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Waste Segregation & Tracking

Shreya Mondhe[1], Mayank Mukundam[2], Dr. R. C. Jaiswal[3]
[1, 2, 3]*E&TC Department, Pune Institute of Computer Technology, Pune, Maharashtra, India*

Abstract: ***The definition of Waste Management has changed a lot in recent times as people have been more socially & politically aware of this. In 2014, our government undertook an oath for a cleaner India by launching a mission called "Swachha Bharat Abhiyaan", which ensures to make cleaner & greener India & to inculcate this habit of cleanliness in every citizen possible. Since we are growing technically each & every day, this paper below enlightens how we can make a product out of amalgamation of Technology & Environmental Awareness.***
As the idea of separating waste is pretty common these days, we have described how we can make the process automated & how we can achieve a single dustbin rather than manually segregating it in types. Moreover it also talks about combining every feature that the dustbin provides on an Android app.

I. INTRODUCTION

With the advancement in Technology & spreading awareness among people regarding cleanliness, it was necessary to ease the process of waste segregation which involves minimal human interaction with the waste, which will not only make it a faster process but it will also generate employment opportunities in various fields, right from the raw materials manufacturing to research & development of the product.

The final product will have two things: a dustbin which can segregate the waste in Organic, Inorganic & Inert & an Android app which will handle all the notifications from the dustbin.

Earlier, a Manual sorting of waste produced some wrong results as we didn't have proper knowledge as to which waste belongs to which type, but automating the same process will give us more accurate results which will further help us in recycling & reusing things in a better way.

II. WORKING

The segregator bin is divided into four sections: organic waste, metallic materials, glassy and transparent plastic materials and leftover waste which are further segregated. The model consists of a platform which is surrounded by three sensors namely capacitive sensor, inductive sensor and Omron E3SCRC7. This platform forms the lid of a bin which has four sections. This bin is rotated by the motor depending upon the input given by the sensor to the microcontroller. It rotates the bin such that the section of the bin of respective type of waste is exactly below the platform. Now the platform opens and the waste falls in the corresponding section.

At the first instance Inductive Sensor is made active which detects metal, if the material is not metallic then Capacitive Sensor activates, where organic wastes are sorted. If the waste is not organic, then the Omron E3SCRC7 sensor senses glass & transparent plastic materials.

If all the three sensors fail to identify the waste then it is put by default into the fourth section. All the leftover waste in the fourth section is made to fall in a tank attached at the bottom of the bin.This tank contains the chemical named Methyl ethyl ketone. In this chemical all the leftover inorganic waste gets dissolved.

The control valve opens and the liquid solution along with the dissolved inorganic material flows out into a separate tank through a drain out system. In this way inert waste remains as it is in the section, and inorganic is passed in different sections. An ultrasonic sensor is also interfaced to detect the level of waste in a particular section. If any of the sections get completely full, the user is notified through a GSM module regarding the particular section.

When all of the four sections get full, the user can inform the nearest municipal cleanliness ward to come and collect the waste. In addition to that the app also consists of a feature to register a complaint & also take a picture of any place & send it to municipality & get it cleaned then & there.

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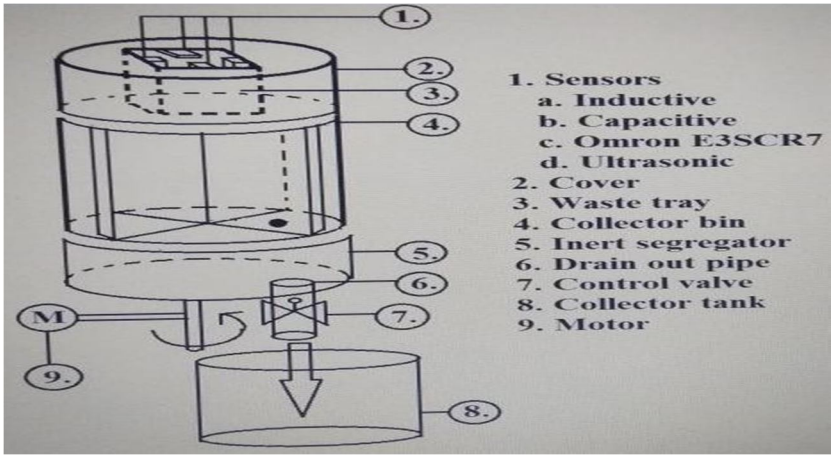


Fig 1: Smart Dustbin Schematic Diagram

1) *Inductive Sensor:* Detects if the given waste is metallic on the basis of the change in oscillation.
2) *Capacitive Sensor:* If the waste is not metallic, then this sensor will categorize the waste into organic depending upon the change in capacitance caused by dielectric constant of different materials. A table of dielectric strength of different materials is provided below.
3) *Omron E3SCRC7 Sensor:* This sensor is a phototransistor & consists of a LED light source. It is used to determine glass and transparent plastic objects, and works on the principle of retro reflectivity.
4) *Ultrasonic Sensor:* This sensor is interfaced to get the notification if the dustbin is full, which is given on mobile phones with the help of a Communication System (GSM Module).
5) *Methyl ethyl ketone:* This chemical, also known as butanone, is used to dissolve the inorganic materials & separate the inert materials out of it.
6) *Arduino:* This forms the brain of our model which will control the motor and give output depending upon the inputs received from different sensors.
7) *GSM Module (SIM 900A):* To inform the user about the capacity of the dustbin.

III. RESULTS & ANALYSIS

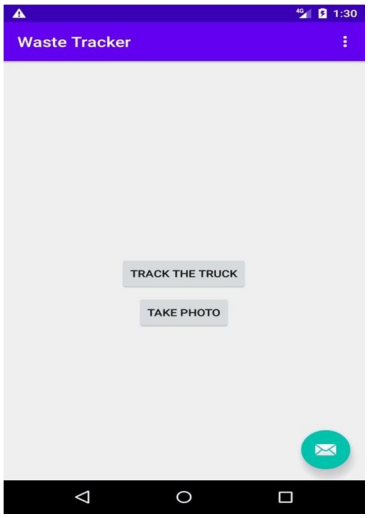


Fig 2: Android app in addition with the dustbin

Fig 2 depicts an Android app that can collect notifications from the dustbin & also some added features already explained in the above point. The message icon in the right bottom corner is used to register complaints.

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IV. CONCLUSIONS & FUTURE PLANS

A. We concluded that manual sorting is avoided to a greater extent which increases the safety of people working to collect wastes in different areas.

B. Plan to deploy an IOS version of this & also deploy it in rural areas as much as possible.

C. Self-chargeable dustbin to make the segregation process seamless.

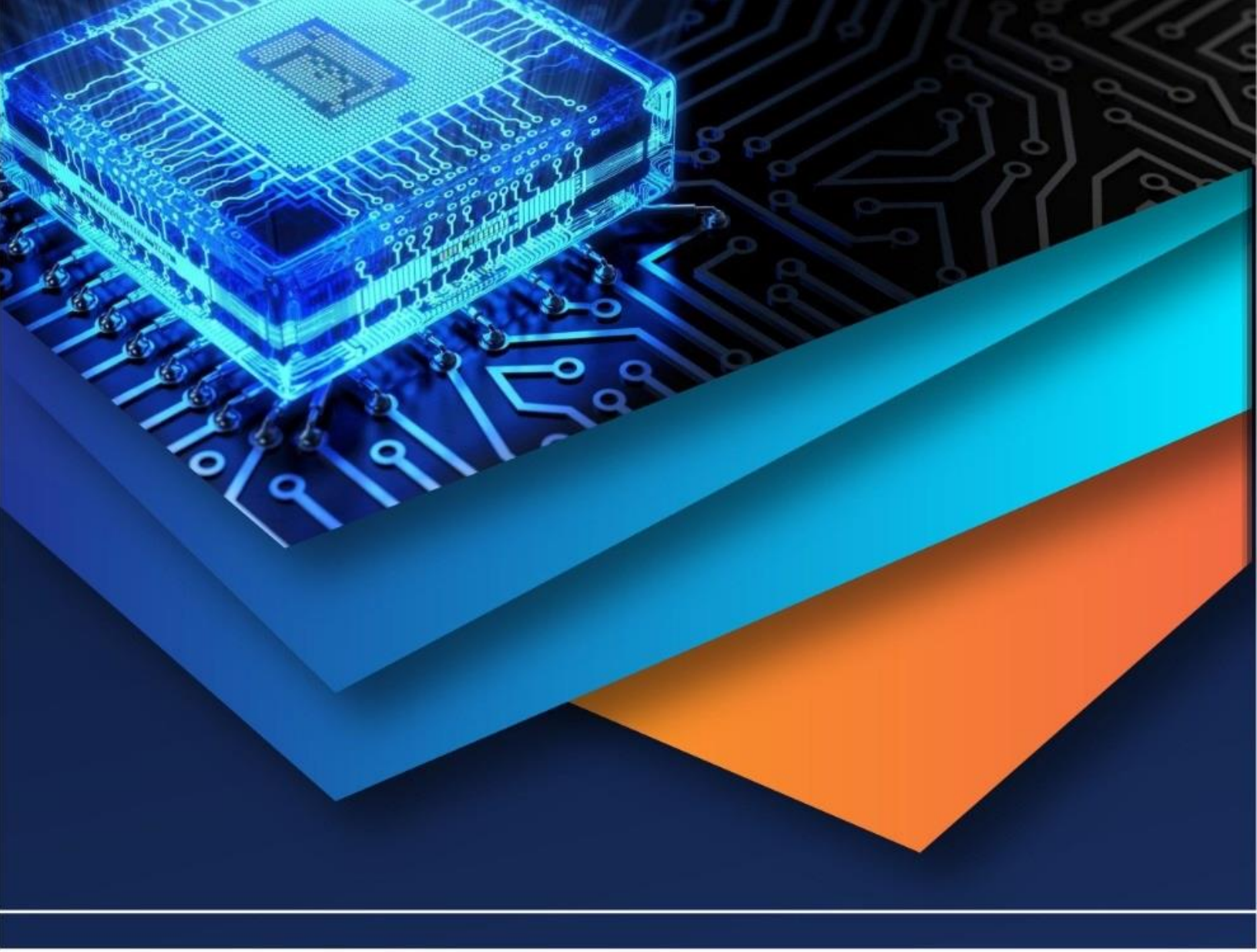
V. ACKNOWLEDGEMENT

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