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# A Modern Methodology Enabling Plastic Disposal and Money Crediting System Promoting Digital India

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***Abstract*: The solid waste problem is one of the most severe environmental issues. Other issues that have received extensive public attention are the haze and air emissions. These anthropogenic sources are generated from indiscriminate dumping of toxic and hazardous wastes, which has raised the sensitive issues both in terms of quantity and quality. Since the use of plastics is constantly increasing in our day-to-day life, there is no proper waste disposal for plastics. So we propose a system where the plastics are detected using image processing technique and it process by checking whether the placed item is plastic and classifying the plastic type as bottle, polythene covers and other plastic materials. The plastic is then automatically collected using dustbin mechanism. This simultaneously checks the user data with the kept RFID tag of user. This RFID tag helps to get the user details and money will be credited to account linked with user only if placed item is plastic and also depending on the plastic type the amount is credited. This automated money crediting technique creates an awareness among public on plastic disposal. This promotes the digital India as the money is credited directly to account of the user.**

***Keywords*: Radio Frequency Identification (RFID), Automation and Electromechanical Engineering Conference (IEMECON) and Hypothesis verifier.**

## 1. Introduction

Commonly, in city we see that the rubbish receptacles or dustbins put at open spots are over-burden. It makes unhygienic conditions for individuals and in addition offensiveness to that place leaving awful stench. It is known that the technological advancements are increasing at a faster pace. But the utilization of technologies in various sectors is very low. It is known that there are no proper measures for waste disposal. Since the use of plastics is constantly increasing in our day-to-day life, there is no proper waste disposal for plastics. So we propose a system where the plastics are detected using image processing technique. And an automated money crediting technique is also used for increasing the plastic disposal awareness among public

## 2. Literature review

- Vasagade S, Tamboli S and Shinde D (2017), 'Dynamic Solid Waste Collection and Management System Based on Sensors, Elevator and GSM' International Conference on Inventive Communication and Computational Technologies, pp. 263-267. A smart solid waste management system is designed that will check status and give alert of dust bin fullness and more significantly system has a feature to literate people to use dustbin properly and to automatically sense and clean garbage present outside the dustbin. Thus presented solution achieves smart solid waste management satisfying goal of making Indian cities clean, healthy and hygienic.
- Sagnik Kanta, Srinjoy Jash and Himadri Nath Saha. (2017), 'Internet of Things Based Garbage Monitoring System', 2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON), pp. 127-130.

In this project the garbage bins are set in the urban areas of a city and a closed circuit camera is set on the bin location. The camera captures the images for garbage bins continuously and the Radio Frequency Identification (RFID), GPS and GIS send these images for work station. The RFID reader and the camera are mounted to the truck which will load the garbage. When the truck come closer to the bins, the RFID starts communicating with the RFID tag and send all information. This information process uses controlling Hut. This Hut is S.M.S Technology. The GPS and GPRS mapping servers are used to analyse data of various locations. The control station compile all the information and store in the system database.

## 3. Object recognition

Object recognition is the area of artificial intelligence concerned with the abilities of robots and other AI implementations to recognize various things and entities. Object recognition allows robots and AI programs to pick out and identify objects from inputs like video and still camera images. Methods used for object identification include 3D models, component identification, edge detection and analysis of appearances from different angles. Object recognition is at

the convergence points of robotics, machine vision, neural networks and AI. Google and Microsoft are among the companies working in the area -- Google's driverless car and Microsoft's Kinect system both use object recognition. Robots that understand their environments can perform more complex tasks better.

Major advances of object recognition stand to revolutionize AI and robotics:

- MIT has created neural networks, based on our understanding of how the brain works, that allow software to identify objects almost as quickly as primates do.
- Gathered visual data from cloud robotics can allow multiple robots to learn tasks associated with object recognition faster. Robots can also reference massive databases of known objects and that knowledge can be shared among all connected robots.
- Scientists at Brigham Young University have developed an object recognition algorithm that can learn to identify objects on its own. The Evolution-Constructed Features algorithm, as it's called, can make decisions about what characteristics of an object are relevant to its identification.

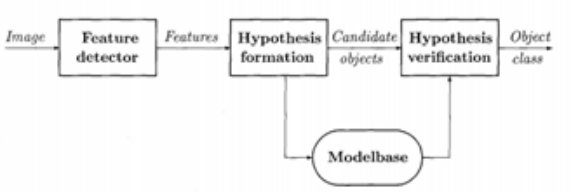


Fig. 1. Different components of an object recognition system are shown

### A. System component

An object recognition system must have the following components to perform the task:

- Model database (also called model base)
- Feature detector
- Hypothesizer
- Hypothesis verifier

A block diagram showing interactions and information flow among different components of the system is given in the Figure. The model database contains all the models known to the system. The information in the model database depends on the approach used for the recognition. It can vary from a qualitative or functional description to precise geometric surface information. In many cases, the models of objects are abstract feature vectors, as discussed later in this section. A feature is some attribute of the object that is considered important in describing and recognizing the object in relation to other objects. Size, color, and shape are some commonly used features. The feature detector applies operators to images and identifies locations of features that help in forming object hypotheses. The features used by a system depend on the types of objects to be recognized and the organization of the model database. Using the detected features in the image, the hypothesizer assigns likelihoods to objects present in the scene. This step is used to reduce the search space for the recognizer using certain features. The model base is organized using some type of indexing scheme to facilitate elimination of unlikely object candidates from possible consideration. The verifier then uses object models to verify the hypotheses and refines the likelihood of objects. The system then selects the object with the highest likelihood, based on all the evidence, as the correct object. All object recognition systems use models either explicitly or implicitly and employ feature detectors based on these object models. The hypothesis formation and verification components vary in their importance in different approaches to object recognition. Some systems use only hypothesis formation and then select the object with highest likelihood as the correct object.

Pattern classification approaches are a good example of this approach. Many artificial intelligence systems, on the other hand, rely little on the hypothesis formation and do more work in the verification phases. In fact, one of the classical approaches, template matching, bypasses the hypothesis formation stage entirely. An object recognition system must select appropriate tools and techniques for the steps discussed above. Many factors must be considered in the selection of appropriate methods for a particular application. The central issues that should be considered in designing an object recognition system are:

- *Object or model representation:* How should objects be represented in the model database? What are the important attributes or features of objects that must be captured in these models? For some objects, geometric descriptions may be available and may also be efficient, while for another class one may have to rely on generic or functional features. The representation of an object should capture all relevant information without any redundancies and should organize this information in a form that allows easy access by different components of the object recognition system.
- *Feature extraction:* Which features should be detected, and how can they be detected reliably? Most features can be computed in two dimensional images but they are related to three-dimensional characteristics of objects. Due to the nature of the image formation process, some features are easy to compute reliably while others are very difficult. Feature detection issues were discussed in many chapters in this book.
- *Feature-model matching:* How can features in images be matched to models in the database? In most object recognition tasks, there are many features and numerous objects. An exhaustive matching approach will solve the recognition problem but may be too slow to be useful. Effectiveness of features and efficiency of a matching technique must be considered in developing a matching approach.

- *Hypotheses formation:* How can a set of likely objects based on the feature matching be selected, and how can probabilities be assigned to each possible object? The hypothesis formation step is basically a heuristic to reduce the size of the search space. This step uses knowledge of the application domain to assign some kind of probability or confidence measure to different objects in the domain. This measure reflects the likelihood of the presence of objects based on the detected features.
- *Object verification:* How can object models be used to select the most likely object from the set of probable objects in a given image? The presence of each likely object can be verified by using their models. One must examine each plausible hypothesis to verify the presence of the object or ignore it. If the models are geometric, it is easy to precisely verify objects using camera location and other scene parameters. In other cases, it may not be possible to verify a hypothesis.

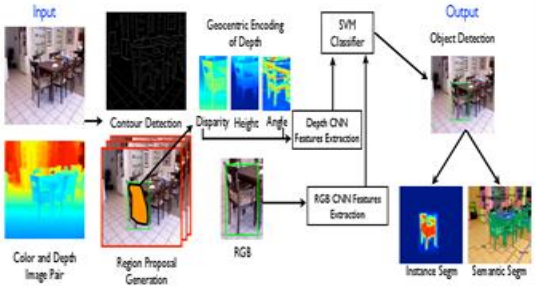


Fig. 2. Object Recognition

## 4. Block diagram

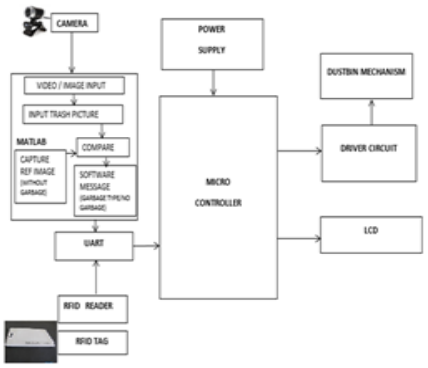


Fig. 3. Block diagram

## 5. Methodology

The system consists of an image processing technique to detect the plastic and other wastes. Image processing is performed to detect whether the plastic displayed is bottle or plastic bag. If placed an option for user to select between the plastic bottle and cover, it is common that many people will select the plastic item which credits higher money to the individual. Also the user might place stones instead of plastic to get money. The CAMERA attached takes the image and compared what item is placed. Based on the image processing technique the respected output is provided. The MATLAB provides the data to the controller. The data from the MATLAB to the controller is provided using UART protocol. The data denoting the plastic bag or plastic bottle is provided. Based on the data gathered by the UART, we compare the details. Based on the data received the programming is already done and provided to the controller. For the provided data respected money is credited to the user. To differentiate the number of users we employ the concept of Radio Frequency Identification known as RFID. A tag is provided to every user who is authorized to take money whenever they dispose plastics. The tag when placed near the RFID reader gets energized and transfers the unique number programmed in the chip. The data is received by the RFID reader. The reader provides the data to the microcontroller. The microcontroller identifies the user based on the number transferred by the Tag to the reader and from reader to the microcontroller. Once the tag is recognized the user's name is obtained. Now the user can be credited with the amount of money programmed. The amount of money to be credited is also programmed by the user to the microcontroller. The money crediting is displayed on the LCD. The amount of money to be credited is displayed on the LCD display unit. A dustbin mechanism is used to dump the plastic into the dustbin. The mechanism is operated with the help of driver circuit attached to the microcontroller. The driver circuit is used to control the operation of the motor. As the motor operates in 12V, it is difficult to control the motor directly by the microcontroller output. Once the user is identified and the plastic is detected, then the signal; is transmitted from the controller to the driver circuit to control the motor. Now the dustbin mechanism is operated to dump plastics.

## 6. Result

### A. *No garbage detected*

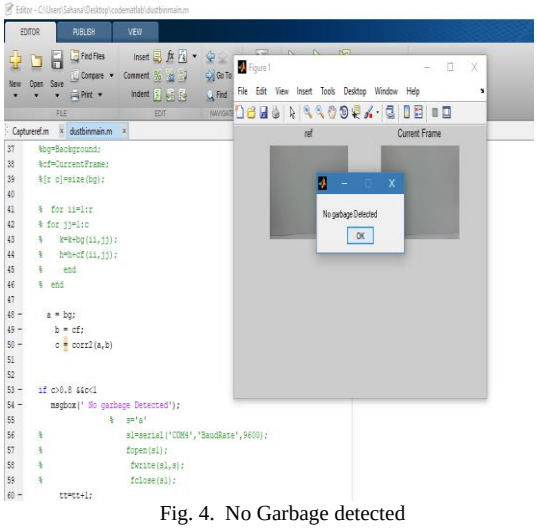


Fig. 4. No Garbage detected

*B. Bottle Detected*

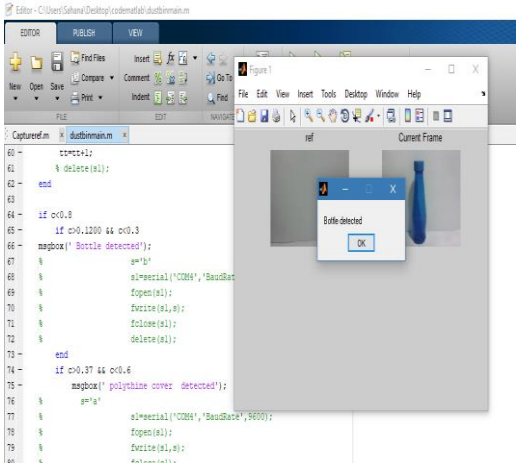


Fig. 5. Bottle detected

*C. Polythene cover detected*

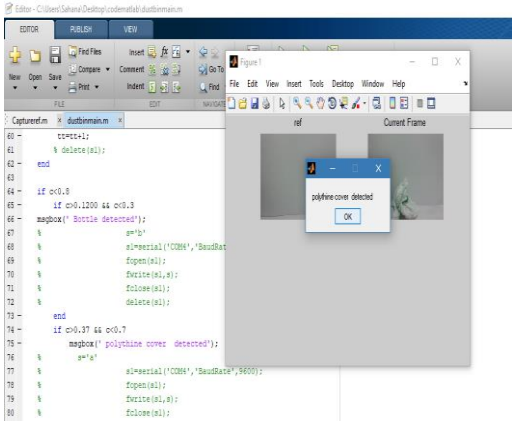


Fig. 6. Polythene Cover Detected

## 7. Conclusion

A system capable of finding whether the item placed is plastic and segregating plastic types. Here we detect whether the placed item is plastic in front of camera by the image processing, if it is plastic then it finds the plastic type. The plastic type is detected by matching the plastic object with its respective data type using MATLAB coding. The camera will be on all time when an item kept, it asks for capture by asking user name first then after entering it capture the item, compares with the existing image means before placing item. Thus comparing the existing image and the kept item image it checks whether it's plastic and then matches the value of plastic type such as polythene covers, plastic bottles.

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