An Intelligent IOT based Waste Dissociation and Monitoring System

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ABSTRACT: At present, the increasing population causes many types of problems like scarcity of water, unemployment, poverty where the management of waste is also the one that is included. Because of rising population the outcome of waste is also increased. The collection, segregation, transportation and disposal of waste is becoming a burgeoning trouble in all over the world and also in home government. If we thought 100% of waste is produced every year only 5-7 % of waste is recycled, another 93% is simply dumped at the landfills. It causes air pollution, unhygienic condition, health issues, contaminate the soil, ground water by liquid leachate. To avoid this problem an innovative solution is proposed. Here, the waste is get dissociated at the source level itself which helps in recycling of waste in efficient manner. The waste is get dissociated into different types namely metal, wet, dry and collected in different bins accordingly. Experimental results approved that the proposed idea have been successfully implemented.

KEYWORDS: Automatic waste Dissociation(AWD), Amazon Web Service (AWS), GPRS, SMS.

I.   INTRODUCTION

The internet of things (IOT) can be defined as network of physical devices like smart-phones, Internet TV's, sensors and actuators that connects and communicate with everyday objects via Internet. It gives an open access to plenty of digital services. The devices works smartly by allowing new form of communication between things and people and between things located at different location. Building an IOT has improved meaning from the past couple of years it adds the new aspect to the world of communication and technology. Currently the management of waste disposal has become a major challenge for the government. Because of the ceaseless economic growth, industrialization, urbanisation there is an increase in the voluminous amount of waste which includes solid waste, harmless waste and hazardous waste. The dumping of waste at the landfill sites is done in an unplanned and uncontrolled manner which causes negative impact on the environment. Rag pickers play an important role in recycling of waste by manually collecting paper, plastic bottles, metal pieces etc. from the garbage. They can also be called as manual sorters. Due to this they are suffered from skin infections, respiratory disorders, dog bites and other health issues. To overcome this hazard automatic dissociation of waste is proposed. The waste is get dissociated into metal, wet and dry waste at the source level. Many advancements in the technology help to sort out the metallic, wet and dry waste based on the threshold value assigned to the sensor. The metallic waste has the higher reusability so that it can be recycled and reused. Wet waste has the moisture content in it so that it can be degradable to make bio-gas fuels and chemical fertilizer can be used as source of energy. Dry waste can also be reused by recycling it accordingly. The advantage of recycling is achieved by giving the economic value to the waste that is dissociated. The proposed system helps in sending the dissociated waste into the recycling industry instead of sending it to the segregation and processing plant.

II.   RELATED WORK

Rashmi M Kittali and Ashok Sutagundar [1]: Authors proposed an automatic waste segregating system using the PLC (programmed logic circuit). The system separates out the wet and dry waste along with few dry components detection and separation at affordable cost. Here using of PLC has added advantages like reduction in manpower with

improved accuracy and speed of waste management, also avoiding the risk of working at hazardous places. Nithya L, Mahesh M [2]: Authors discussed that an automation of waste reduces the human effort and consequently the cost of the whole process. Robot model is used for supporting and unloading the stable wastes from dustbin using DC motor. This approach is best in huge business enterprise regions. This approach can be implemented nearly. The air pollution sensor output when the sensor senses the carbon dioxide inside the bin it sends message from the GSM modem to mobile. Vishnu Priya M, Mohana Priyanka K and Malar R [3]: Authors discussed that project goal is to monitor the garbage bins and intimating the status of the bins to the concern person or municipality using the IOT technique. The second process is separating the waste in garbage bin as biodegradable and non-biodegradable waste. This will helps to maintain a hygienic environment by periodic cleaning procedure and reduce the pollution. Mainly this system helpful for the government sector, industries, large scale organization. Dr. M Yuvaraju and Divya Priya [4]: Authors proposed GSM based waste segregation and monitoring to segregate the waste at periodic interval of time for the proper disposal of waste at right time. Because it reduces the litter without causing any overflow and it maintains the hygiene and also helps to relocate the bins with extra one if it is necessary. Neha Kabra, Pradnya Tirthkar, Pratiksha Umak, Poonam Deokar [5]: Authors design of this system results to automatic waste segregation using electromagnet, conveyor belt and blower like systems. These electromechanical devices used to segregate waste as dry, metal pieces and wet waste separately from all collected waste. Here the system gives advantages to less hardware circuitry and less efforts for implementation in small amount of time. Padmnabh Munde, Abhijeeth Lokhande, Mahesh Kaware, Suyog Waditke, Prof.V R Ghule [6]: Authors proposed that the level sensor senses the level of the bin and the ultrasonic sensor will be interfaced with ultrasonic conditioning chip where the four load sensors will be given to analog and digital convertor. GPS module is also installed outside the bin to communicate with municipality office where the bins are provided with the ID number.

III. PROBLEM STATEMENT

The aim of the project is to help the government by providing the idea about segregation mechanism to sort the problem of waste disposal and also to overcome occupational hazard of rag pickers. The objective is to provide an efficient waste segregator to work in an automatic way than working manually and to take care of waste workers. The proposed idea is to dissociate waste into three different types ie metal, wet and dry and that should be sorted accordingly and collected in the separate bins. The sorted material count will be taken and stored in AWS cloud with date and time which can be used by the government to make profit by recycling waste.

IV. EXISTING SYSTEM

The waste that is dumped at open area includes many types of waste such as solid, semisolid, organic, hazardous, recyclable, liquid waste. Where it leads to liquid leachate by contaminating the soil and ground water. Previously, the waste is sorted based on its size. The larger items are sorted manually. After removing larger items from the refuse again the waste is sorted based on its density by using large rotating drums having certain size of holes. The smaller objects will be dropped from the holes and the larger items compare to the size of holes in drum is settled there itself. Magnetic fields and eddy currents are used to sort the metallic items in the drum. Conveyor belt and robotic arms are used to move and to put the waste accordingly. Sorting of waste by using x-rays can be done based on its density. Plastic objects is sorted on the basis of reflectability of object by using infrared scanners. To reduce this complexity automatic dissociation waste has been proposed.

V. PROPOSED SYSTEM

The main aim of the proposed methodology is to dissociate the waste into metal, wet and dry waste at household level in an automated way. The model is designed by using different hardware components like Renesas microcontroller, IR senor, proximity sensor, moisture sensor, dc motor and mainly GPRS module. The block diagram of the proposed system is shown in the fig 1.
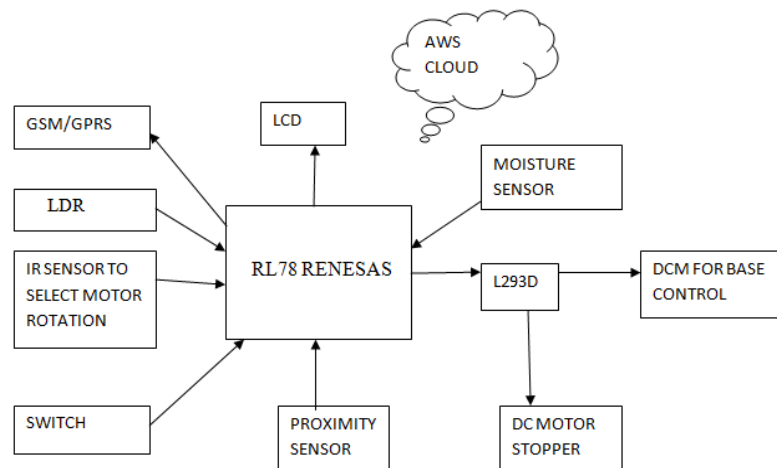
Fig 1: Block diagram of Automated waste Dissociation

IR sensor senses the presence of an object at the entry level of flap. Proximity sensor detects the metallic items. Moisture sensor detects and differentiates wet and dry waste. The stopper is used for the open and closing mechanism on the flap. The circular base which holds the container is rotated according to the type of waste is sensed. Meanwhile the count will be taken for each type of waste collected in the bin. The waste that is collected in the container can be directly sent to the recycling industry instead of sending it to segregation and then to processing. The data will get updated in Amazon web cloud with date and time facility. The amount will be paid by recycling industries to the government. So the government will get profited by using this data.

VI.   IMPLEMENTATION

The proposed model is designed and integrated as shown in the fig 2 and fig 3. The automated system starts by pushing the waste into the inlet section of flap and ensures that the object should not go out of the sensing area. IR sensor gets activated by identifying the presence of an object at the flap entry and interrupts the microcontroller. The interruption brings the microcontroller to the low power mode.

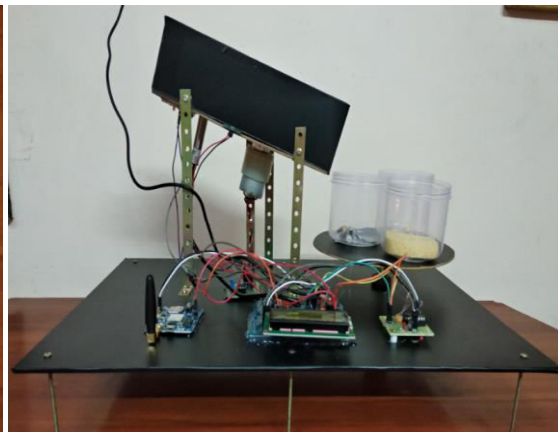**Fig 2: Top view of AWD model**   **Fig 3: Side view of AWD model**

After detecting the type of waste by using proximity and moisture sensor it will be pushed to the respective bin by using door mechanism. There are two types of DC motors used in the model. One motor is used for door mechanism

where it helps the flap to drop the waste in to the bin. The second motor is used to rotate the circular base which holds the different bins to collect the waste accordingly. The count will be taken for each type of waste sensed and it will be displayed on the LCD. Meanwhile the data is updated in the cloud using GPRS modem.

a) **Entry system and Initialization**

The system initialized by pushing the waste into the flap. The IR sensor senses the presence of waste and sends interrupt to the microcontroller which sets the Renesas to the low power mode. . The L293D is a driver which drives the stopper motor and also the base motor in a synchronized way. The default position of the circular base is also checked. The count will be initialized and displayed on the LCD. The base count value is stored in cloud.

b) **Metal sensing module**

The waste is moved over the proximity sensor. Where the proximity sensor is used to detect the metallic items by using parallel resonant impedance and returns data as proximity value. The metal collecting bin is the default bin in this system. The stopper opens and the waste is fall in to the metal colleting bin. The count will be incremented and stored.

c) **Moisture sensing module**

Moisture sensor basically sense the wet objects based on some properties such as electrical resistance, dielectric constant etc. It is placed after the metal sensor in the model. The moisture sensor has the higher dielectric constant. If the waste reaches the value then it is considered as wet waste else as dry waste. Based on the type of waste circular base is rotated ie either in anticlockwise or in clockwise direction. After that stopper opens and waste is dropped in to the bin respectively. The counter increments respectively.

d) **GPRS module**

GPRS stands for General Packet Radio Service. GPRS module is also a GSM module that additionaly supports the GPRS technology for data transmission. The key advantage is it transfers the data in high speed. Different types of AT commands are used to interact with cellular network. This module is used in the proposed system to transfer the data in cloud for future use. The count of every waste will get updated in the cloud with date and time. The data will be used by government or respective authority for future use. They can retrieve the data by using IP address and the login information.

VII. RESULTS

The proposed methodology is designed and implemented to dissociate the waste into three different categories namely metal, wet and dry. The metal waste includes the items that have parallel resonant impedance. Wet waste has the higher dielectric constant to segregate the wet waste from the dry waste. Dry waste maintains minimum threshold value to identify the waste.
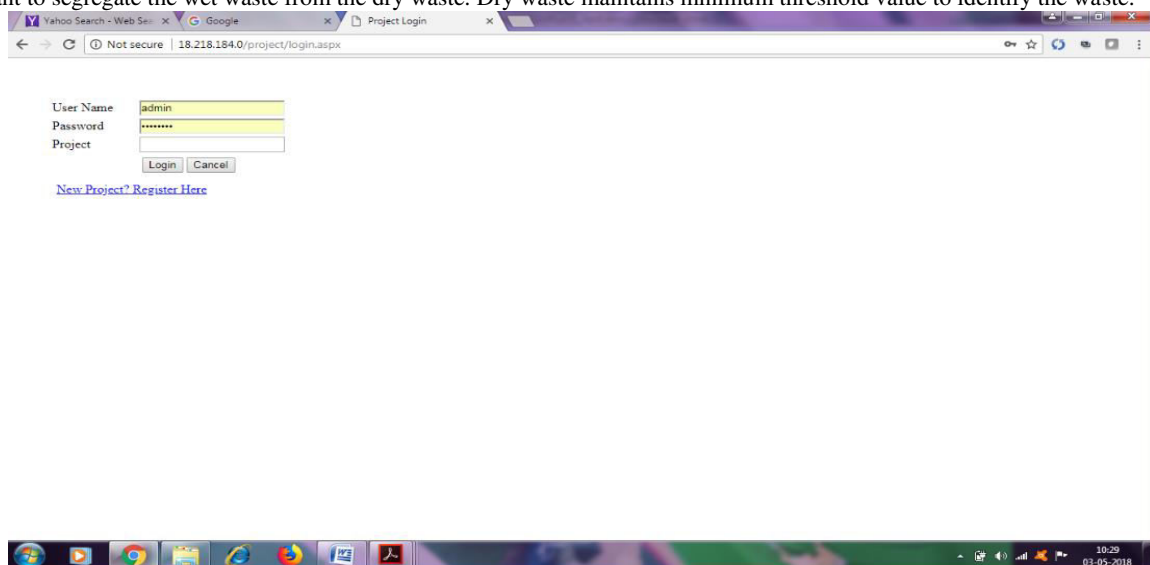

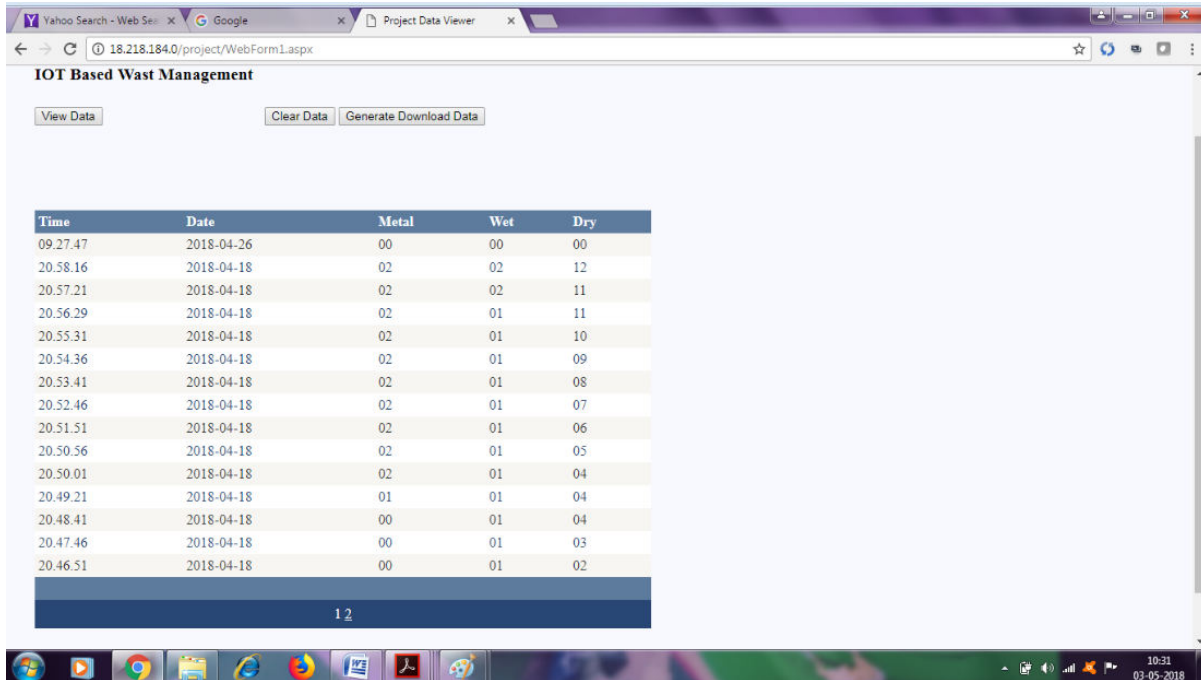**Fig4: login page of Automated waste dissociation model**

The Fig4 shows above is the login page for the automated waste dissociation model provided with username and password to access the collected information in cloud.

DOI: 10.15680/IJIRCCE.2018.0604024

Fig5: counted value of the waste collected in the bin

As per the Fig5 shown above shows that the counter counts the value of every waste that is collected in the bin. This value will be displayed on the LCD. Meanwhile the value will be updated in the Amazon cloud using GPRS technology. Web page contains the value of the waste with date and time. This data will be accessed by the government or the authorized person for further processing. This can help in avoiding the miscommunication between the industry and the government.

VIII. CONCLUSION

The automatic waste dissociation system dissociates the waste into three categories: metal, wet and dry. The waste is dissociated based on the proximity value, dielectric constant and threshold value of the sensors. The sensors play an important role in sorting item in a better way. The collection, handling and disposal of waste become easy and simple. The automated way reduces the manpower, the time and cost. The dissociating of waste helps in recycling and reuse of waste in an efficient manner. This helps in maintaining a hygienic environment by periodic cleaning and reduces the pollution.

FUTURE WORK

With the ongoing changes in the current technology the inlet section can be provided with crusher mechanism. The segregation levels can be further classified and recycled. The proposed system works in real-time by providing ID numbers to the dustbins. Solar power can be attached for power supply.

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