a miniature camera that is used to monitor the live status of the child inside the bore well. The proposed system will easily rescue the child without major injury.

Nandhini. S et.al. [8] discusses about the automated waste collection and segregation system based on a robotic assembly and machine learning based classification is developed. A robotic arm with a distance sensor will pick up the waste and place it on a binary classifier platform which has a camera attached to capture the image and an algorithm to classify the waste as biodegradable or non-biodegradable into their respective bins.

Trashcon [9] provides complete end-to-end technology that sorts the waste and recycles it, thus providing a comprehensive solution to convert every bit of waste to value.

III. COMPARISON TABLE

Paper No.	Paper Name	Controller Used	Software Used	Wireless Technology	Type of Waste	Size of Waste	Area of Cleaning	Sensors
1	Road Garbage Cleaning Device Based on ZigBee Gateway and Image	MCU	RBF Neural Network	Zigbee Gateway	Dry	Small	Road	Image Recognition using

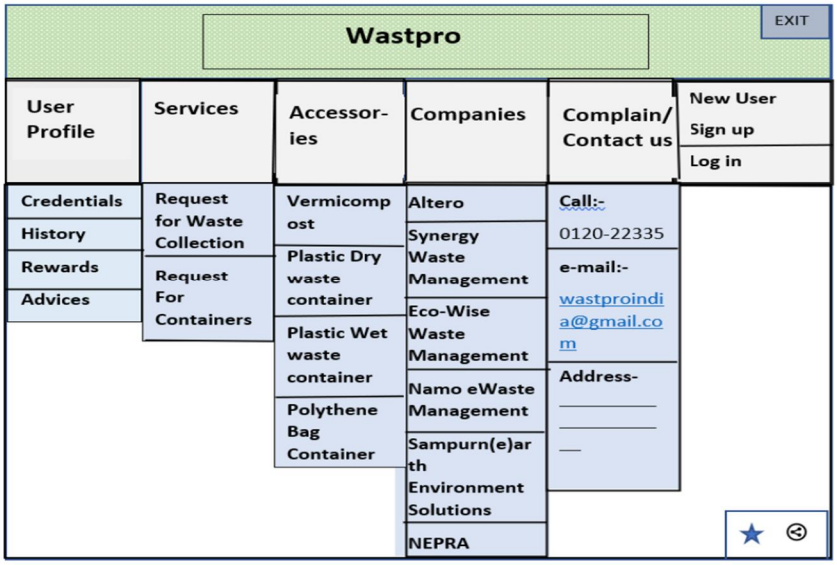
	Recognition		Model					Camera
2	"A Novel Approach for Waste Collection Automated Waste Collecting Robot with Advanced Image Recognition Technology And Onboard Robotic Arm	RasberryPi	Tensorflow ML Library and SSDLite	GSM Module	Dry	Medium	Homeand Outside Area	Image Recognition using Camera and IR Sensor
3	A Novel Fire Extinguishing Robotic Vehicle Controlled by Android Application	AVR ATmega32	Java and Android Studio and Arduino IDE	Bluetooth Module	-	-	-	Infrared Sensor
4	Low Cost Arduino WIFI Bluetooth Integrated Path Following Robotic Vehicle With Wireless GUI Remote Control	Arduino	Java and Arduino IDE	Bluetooth and WiFi Module	-	-	-	Infrared Sensor
5	Design and Development of IOT based Robotic Arm by using Arduino	Arduino	IOT and Arduino IDE	IOT	Dry	Medium	At all Places	Potentiometer based Sensor
6	Arduino Controlled Robotic Arm	Arduino	Arduino IDE	Wired	Dry	Medium	At Home	Potentiometer based Sensor
7	Robotic Arm for Extricate Operation in Bore well	Arduino	Arduino IDE	Zigbee Gateway	Dry	-	At Borewell	Gas and Temperature Sensor
8	Electronically assisted automatic waste segregation	Arduino	AI Convolut-ional Neural Network	-	Dryand Wet	Medium	At all places	Ultrasonic Distance Sensor

IV. PROPOSED MODEL

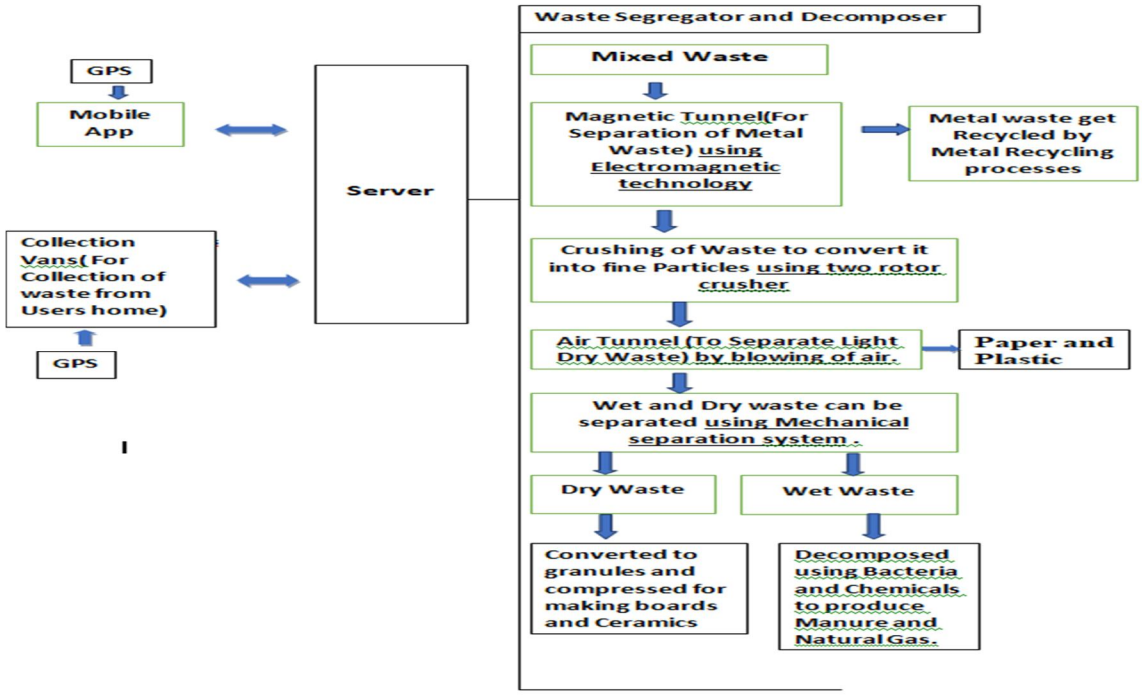
The proposed model is fully automated system, it will collect the data from user about waste, collect the waste from users home with the help of collection vans and then performs the different segregation processes at site to filter out different types of wastes and performs degradation process for organic waste and non-organic dry waste utilization. .

This model differs from the others as it is performing the waste collection , waste segregation and waste decomposition process, in addition to this it will give rewards to user as per their quantity of waste and also give some warnings to users who don't keep wet and dry waste separate or mixes all type of waste which will create problems..

A. Mobile app Menu for Waste Collection



B. Flowchart and Block- Diagram of Proposed Model



V. PROPOSED MODEL EXPLANATION

Our fully automated Waste Collector and Segregator system will performs the following functions:-

1) When any user requests for waste collection in app, the details of user with its real time location using GPS technology sends to Waste collection van .(GPS is a system of 30+ navigation satellites circling Earth. We know where they are because they constantly send out signals. A GPS receiver in your phone listens for these signals. Once the receiver calculates its distance from four or more GPS satellites, it figure out yours exact location.)
2) Then, the van reaches to user location, picks the waste and scans for any harmful or illegal things like animal dead body, explosives etc.(By using X-Ray scanners we can detect the presence of these harmful things)

3) The X-Ray scanners are already fitted inside the van container to detect the presence of such harmful things, if any such thing is detected then the buzzer starts giving warning sound about it and rejects the waste,(X-rays launched from one side of the machine are picked up by a pair of detectors on the opposite side. As your bag enters into the container. They visually inspect the X-ray images and decide whether the bag is harmless or contains a fully functioning IED with the following components: a triggering device, a power source, an explosive, and a detonator that need to be connected to each other by, for example, wires. All of the Inorganic explosives will turn green in x-ray)
4) When wastes are put in the van, it calculates the amount of waste using weighing machine and update it in the app.
5) The Van will be also GPS fitted to monitor its location by respected authority.
6) When Waste Collection van reaches the waste segregation site, then the wastes are fed to our waste segregator system using robotic arm for ensuring contactless feeding of waste to prevent workers from various diseases.
7) At first step of segregation, the mixed waste is passed through magnetic tunnel to separate metal wastes such as iron, copper etc. using Magnetism Technology.
8) The metal waste segregated out can be recycled to make new items using processes such as Shredding, Melting, Purification and Shaping.(Shredding is the process of cutting or torning big metal into smaller one. Melting is the process of heating metal at its melting point to make it liquid. Purification is the process of removing impurity from the liquid metal to make it pure and shaping is the process of moulding liquid metal into any shape.)
9) Then the remaining waste are passed through Dual rotor crusher to convert it into small particles. (Dual rotor crusher is a heavy duty crusher with staggered blunt edge hammers or hooked teeth welded on large diameter shaft to break the large matter into smaller particles).
10) Now, the crushed waste is passed though Air Tunnel where high speed air is blowed to separate out the small and light particles like Paper and Plastic(Air tunnel is a chamber where air is blowed at high speed to remove out light particles).
11) The separated Paper and plastics are then carried out for Recycling purpose.
12) Now, the remaining mixture of wet and dry waste is Separated using Mechanical Separation process.
13) The dry waste is differentiated using the Capacitive Proximity sensor and wet waste is examined with the help of moisture sensor.
14) Capacitive Proximity Sensors detect changes in the capacitance between the sensing object and the Sensor. As per the name, capacitive proximity sensors operate by noting a change in the capacitance read by the sensor. The amount of capacitance varies depending on the size and distance of the sensing object. An ordinary Capacitive Proximity Sensor is similar to a capacitor with two parallel plates, where the capacity of the two plates detected.
15) Moisture sensor works on the principle that As humidity changes, so does the resistance of the electrodes on either side of the salt medium. **Two** thermal sensors conduct electricity based upon the humidity of the surrounding air. One sensor is encased in dry nitrogen while the other measures ambient air. The difference between the two measures the humidity.
16) Now, from the above results of the sensors, if the result of humidity sensor is more than Capacitive proximity sensor then the waste is placed into wet waste bin and similarly if the result of Capacitive proximity sensor is more than the moisture sensor then the waste is placed into the dry waste bin.
17) Now, the dry waste separated can be used for making ceramics, boards, furniture etc.
18) Wet waste can be decomposed using Decomposition process to make form Manure and Natural gas.(The process of decomposition — the breakdown of raw organic materials to a finished compost — is a gradual complex process, one in which both chemical and biological processes must occur in order for organic matter to change into compost).
19) Now, the software stores the data of waste collected and post collection and segregation it shows the data of respected amount of Wet, dry, Organic and Inorganic waste from total waste.
20) After segregation it processes the payment of rewards/ amount as per amount of waste to user selected account or in cash mode as per users choice.

VI. CONCLUSION

1) In present scenario, there are so many studies being carried out in order to automate the process of cleaning, our project also stand with the same ideology but has major improvements than other projects. Many studies have been d one in great depth. We will focus more on making system contactless.
2) The Waste collection van will reach the desired location and collect the waste after it performs the Waste Segregation and Organic waste decomposition process at the site.

3) The mobile application user interface will be responsible for making request for waste collection and collecting the data and location of waste and payment of rewards rewards to the user.
4) User also can order accessories like containers for collection of waste and manure through app.
5) Mobile application also performs the payment of rewards to user for waste collected and also performs payment for order of Accessories.
6) In present, there are many environment problems getting developed day by day such as Greenhouse effect, Global Warming and irregularity in climate change etc. Our project will definitely contribute towards making solution for these problems.

VII. FUTURE SCOPE

We can add our Waste segregation and decomposer system in every societies and colonies for proper and on-time disposal of waste It will help in reducing the pollution and diseases by a greater extent.

Waste segregation system based on different sensors output can be implemented in the proposed model so to identify the waste is suitable for further processing or not.

A Vacuum cleaning facility can be provided for the small wastes, dust and other small particles in in collection van. Fully automatic control for the robot can be added so it needs less monitoring and saves man power.

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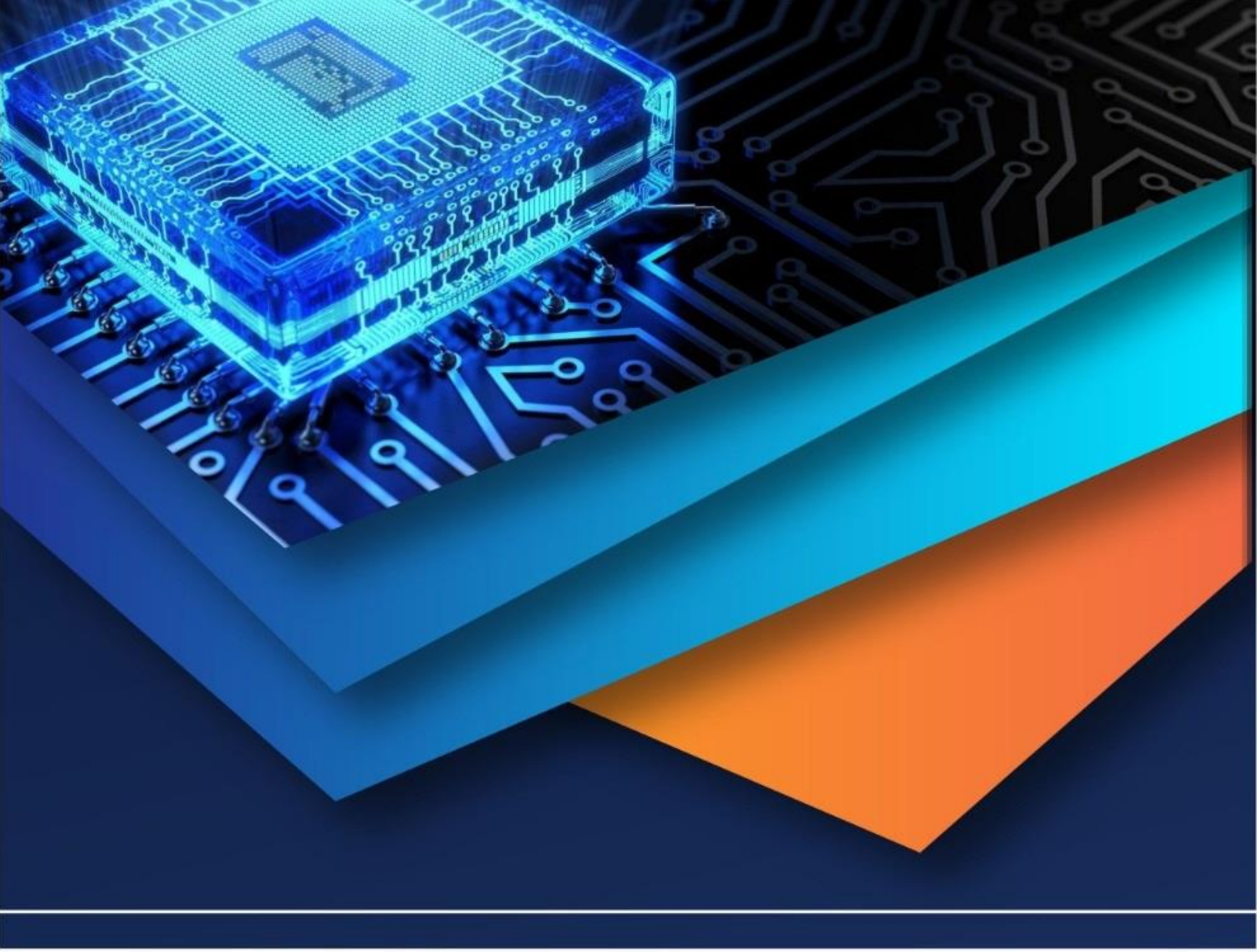

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