Automatic Waste Segregation

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Abstract: *The purpose of this project is to reduce health issues of rag pickers due to harmful materials in waste.. Rag pickers have an illness due to infection of skin, respiratory system, gastrointestinal tract and other allergic disorders. In this project waste is mainly segregated into three categories that are metal,light and high weighted waste by using Microcontroller AT89S52. This system utilizes low cost components for the successful segregation of most types of waste. When installed in industries, it proves to be beneficial in sorting the waste at the site of disposal itself. The occupational hazard for rag pickers is reduced. Also the segregated waste can be directly sent to recycle.*
Key words: *Automatic waste segregator, Conveyor belt, Sensors, LCD, GSM*

I.   Introduction

The rising population of India poses serious threats with regard to the availability of living space, utilization of natural resources and raw materials, education and employment. But another serious peril that follows is the escalating amount of waste generated each minute by an individual. An astounding 0.1 million tonnes of waste is generated each day in our country. Sadly, only 5amount of waste is recycled. In India, the collection, transportation and disposal of MSW are unscientific and chaotic. Uncontrolled dumping of waste on outskirts of towns and cities has created overflowing landfills which are not only impossible to reclaim because of the haphazard manner of dumping but also has serious environmental implications. When viewed on a larger scale, the poor recovery rate has impeded the growth of the country as well as the economy of the nation. One possible solution for this problem could be segregating the waste at the disposal level itself. An Automatic waste segregator that categorizes the   waste as wet, dry or metal. A Raspberry pi forms the heart of the system. Inductive proximity sensor is used to detect if the waste is a metal. Wet and dry waste can be distinguished based on their weight. A high speed blower system is used to blow dry waste off the belt while most of the wet waste remains. It then falls off as the belt rotates and is collected later. This cost effective system is particularly suitable for installation in small scale industries. It is now time to give back to Mother Nature. Therefore to set the ball rolling, we have proposed this project to give back to our nation, making our India a Swachha Bharat.

II. Literature Review

The mixed waste matrix is fed through the hopper and the conveyor belt carries the waste matrix. An air blower and the air channel mounted on the conveyor belt separate the light waste materials like plastic, polythene bags etc. from the waste matrix and are collected in collector bin-1.The left over waste matrix is carried away at the extreme end of the conveyor belt towards the magnetic pulley. Due to the magnetic attraction, the ferrous materials gets segregated from the waste matrix and is collected at the bin-2. Then, the rest of the waste matrix automatically travel over the roller collected at bin-4 at the end [1].

The proposed system automatic waste segregator and monitoring system sorts wastes into three different categories, namely metal, plastic and the wet (organic) waste. Wet waste refers to organic waste such as vegetable peels, left-over food etc. Separating our waste is essential as the amount of waste being generated today causes immense problem. Here, we have tested the household wastes which are generated in every home today and we have come up with the following result [2].

This project solid waste monitoring and management system has been successfully implemented with the integration of communication technologies such as Zigbee, GSM and for truck monitoring system In this system, truck database has been developed in the way that information of truck ID, driver ID, date and time of waste collection, etc. are compiled and stored for monitoring and management activities [3].

III. Proposed Methodology

The whole system is controlled by an Microcontroller board. All other parts like proximity sensors,inductive metal detector, DC motors, blower, servo motors, GSM module and LCD are interfaced to the microcontroller board. Output of all the sensors like proximity sensor, Inductive metal detector and Level detector are given to controller board as an 13 AUTOMATIC WASTE SEGREGATOR input. DC motors, servo motors, GSM and LCD are connected to the output side of the controller. L293D is a driver which drives the DC motor.
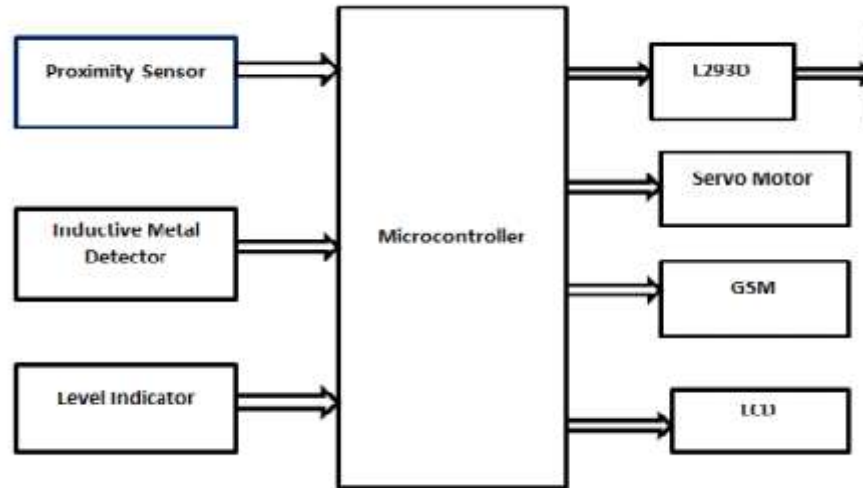

Fig 1. *Block Diagram of Automatic Waste Segregator*

The microcontroller is programmed in such a way that when trash falls on the conveyor belt, first it detected by proximity sensor and sends a signal to controller. then controller sends a signal to L293D motor driver to drive the DC motor. Conveyor starts rotating itself. Trash moves forward as conveyor rotates. Inductive metal detector is placed after proximity sensor. if trash contains any metal elements then it detects and flapper attached to conveyor moves to left side and metal trash is pull down to the bin kept below conveyor.

If trash contains paper material it will blow up to another bin kept at opposite side of conveyor. Remaining non metallic trash will move straight as per the conveyor direction and pulls down to the third bin. As level of bins becomes full, the SMS will be send to respective owner. It is not possible to recycle metal at small scale, same SMS will send to recycling industry to come and take away the metal waste for recycling. LCD is used to display the level of bins filled.

IV. Components

Following components are used in this project:
1. Microcontroller

The AT89C52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a sixvector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry.

2. Air Blower

Air blowers are machines whose primary function is to provide and accommodate a large flow of air or gas to various parts of a system. We used air blower in this project to remove light weighted waste.

3. Conveyor belt

We use conveyor belt to carry any type of waste from one place to another place. It is made up of rubber belt connected by two or more pulleys which rotates around itself.

4. Servo Motor S3003
This motor is use to turn the flapper at specific angle when microcontroller gives the output signal.

5. Proximity Sensor

This sensor is require to detect presence of nearby objects without physical contact.

6. Inductive Metal Detector

This sensor is used for detection of metallic materials without any physical connection.

7. GSM

GSM (Global System for Mobile Communication) module is used to send the SMS to inform the industries.

V. Advantages

The advantages of automatic waste segregator and monitoring system are listed below:

- Sorting of waste at the primary stage will make the waste management more effective and fruitful.
- The dustbins are cleared as and when they are filled, thus giving way to a cleaner environment.
- Eco friendly system.
- Lower initial investment including lower cost of installation.
- Minimal time.
- Optimizes resourses.

VI. Limitations

- Waste separation is time consuming.
- Size of waste must be less than or equal to the dimension of conveyor belt.

VII. Conclusion

Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automatic waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention and also no hazard to human life. Using a conveyor belt makes the system far more accurate, cost-effective and also easier to install and use at a domestic level. Segregating all these wastes at a domestic level will also be time-saving. While implementing our system we came across many problems like the sensing range of inductive proximity sensor, the accuracy of the moisture sensor, adjusting the range of IR sensors and some more, but using some modifications we tried the make the system as reliable as possible but not completely perfect.

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