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Smart Bin for Waste Management

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Abstract: ***The aim and object of this project is to prepare a Smart Bin for the collection of Metal and non metal so that they can be easily separated. What this project will do is, Separate the metal and non metal from the waste. Metal will be detected by the help of Proximity Inductive sensor and will be separated as metal by the help of servo motor.***
Keyword: (Metal and non-metal separation)

I. INTRODUCTION

Separation of metals, when well organized and controlled, can ease the process. In recent years, sorting of scrap material using various automated techniques has gained a lot of focus. One of the multiple steps in the recycling of non-ferrous metals is the separation of shredded material into different groups. In our project, we propose the concept of "Metal & Non-metal Sorting Using Metal Separator". This system of sorting products is optimized to differentiate between metal & non-metals product, which is done with the help of a Proximity Inductive Sensor, with the help of a control motor it separates metal from non-metal. This project is useful in automobile industries, steel plants and industry for separation of metal and non-metal element in the industry on a large basis. It can also be used for waste management so also beneficial for the environment.

II. METHODOLOGY

A. Research Methodology

Various methods has been used in order to analyze and present the studies and researches presented. Considerations were made in searching years it cover, databases to be used for searching, keywords to search and relatedness to the focus of paper. Researcher searched for an updated study ranges from year 2014 up to 2018. To be able to present some innovations, keywords such as Machine Learning, image processing, artificial intelligence and a combination of waste segregation was used in searching in the database from two large databases: Scopus and Web of Science. They were selected because they are the most comprehensive source of scholarly paper and articles. Upon searching, there are 100 results found. But since some of the study is outdated it was not considered. In addition, some researches were not related in the study. PHP is an open-source scripting language. PHP 7.4.0 is the latest version of PHP, which was released on . 28 November.

Acquisition of the Images of Waste Materials This study defines the waste first. To be able to do that, the researcher used to categorize the waste into six (6) parts. After considering the waste category, the also determine the database wherein about 500 images of an item was collected [18]. The code to train the CNN trims the number of images in each category. Thus, they train the CNN that is the machine learning tool that consists of several layers in a network which was the Deep Networks (Alex). Determining the label of the new input image was conducted by AlexNet a trained CNN with 25 layers. They transfer the learning which involves the modification of a pre-trained network.

Infrared Obstacle Line Sensor The system features an Infrared Obstacle Line Sensor that is fitted on the dustbin. The sensor system is connected to Raspberry Pi 2 board, in which it was fitted with a Wi-fi or GSM Module that connects to the internet. As the dustbin has filled-up, a notification was sent to the server using the Python (Django Framework) to schedule the collection of garbage. Using Azure Machine Learning System wastes can be collected from the various dustbin and obtain predicted times this will improves the scheduling process.

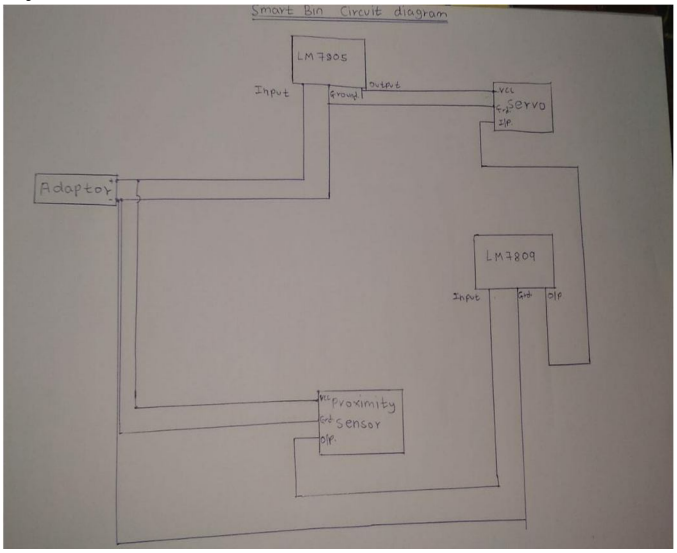
III. COMPONENTS

MODULE DESCRIPTION

1) First connect the device with a 12V AC voltage source.
2) Placed the items to be sorted in the available places alternately.
3) The results of testing metal and non-metal sorting tools, it can be seen that the analysis of this equipment is as follows:
4) If the detected one is metallic, then only the sensor will operate.

5) When Inductive Proximity Sensor senses metal , the Servo motor will get an input from the sensor .

6) Then the object will be pushed by the wooden arm attached on servo motor into the metallic container.



IV. SYSTEM ARCHITECTURE

System architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

V. THEORY

A. Power Supply Testing

In a power supply electronic device is the most important component. Because without the power supply the appliance will not be able to light up, let alone operate. Each component has a voltage specification each to work. Therefore it is very important for us to test the voltage entering or exiting a device.

B. Proximity Sensor Testing

Proximity sensor are used to find metal. This sensor is very important in segregating metal and non metal. As for testing that the aim is to find out whether this sensor can work properly or not. Besides this, with this test we can find out the distance the maximum that can be detected by this sensor.

Table 3 Proximity Sensor Testing

Sensor Distance with Objects	Type of Object	Sensor Condition	Sensor Input Voltage	Sensor output Voltage
1 mm	Metal	ON	24.12	23.40
1 mm	Non-Metal	OFF	24.12	0
2 mm	Metal	ON	24.12	23.39
2 mm	Non-Metal	OFF	24.12	0
3 mm	Metal	ON	24.12	23.40
3 mm	Non-Metal	OFF	24.12	0
4 mm	Metal	ON	24.12	23.40
4 mm	Non-Metal	OFF	24.12	0
5 mm	Metal	OFF	24.12	0
5 mm	Non-Metal	OFF	24.12	0

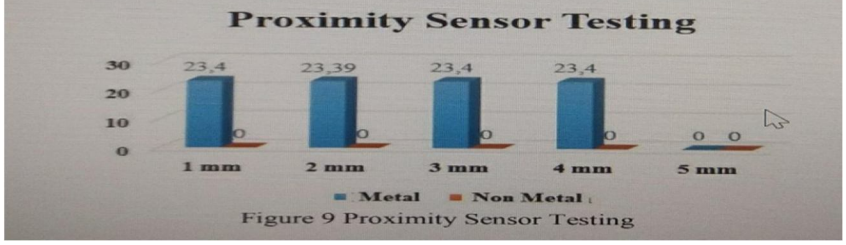


Figure 9 Proximity Sensor Testing

In the above test it can be seen that the existing proximity sensors are still functioning properly. That distance can be measured by a minimum sensor is 0 mm to a maximum of 4 mm. The measured output voltage is voltage between the sensor output with input. Besides that we can also know that only metal objects can be detected by this sensor.

VI. RESULTS AND DISCUSSIONS

The main aim of this "Smart Bin for Waste management " is to provide Separation of metal and non metal . Various steps and methods of efficient waste management and disposal have already been researched and carried out by many researchers and research enthusiasts. Many devices have also been designed in order to carry on this process efficiently. Hardware components such as raspberry pi have been used along with various algorithms to achieve the goal. Images of objects are scanned using the device in order to classify them accordingly. Research opportunities can be worth considering in which the time it response in determining the waste being thrown must be quick, waste classification in bulk should also be in consideration and determining and sorting waste produce in school should be focus on. Image processing capability must be high in order to determine and segregate recyclable materials.

VII. LIMITATIONS

One of the main limitation of this Smart bin was that the metal and non metal waste should be kept at a specified distance only .The Range of Inductive Proximity Sensor for sensing metal is less.

VIII. FUTURE SCOPE

Some things that need to be considered in the process of effective testing are usually:

1) When detection can be added a counter circuit to calculate how many objects detected both metal and non-metal.
2) In non-metal containers an alarm and proximity sensor can be added to determine whether there is a wrong sort of object due to a system error.
3) In the storage of objects both metal and non-metal can be replaced with conveyors to carry objects that will have been sorted into the next process

IX. CONCLUSION

1) Inductive Proximity sensor can only detect metal objects.
2) The proximity detection distance is above 0-4 mm from the sensor.
3) Based on the design, test results and working principle, then the tool has worked according to what was planned before, then the tool can be said to function.

The proposed method is a solution to the current waste management problem which will effectively segregate metal and non metal. This system can be effectively deployed in industries for material segregation, scrap shops and urban households.The waste separated material can be used to produce the desired products thus helps in saving economy and resources. Acknowledgment

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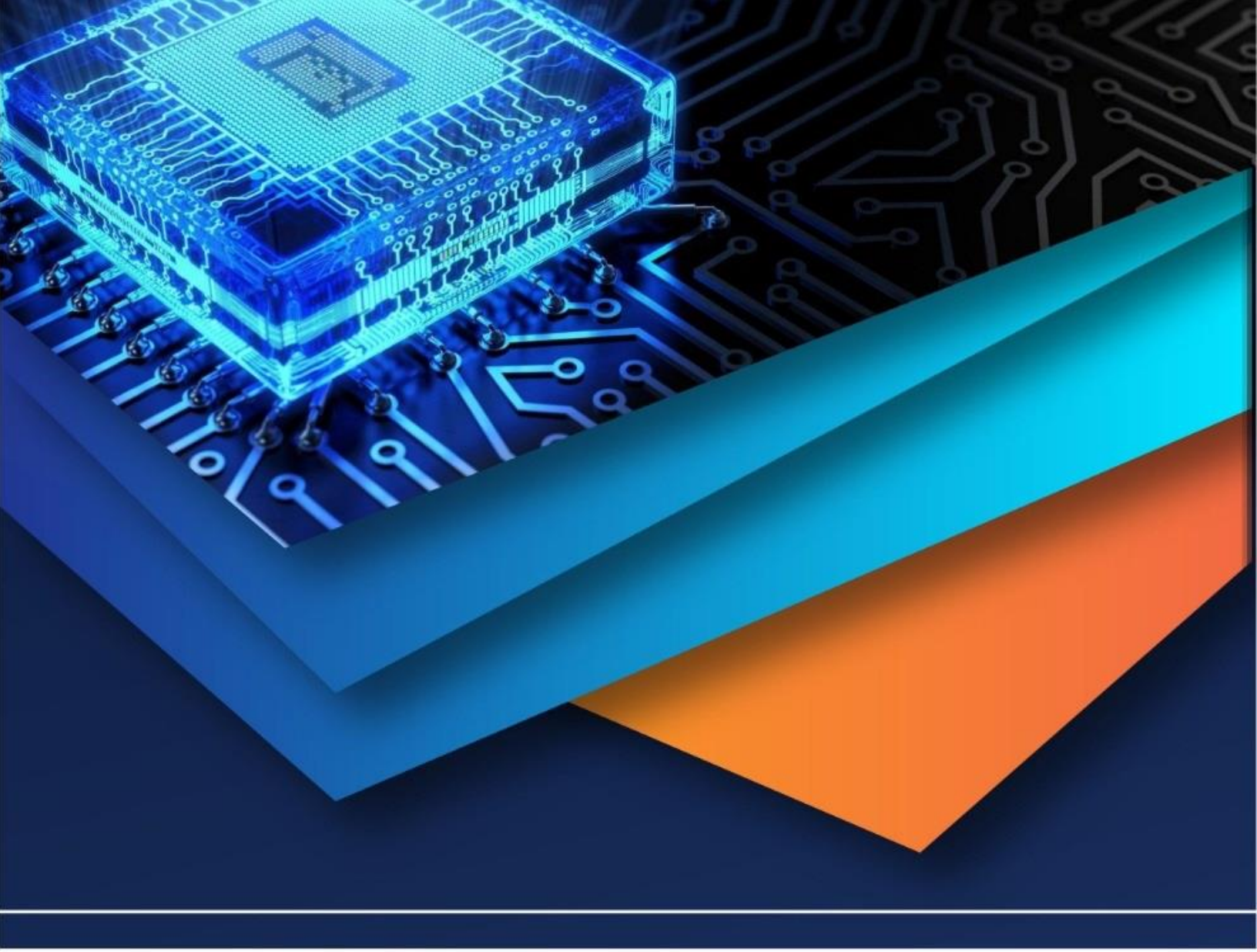

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