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Automation of Metal, Dry and Wet Waste Materials Segregation using Microcontroller in Scrap Industry

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Abstract: ***Even though there are huge scale industrialized waste segregators present, it is always much well to segregate the waste at the source itself. The welfares of doing so are that a advanced quality of the physical is retained for reprocessing which means that more value could be healthier from the waste. The occupational hazard for waste labors is reduced. Also, the segregated waste could be straight sent to the recycling and dispensation plant instead of sending it to the segregation plant then to the reprocessing plant. In our system we are segregating metal, dry and wet waste also sending message to recycling industry. The purpose of this project is the understanding of a compact, low cost and user welcoming segregation system for city households and scrap shops to rationalize the waste organization process.***
Keywords: industrialization, urbanization, raindrop sensor, inductive sensor, scrap industry .

I. INTRODUCTION

The group and dumping of waste in large amounts has created a better concern over time for the world which is unfavorably affecting the human lives and ecological conditions. Wastes are the one which grows with the development of the country. Separation of waste is important for proper disposal of vast amount of garbage modern society crops, industry waste in an environmentally sensible mode. People became adapted to mixing things away and never realize the penalties of their action. The common method of removal of the industrial waste is by uncontrolled and unplanned, and exposed dumping at the river sites and open areas. This method is harmful to plants, human health and animal life. Scrap shops play a vital role in maintenance of industrial waste that is generated.

Scrap consists of decomposable materials that are results from product ingesting and manufacturing, such as parts of automobiles, construction supplies, and extra materials like dry and wet waste. Scrap has economic value, mainly improved metals, and non-metallic materials are also healthier for recycling. Reprocessing of scrap materials is the key for effective waste organization and it's economical too. The practice adopted in this paper to resolve the issue of waste separation is by making the entire process automated and to the reduce cost such that it could be adapted in a scrap industry.

A. Problem Ingredients

To design an automated waste segregation system to sort the waste material like metal,dry and wet waste by using various sensors like inductive sensor, raindrop sensor and IR sensor and arduino controller to reduce a human efforts and pollution

B. Goals and Objectives

1) To reduce increasing solid waste .
2) To reduce rapid growth in pollution
3) To prevent manual sorting, landfilling and open dumping
4) To reduce economic growth, industrialization and urbanization
5) To provide waste material to recycling industry

C. Future scope

Scope of our project is as follows:
1) Recycling content analysis
2) Segregation of different type of waste
3) Automatic dealing with recycling industry

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II. LITERATURE REVIEW

Syeda Madiha Samreen, et al.[1] Today nation is facing a huge problem today of disposal, segregation and recycling of waste material and improper management of these wastes are hazardous and dangerous to human health and environment. There is a rapid increase in capacity of waste material as a result of urbanization, constant economic growth, and industrialization. Global Waste Management Market reported that the amount of waste generated worldwide produced is 2.02 billion tones of waste material. "Wastes are not always waste if it is segregated it will become a useful material". To properly manage the waste it has to be handled, segregated, transported and disposed so as to reduce the pollution and risks to the public lives .The economic value of waste is best when it is segregated. Currently there is no such system employed of segregation of waste material at industrial level. This paper gives the information about Automation of Waste material Segregation .This method is easy and simple solution of segregation of three types of waste material like glass, metal and plastic. It is designed to segregate the waste material into metallic waste, plastic waste and glass waste ready to be processed separately for recycling. The Method uses inductive sensors for metallic items and capacitive sensors to distinguish between glass and paper waste. Final results show that the segregation of waste material into metallic, plastic and glass waste material has been successfully implemented using the arduino controller.

Vedant Dhamde, et al. [2]Garbage collection as well as garbage management are the major issues for almost every developing or developed country. The unattended garbage bins leads to unhygienic conditions and creates dirty and unhealthy environment, it could result in spread of diseases also. All this was done due to lack of management. To avoid this problems, we have designed an "IOT Based Garbage Management System". The main concern behind this system is to know whether the garbage bin is full or not and provide instant cleaning of the bins to make efficient use of time and man-power. The ultra-sonic sensor which is interfaced with Arduino UNO is placed on every garbage bin which checks the level of the garbage in the bin and sends alert to the municipal web server if the bin fills above the threshold level. The status of bin is automatically changed to empty in the municipal web server after the cleaning of dustbin. Also the real time status of how much garbage is filled can be monitored by municipal authority. We have also developed an android application which is linked to the municipal web server to notify the drivers to take necessary action after any of the dustbin get fulfilled for reducing the manual process of monitoring verification. The whole system contains an embedded module integrated with RFID and IOT facilitation.

Soutrik Bose, et al. [3] The waste generated by absorbent hygiene products are desired to be properly recycled and disposed. This paper provides an energy assessment method to appraise the complete performances of an integrated incineration system. This paper aims to find the feasible criteria of environmental compatibility and the societal aspects of the recycled waste. The prime focus is given on the effects of sanitation coverage of children and menstrual hygiene of women. Proper segregation, reuse and recycle by scientific approaches are the most important criteria of waste management.

A gasket with a sorting machine is designed which sterilizes the waste and separates its plastics and utilizes the cellulose in a fluidized bed gasifier, to produce steam nearly at 8500C for sterilization and an ash collection chamber for proper disposal. A prototype is proposed to develop in future based on the design of the novel incineration method which is also proposed to be cost effective with easy disposal techniques. This paper also aims for proper cleaning and sterilization of wastes by recycling and incineration and recovering environmental friendly renewable energy for the society. High electrical energy is generated by this incineration method with low cost.

Harnani Hassan,et al. [4] The increase in amount of waste on daily basis in Malaysia is due to the lack of waste management and imposition by the government, which has created unpleasant view of jammed waste in the landfill. This paper represents the growth of a low-cost recycle bin that automatically classify different type of recycle waste using an Arduino microcontroller. The objectives of this paper is to construct a recycle bin prototype with a sensing mechanism that is able to sort recycle waste (such as metal, paper and plastic) and automatically collect the waste to specific bin splitting according to their types. This paper also presents the responsiveness analysis of the recycle dust-bin prototype to sort the waste correctly. The construction of the recycle bin prototype is divided into two parts: i) sensing and ii) mechanical.

The sensing fragment detects type of waste material such as metal, paper and plastic. The metal waste is detected using an inductive proximity sensor; as for paper and plastic waste, a light emitting diode (LED) and a light dependent resistor (LDR) are utilized. The mechanical part gathered of a servo motor together with the microcontroller to segregate the waste type accordingly. The output of this work shows that the recycle bin prototype is able to sort the waste efficiently specifically the plastic-based waste and it is highly probable to be utilized in the future. Nevertheless, the prototype sensitivity on paper and metal waste need to be further improved for an effective segregation of waste.

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III. PROPOSED SYSTEM

Waste is pushed onto conveyer belt. the presence of waste is first recognized by use of Infra-red sensor at switch end of the conveyer belt, the leftover moves further for discovery with inductive sensor to sense it is metal or nonmetal. If it is detected metal, conveyer motor rotates to in a direction to collect the metallic waste, for nonmetal it moves further towards raindrop sensor to detection of dry or wet waste material. With detection of dry waste it rotates in other direction or moved by pivot to collect in other bin to calculate the weight of the each waste material.

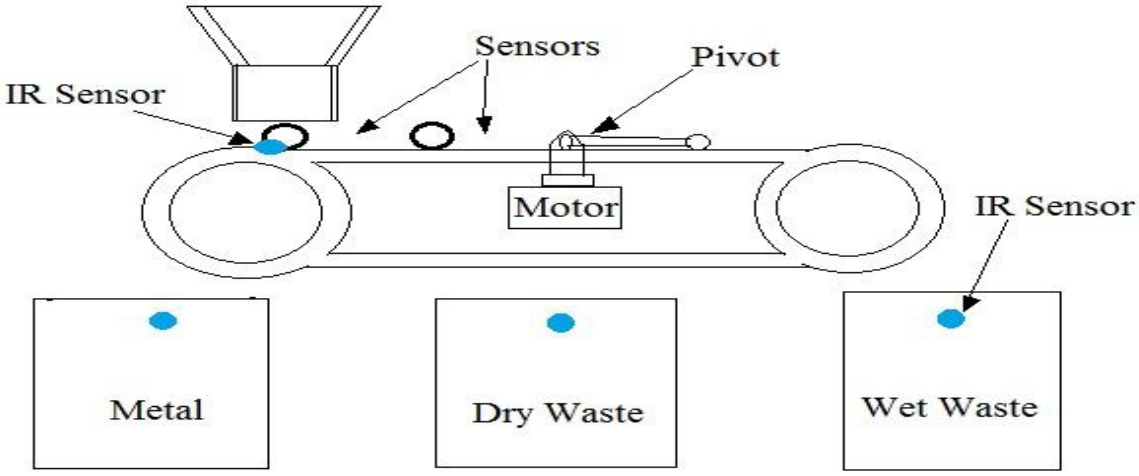


Figure 1. Experimental set up of automated waste segregator

A. System Architecture

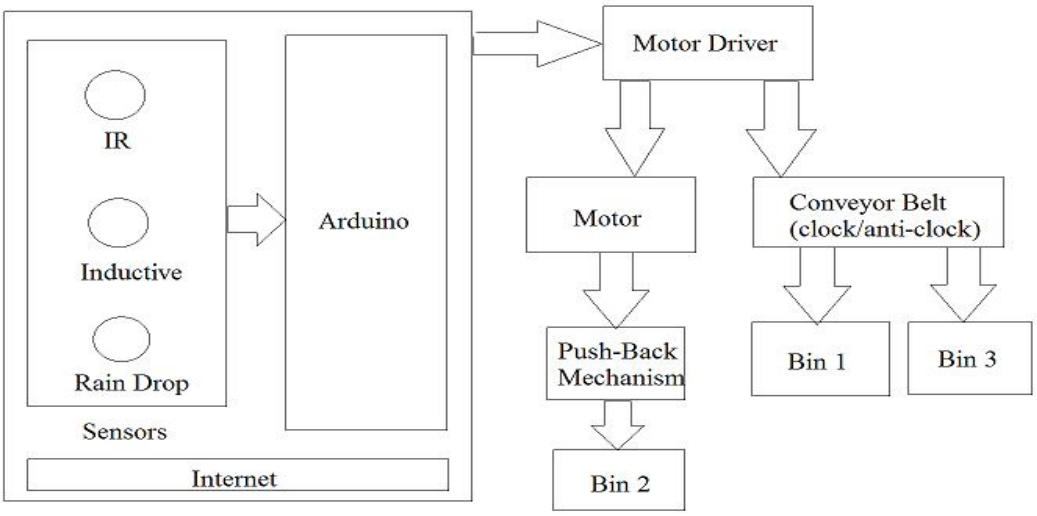


Figure 2. System architecture of automated waste segregator

The above shown Figure 2.represents the system architecture of the automated waste segregator.their is one sensor block as shown above which contains all the sensor which are basically used for detection purpose i.e.,IR sensor is used to detect presence of material,Inductive sensor is used to detect whether material is metal or non-metal and raindrop sensor is used to detect whether material is wet waste or dry waste material.their is another block called as control block which contains arduino controller and the connection between this two block is shown by arrow.Internet block is used to communicate with user.their is another block that is motor driver which is connected to the motor to drive that motor.Conveyor belt is used to segregate the collected waste material at industry level.their are total three bins i.e.,bin1,bin2 and bin3 to collect segregated waste material there is one bin that is bin 2 which is connected to the push back mechanism blovk or pivot to push waste material in bin 2.this is the total description regarding system architecture.

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B. System Flowchart

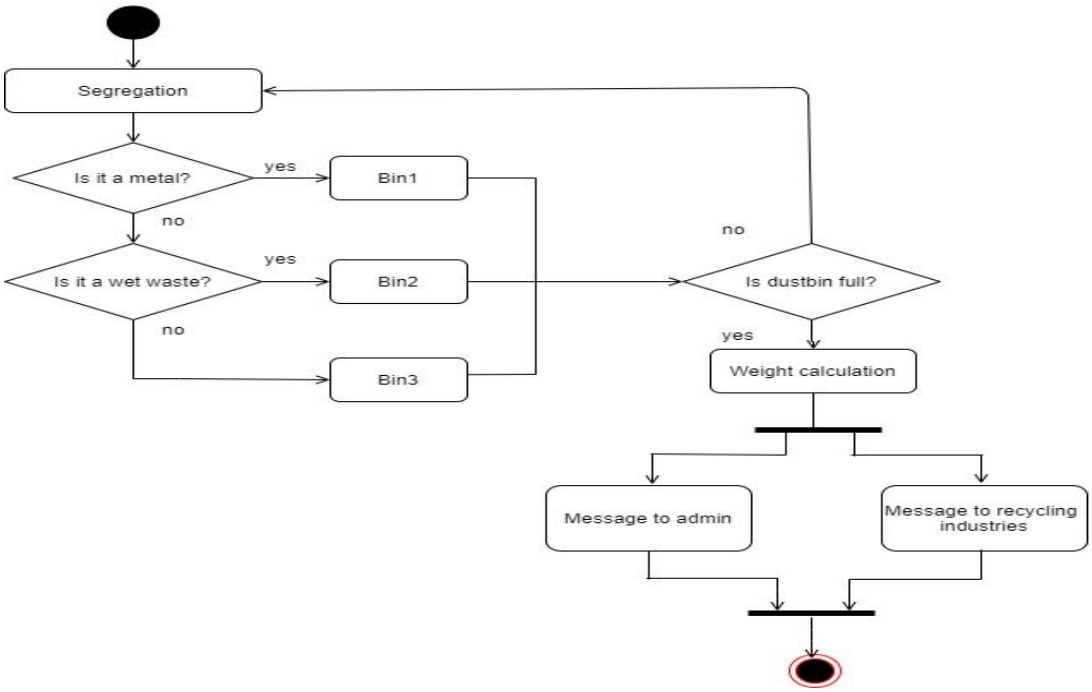


Figure 3. System flow of automated waste segregator

IV. ALGORITHM

A. Waste Material Segregation Using Controller

1) Step 1: Start

2) Step 2: Start the motor driver using motor which will rotate the conveyor belt

3) Step 3: Falling of material on conveyor belt

4) Step 4: If IR sensor == HIGH then presence of object on the belt

If Inductive sensor == HIGH
then presence of Metal
conveyor motor stops and object move in Bin1
else
If Raindrop sensor == HIGH
then presence of wet waste
conveyor motor stops and object move in Bin2
else
object present is dry waste then object move in Bin3
else
no object present on conveyor belt

5) Step 5: If IR sensor == HIGH
then send message “dustbin is full” to admin
flag = 1
else
goto step 3

6) Step 6: If flag == 1
then send message to recycling industry about availability of material
else
goto step 3

7) Step 7: Stop

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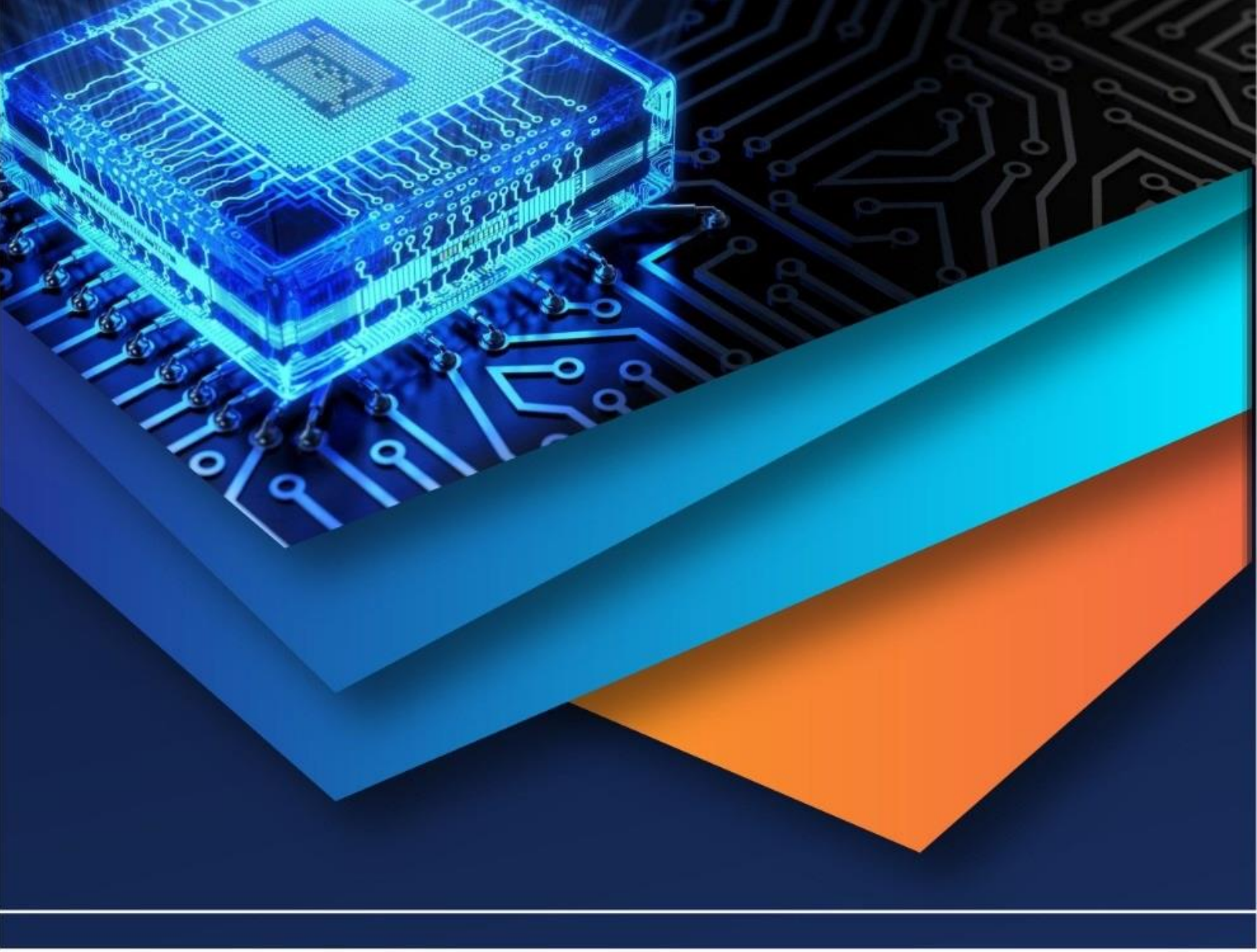
V. CONCLUSION

The proposed method is an efficient salutation to segregate metal ,dry and wet waste material this system can be effectively deployed in industrial material segregation .the automated material segregation system effectively employs inductive proximity sensor to identify metallic items and raindrop sensor to identify dry or wet waste. it is the first step towards recycling .which has an huge impact on economic condition of the country it gives idea about the availability of waste to the recycling industry by sending them message.

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