

# Waste Segregation Using Smart Robotic Arm

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**Abstract-**Waste segregation is a simple method of reducing the amount of waste dumped into our landfills. People who not aware of waste segregation for these guidelines are implemented by the government with regards to waste segregation but these efforts have yet to touch the mindset of the people. Large amount of recyclable waste that are not maximized and which is different in proper waste segregation. A solution to this is Automated Waste Sorter (AWS) and Mobile Robot Waste Deliver System are intended to automate the sorting process of paper, glass and metal. Along with this we integrate a robot system to deliver the process of collecting the waste that is to be sorted by the AWS, to minimize the human interference. For each material to control we approach the sensor array, along with a robotic arm as the Automated Waste Sorter. The Mobile Robot Delivery System is composed of a robot that is able to mechanically pick up the waste and put it in appointed trash bin.

**Key Words:** Robotic arm, Proximity sensor, USB-TTL, Limit Switch, Solid waste etc.

## 1. INTRODUCTION

Waste segregation and recycling are effective ways of reducing dumped trash. Unfortunately, these practices are not widely implemented in the country. People have been negligent when it comes to proper waste disposal, ignoring labels and throwing recyclables that can still be reused. Most of the people are unaware or ignore the fact the waste segregation and recycling can reduce cost, reduce drain in our resources, and lessen the waste being produced. Typical composition of garbage people throw in are 5.8% metals, 3.5% glass, 1.6% plastic, 12.9% papers, 1.8% textiles and 53.7% biodegradables which means only the remaining 20.7% of the wastes should really be going to our landfills. In our country, recycling centers do manual process of sorting wastes so it increase human interface. For this we implement a system which minimizes human interference in the waste collecting and segregation process. Materials such as paper, glass and metals are the wastes that need to be segregated in this project.

## 2. LITERATURE SURVEY

It contains the arm which picks similar type of objects and place them by reading the tags on them. They have used the RFID and image processing is used to scan the tags [1]. This was based on comparison technology. The android app was used to compare materials [2]. This system used to sort the objects according to their textures. Ultrasonic sensors were used to determine sensors [3].

## 3 .ROBOTIC ARM

We are using robotic arm which works similar to human hands. It has two motors for motion.one is used for gripping movement and another is used for ARM movement .The ARM is being used for picking and placing the waste. The robotic arm moves with respect to the command given by user.

## 4. SYSTEM COMPONENTS

### 4.1 Metal Proximity Sensor

A metal detector is an electronic instrument which detects the presence of metal nearby. We use an Inductive proximity sensor which operates under the electrical principle of inductance. Inductance is the phenomenon having a magnetic component, which induces an electromotive force (emf) in a target object. The inductive proximity sensor consists of four components such as coil, oscillator, detection circuit and output circuit. The oscillator is used to generate a fluctuating magnetic field around the coil that is placed in the device's sensing face. When a metal object moves into the inductive proximity of sensors detection, Eddy circuits build up in the metallic object, magnetically push back, which is used to reduce the Inductive sensors own oscillation field.

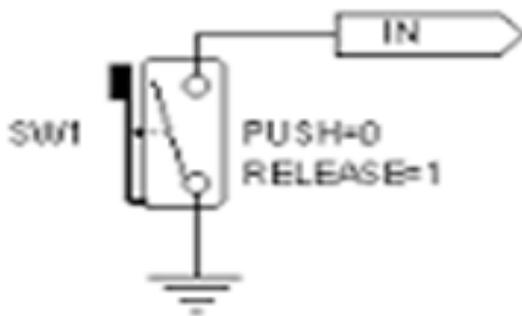


**Fig.1.Metal Proximity Sensor**

**4.2. Limit switch**

A switch is used to cut off the power automatically near the moving object which is controlled by electrical material.

Limit switches are often used to control mechanisms on robots. While limit switches are simple to use, they only can sense a single position of a moving part. Limit switch is in limit but ideal approach to control the movement speed of motor. For example, a rotational shoulder joint on a robot arm would best be controlled using a potentiometer or an absolute encoder, the limit switch could make sure that if the potentiometer ever failed, the limit switch would stop the robot from going too far and causing damage.

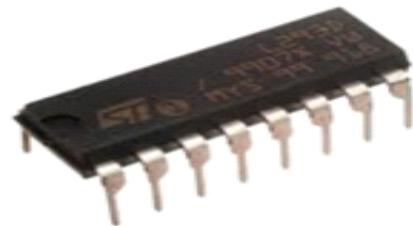


**Fig.2.Limit switch**

Limit switches can have "normally opened" or "normally closed" outputs. The usual way of wiring the switch is between a digital input signal connection and ground. When the switch is open, the digital input has pull-up resistors that make the input high that is 1, but when the switch closes the value goes to 0 since the input is now connected to ground. The switch shown here has both normally open and normally closed outputs.

**4.3 MOTOR DRIVER**

As the motors require more current than the microcontroller pin can typically generate, for this you need some type of a switch such as Transistors, MOSFET, Relay etc. which can accept a small current, amplify it and generate a larger current, which further drives a motor. This entire process is done by what is known as a motor driver. L293D is a Motor Driver IC which allows DC motor to drive in both directions. L293D is a 16-pin IC. Dual H-bridge Motor Driver integrated circuit (IC). The L293d can drive small and quiet big motors as well.



**Fig.4.Motor Driver IC**

**4.4.DC MOTOR**



**Fig.3.Dc Motor**

In any electric motor, operation is based on simple electromagnetism. It is current carrying conductor which is used to generate magnetic field. When this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. The configuration of dc motor is to interaction between internal and external magnetic field to generate rotational motion.

**4.5 USB TO TTL**

The cable is easiest way to connect to microcontroller router serial console port. The power pin provides the 5V @ 500mA direct from the USB port and the RX/TX pins are 3.3V level for interfacing with the most common 3.3V logic level chipsets.



Fig.5.USB to TTL module

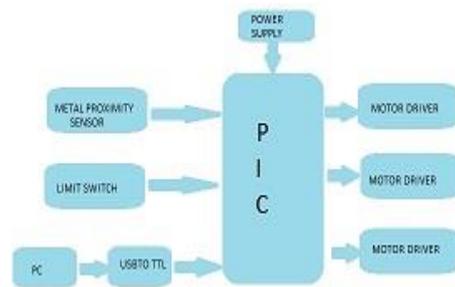


Fig.7.Block Diagram

#### 4.6 PIC MICROCONTROLLER

We are using PIC18F4550 for interfacing various motors and components. The IC contains 40 pins. It has separate program and data bus. It fetches next instruction while current instruction is executed.



Fig.6.PIC MICROCONTROLLER

#### 5. SYSTEM WORKING

In this project ROBOT and PC are connected using USB to TTL module. The ROBOT is receiving commands from VB interface. After that the gripper will pick the waste and at the gripper there are two types of sensors. The sensors are metal proximity and limit switch. The metal proximity sensors are used to sense the metal type waste and the limit switch are used to sense the other waste except the metal. As the sensors sense the waste the bin placed at vehicle will move accordingly. ARM will drop the waste in proper section of bin.

#### 6. CONCLUSIONS

The robotic arm will able to sort out the three different materials like paper, glass and metals. When the sensors are triggered the motor-powered arm is actuated and the materials are dispensed onto its proper bins.

#### 7. REFERENCES

- [1] A SMART ROBOTIC ARM FOR AUTOMATIC SORTING OF OBJECTSWITH DIFFERENT TAGS N.I.Giannoccaro, L. Spedicato, A. Lay-Ekuakille
- [2] Gowri Shankar M1, Aravindh V2, Deeban G2, Divakar T2 “ Degradable and non degradable waste separation using pick and place robot.”
- [3] Saravana kannan G, Sasi kumar S, Ragavan R, Balakrishnan M “Automatic Garbage Separation Robot Using Image Processing Technique”