

## DESIGN AND FABRICATION OF AN AUTOMATIC SYSTEM FOR SORTING AND STORING OF HOUSEHOLD TRASH

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**Abstract-** This project proposes a system for sorting and storing of common beverage containers, controlled by a microcontroller. The system is to differentiate between three common types of trash: paper cups, plastic bottles, and aluminum cans. Based on the type of the trash, the system is to use actuators to deposit trash to the appropriate trash bin for recycling purposes. The type of the trash material can be detected by the interaction of light. Light will interact differently with the three materials specified above. Plastic used in bottles and cups is generally transparent; aluminum can focus reflected light, while paper scatters it. In addition proximity sensors can also be used to detect the metal aluminum. The system also determines when any one of the bins is full by using sensor, and then conveys the information to the user by means of lighting an LED for the appropriate bin.

**Keywords:** Metal sensor, Photoresistor, Actuator, Microcontroller, Recycling.

### 1. INTRODUCTION

Proper trash sorting and storing procedure is a symbol of civilized society. From the beginning of the civilization people used some means for getting rid of unwanted materials. It was buried in land, thrown in the sea, fed to animals or burnt. Due to improper mechanism for disposing waste, heaps of garbage and litter would pile up. It was prone to great risk of contamination. The risk materialized when in 1350 "black plague" erupted and more than 25 million people from all over Europe fall victim to it in just five years<sup>[6]</sup>. In Bangladesh over twelve million people live in Dhaka city and each day they produce over 3,000 tons of household trash<sup>[7]</sup>. And this trash is not sorted and stored properly due to different type of lacking. This has a negative impact on the city's environment. This is not the only problem of Dhaka city but also for other big city like Chittagong, Khulna etc. Another thing is that recycling has become a major issue now a day due to diminishing resources and pollution. Unfortunately, households are not recycling as much as they say they do because recycling is not a consistent habit for most people. Also, recyclables are not always sorted properly. The motivation for this project comes from people not having the ability or will to sort their trash properly. So, I have decided to design and fabricate a system that has the ability to sort common trash beverage containers and also store them properly. It can be used in the houses as a trash cans.

### 2. THE SORTING SYSTEM

The sorting system composed of light detecting resistance (LDR), infrared sensor (IR), metal sensor and a liquid crystal display.

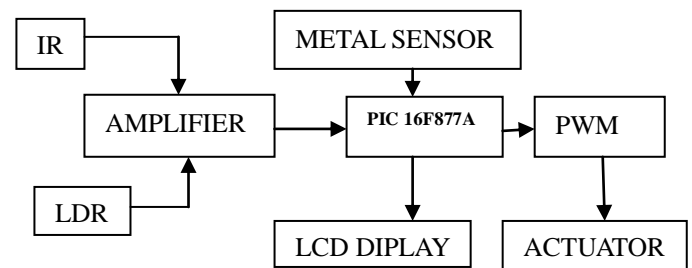


Fig.1: Block diagram of the sorting system

In the above system the IR sensor detects the presence of any type of trash in the sorting system. Then it activates the metal sensor and after that the LDR. If the trash is metal then metal sensor<sup>[1]</sup> detects it and gives signal to the microcontroller. This signal goes to the actuator which is servo motor through pulse width modulator. If the trash is paper or plastic then the LDR produce a zero or one signals. This signal goes to the microcontroller through an amplifier. Then from the microcontroller signal goes to the actuator through pulse width modulator. To display the conditions of different bins, microcontroller also sends signals to the LCD display.

### 3. DESIGN OF THE MECHANICAL SYSTEM

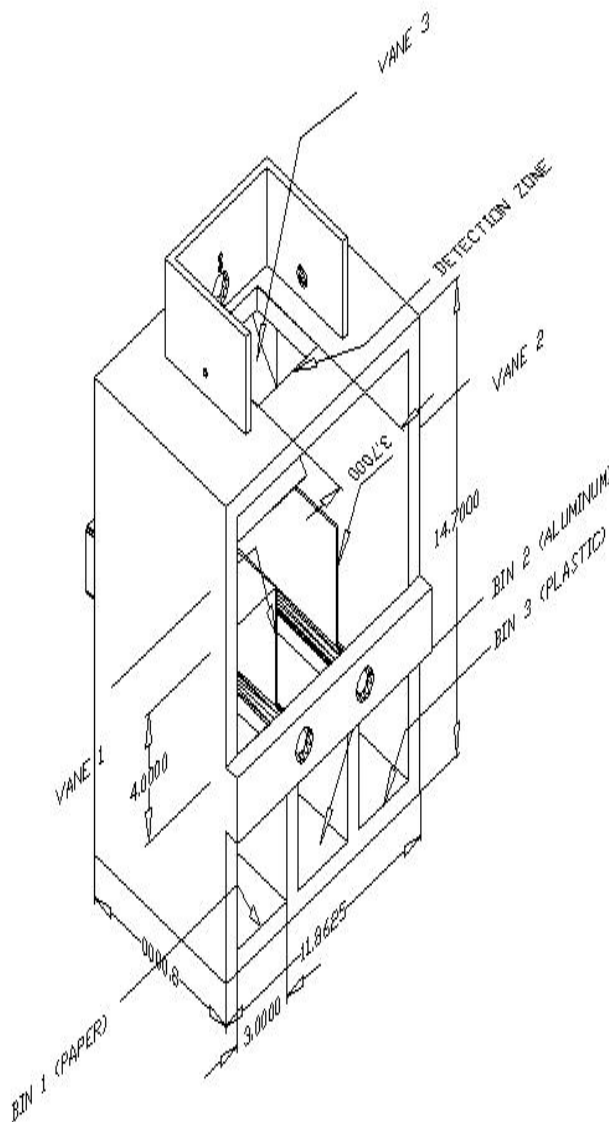


Fig.2: 3D view of the sorting system.

In this system there are three bins. Bin 1 is for paper cups, bin 2 is for aluminum can and bin 3 is for plastic bottles. First the object is placed at the detection zone. After detection the vane 3 opens the path and object drops to the any one of the bins. If the object is aluminum can then there are no movement of the vane 1 and vane 2. If the object is paper then vane 1 rotates clockwise through 45 degree and vane 2 remains stationary. As a result the paper cup drops to bin1. For the plastic bottle the vane 2 rotates 45 degree anticlockwise and vane 1 remains stationary. So the plastic bottle drops to bin 3.

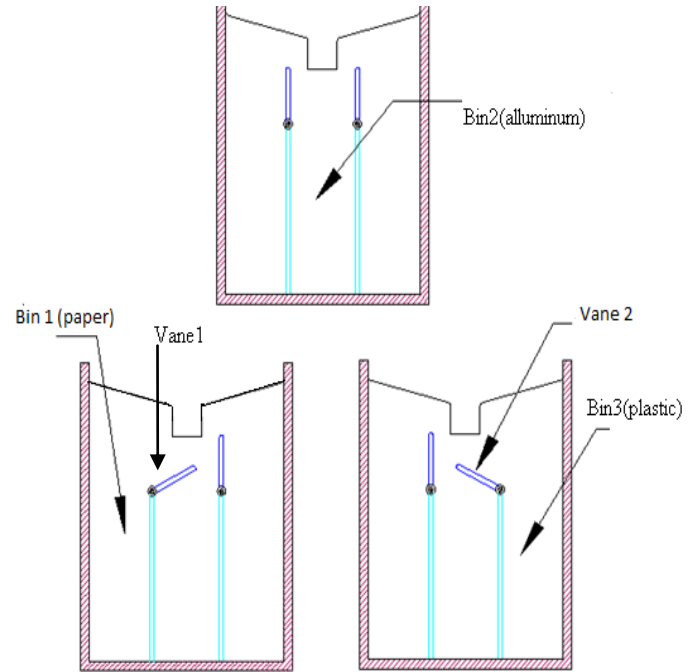


Fig 3: Sorting mechanism

### 4. FLOW DIAGRAM

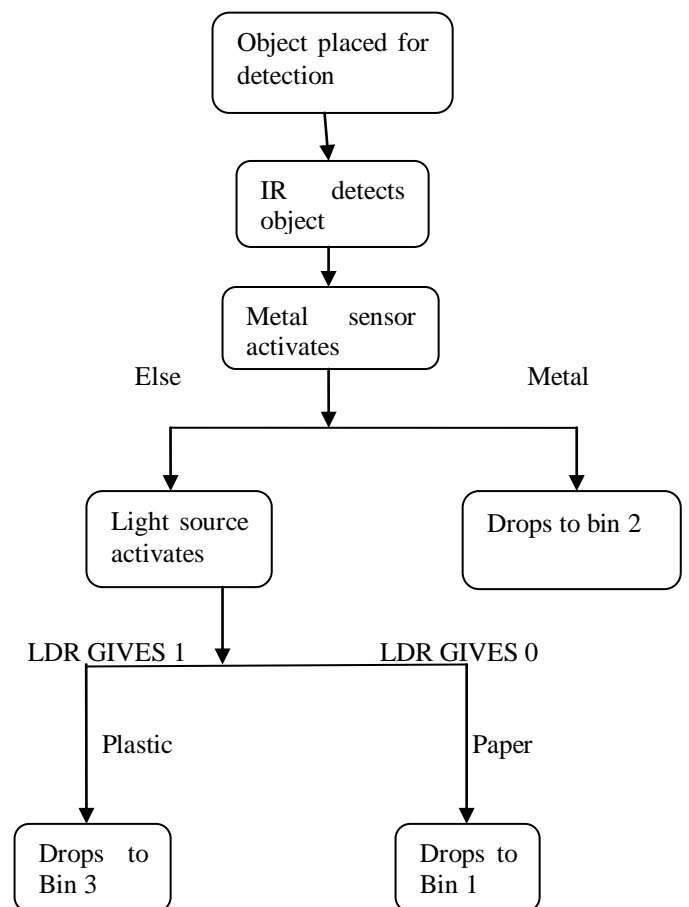


Fig.4: Flow diagram of sorting system.

## 5. RESULT AND DISCUSSION

The system can sort three types of trash successfully. It also stores them to the appropriate bin perfectly. It has some limitations also. The main disadvantage is that it only sorts three types of trash but there is more trash to be sorted. To eliminate this problem we can use more sensors or a sensor that can differentiate between varieties of objects. The system works slowly due to propagation delay in the electronic circuit. It needs to be optimized by proper analysis. The system consumes power which is a vital thing. So proper care need to be taken in this regard also. From overall point of view this project is a good demonstration of basic mechanical and electronic principal.



Fig.5: The system sorts three different types of trash.

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