
“WASTE MATERIAL SEGREGATION USING ATMEGA”

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Abstract: The aim of this project is to successfully design, build, and test a system that identifies and segregates recyclable waste materials like glass, plastic, metal, paper and wood into their proper bins. The growing population of India poses serious huge problem with regard to the availability of living space. But another serious or rather a huge problem that follows is the rapidly increasing amount of waste generated each minute or each second by an individual. Sadly, only 5% of this total amount of waste is recycled. One possible solution for this problem could be segregating the waste at the disposal level itself. In India, the collection, transportation and disposal of material segregation waste are unscientific and uncontrolled. Uncontrolled dumping of waste on outskirts of rural and urban areas has created serious environmental implication or problem in terms of ground water pollution and contribution to Global warming. This has found adverse effect to reduce the average life span of the manual segregators. Developing a mechanized system that helps to save the lives of many human beings and making the world a cleaner and a greener place is the noble objective of our project. We have thus proposed an waste material segregator that aims at segregating the waste at the disposal level itself. It is designed to sort the waste into 4 major categories, namely metallic, colour, wet and dry, thereby making waste management more effective. To set the ball rolling, we have proposed this project to give back to our nation, making our India a “Swachh Bharath”. The Swachh Bharat project was proposed by our honourable Prime Minister MR. Narendra Modi.

Keywords: LCD, DC

[I] Introduction

In all areas of the country, people by and large do salvage re-usable or saleable material from waste and sell it for a price, e.g. newspaper, metal material, glass bottles, empty tins, plastic bags, old clothes etc., and to that extent such reusable and recyclable waste material is not thrown out for disposal. However, a lot of recyclable and reusable dry waste such as waste paper, plastic, broken glass, metal, packaging material etc., is not segregated easily and is thrown on to the streets along with domestic, trade and institutional waste. The aim of this project

is to successfully design, build, and test a system that identifies and segregates recyclable waste materials like glass, plastic, metal, paper, wet and dry waste into their proper bins. Such waste is picked up to some extent by poor rag picker for their livelihood or we can say to survive. At the moment they empty the dustbins and spread the contents around for effective sorting and collection. By throwing such recyclable waste material on the streets or into a common dustbin, the quality of recyclable material deteriorates as it gets soiled by wet waste, which often contains contaminated and

hazardous waste material. Segregation of recyclable waste material at source is thus not seriously and practically practiced by households and establishments, who throw such waste on the streets or in the municipal bins without segregated. At least 15% of the total waste can easily or conveniently be segregated at source for recycling and reusing, which is being thrown on the streets in absence of the practice of segregation of waste at source. Some part of this waste is picked up by poor rag-pickers in a soiled condition and sold to middle men at a very low price, who in turn pass on the material to the recycling industries at a higher price after processing, cleaning or segregation, and the waste that remains uncollected or unprocessed finds its way to the dumping grounds. It is essential and important to save the recyclable waste material from going to the waste processing and disposal sites and using up landfill space. Profitable and correct use of such material could be made by salvaging it at source for recycling. This will save national resources, human lives and also save the cost and efforts to dispose of such waste material.

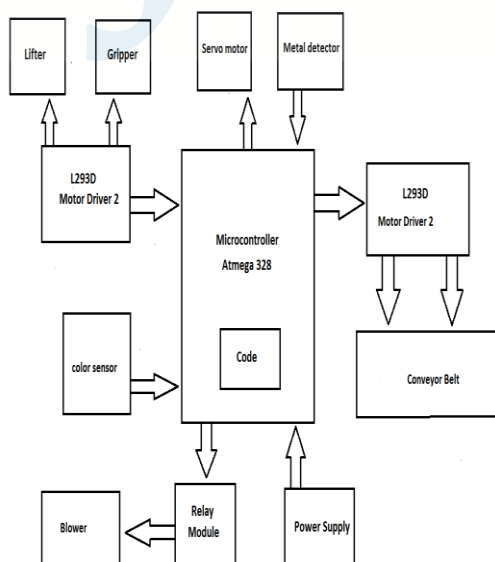


Fig.1: Block diagram of Waste segregator using Atmega

[II]Hardware Description

DC Motor

DC motor is a device that converts electrical form into mechanical form of energy. There are many kind of DC motor such as DC motor, separately excited DC motor and self-excited DC motor. DC motor was powered by DC current.



Atemaga- 328

The Atmega 328 is a single-chip microcontroller created by Atmel in the mega AVR family. The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read-while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, and five software selectable power saving modes.

Blower

A **centrifugal fan** is a mechanical device for moving air or other gases. The terms "blower" and "squirrel cage fan", (because it looks like a hamster wheel), are frequently used as synonyms. These fans increase the speed and volume of an air stream with the rotating impellers

TCS3200 Color Sensor:-

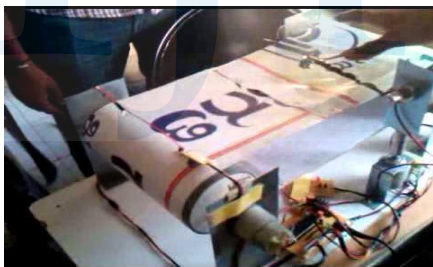
TCS3200 Color Sensor is a complete color detector, including a TAOS TCS3200 RGB sensor chip and 4 white LEDs. In the TCS3200, the light-to-frequency

converter reads an 8 x 8 array of photodiodes. Sixteen photodiodes have blue filters, 16 photodiodes have green filters, 16 photodiodes have red filters, and 16 photodiodes are clear with no filters.



Conveyor belt

Belt conveyors are generally fairly similar in construction consisting of a metal frame with rollers at either end of a flat metal bed. The belt is looped around each of the rollers and when one of the rollers is powered (by an electrical motor) the belting slides across the solid metal frame bed, moving the product. In heavy use applications the beds which the belting is pulled over are replaced with rollers.



Metal detector:-

A metal detector is a device which responds to metal that may not be readily apparent. The simplest form of a metal detector consists of an oscillator producing an alternating current that passes through a coil producing an alternating magnetic field. If a piece of electrically conductive metal is close to the coil, eddy currents will be induced in the metal, and this produces an alternating magnetic field of its own.

Servomotor

A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotor.

Motor driver L293D:-

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

LCD Display

Liquid Crystal Display has the ability to display numbers, characters & graphics. The display is fused to I/O port of microcontroller. The display is in multiplexed mode i.e. only 1 display remains on at a time. Within 1/10th of a second the next display switches on.

[III] Working

The microcontroller initializes all the pins of the ports, sets the sensor pins as input, driver pins as output. The baud rate is set to 9600. After completing the initialization, a "proceed" message is displayed at the terminal. An explication of the working of the microcontroller based waste segregator is explained in further part. A simple 8051 microcontroller forms the heart of the project based on waste segregator. It primary initialise, controls the working and timing of all the subsections so as to sort the waste into the different categories such as metal, dry wet, paper etc. The important part of this model is the base of the model which is basically the base of the entire project. The base is made of

wooden on which different components and conveyor belt is placed. The wooden base of the project is shown in the figure below.



When the object is passed through the conveyor if it is a metal object it will be sensed by the metal sensor else when the object moves further it will be sensed by different sensors i.e. capacitive proximity sensor and IR sensor. If the object is sensed by capacitive sensor alone the object is glass and if the object is sensed by IR sensor alone the object is paper. In case, if the object is sensed by both the sensors it is wood. If the object is not sensed by any of these sensors then it is plastic.

Once the object is sensed by any of the sensor then the microcontroller gives the command signal to the gate driver. This in turn opens the gate and object falls to the respective container. The status of the system is sent to the PC through wireless trans-receiver. The position of the gate and the conveyor motor can be controlled by PC terminal. In case of any malfunction the conveyor stops automatically and gives warning message to the terminal. The main function of microcontroller is to controls the working and timing of all the subsections so as to sort the waste into the different categories. The open close mechanism acts as a regulator to control the waste that at the end of the belt as it roll. A 12V DC geared motor receives inputs from microcontroller to monitor the clockwise and anti-clockwise motion of the motor. L293D is used as a driver IC to

provide the necessary current to the motor. This mechanism is initiated only if the IR sensor detects a waste in its vicinity. Dry and wet separation is based on their weight. Due to its high density and weight, wet waste refuses to be blown off even in the presence of a high speed blower. This technique is made use of to distinguish wet and dry waste. A relay will control the on and off of a high speed AC blower. As blower blows, the belt halts and dry waste is thrown out into the dry bin via a collecting chamber. Wet waste stays on the belt. The C program written to automate the process of waste segregation is downloaded using a tool called Flash magic.

[V] Result and Discussion

The proposed system, "Automatic Waste Segregator" sort's wastes into four different categories, namely metal, dry, colour material and wet. Waste segregation means division of different types of waste into different categories. Dry waste includes paper, cardboard, glass tin cans 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. Our project has been experimented with distinct categories of waste namely metal, dry, wet, colour materials. Each diverse category has been pigeonholed with the acceptance and the rejection rate with our system. Elaborating, True acceptance would mean a section that correctly identifies and sorts the waste. On the other hand True Rejection will be a section which would recognize a wrong waste and reject it. Also, False Acceptance is one in which it would identify a wrong waste to be correct. Lastly a False Rejection is when it should have identified and accepted it but it ends up rejecting the waste.

[VI] Conclusion

- The waste segregator as the name suggests, segregates the waste into three major classes: dry, colour, metallic and wet waste. The permanent magnets placed within the metallic bin further sorts ferrous and non-ferrous metals.
- The inlet section is provided with open and close mechanism to regulate the flow of waste on to the conveyor.
- Inductive proximity sensor is used to detect the metallic waste. The signal from the proximity sensor initiates the push mechanism to discard the metallic waste.
- A blower mechanism is used to segregate dry and wet waste.
- The timing and movement of the conveyor belt is controlled by ATmega 328. Continuous and unnecessary operation of any particular section is thus avoided

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