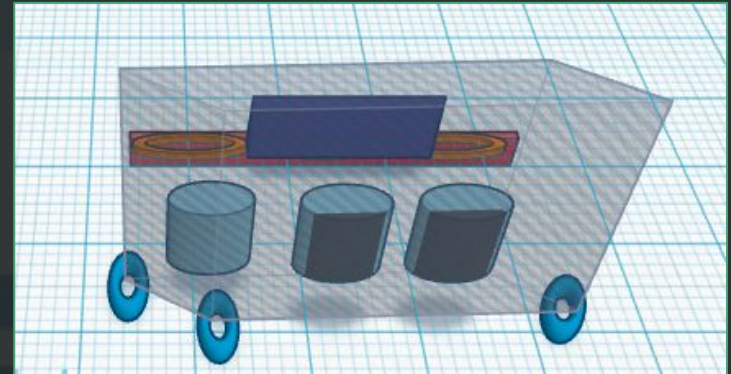
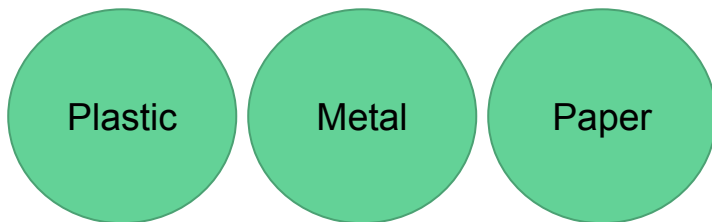


BinC

Aman Gour
Jaseem Umar
Pintu Meena
Ravi Verma



Questions?



1. How many of you think India is not a clean country?
2. What are the ways we/government can improve it?
 - a. Garbage bins at various places
 - b. More investment into cleaning technology

PROBLEM

Waste Segregation
has been a major
problem in waste
disposal

70%

of the government's investment into waste disposal goes into waste segregation
and transportation

[Source: Environment Committee India](#)

Traditional Solution



The final sorting efficiency of colored bins is just 11% - Environment audit for waste management

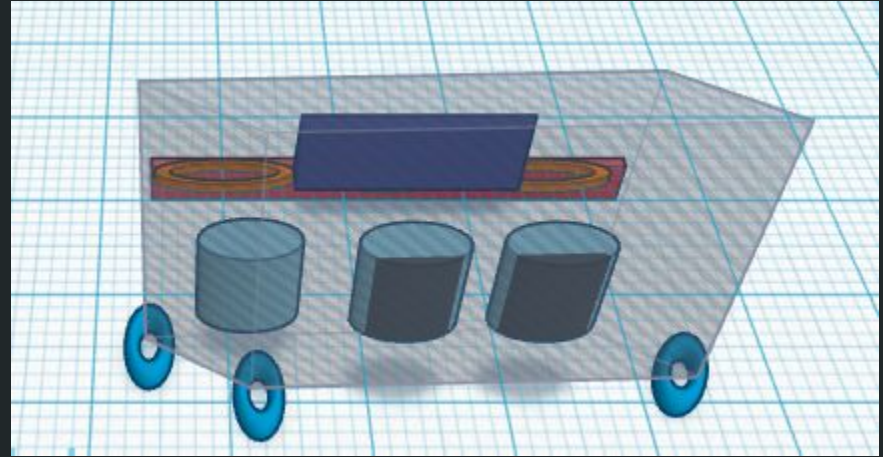
Automatic Waste Segregation Machine



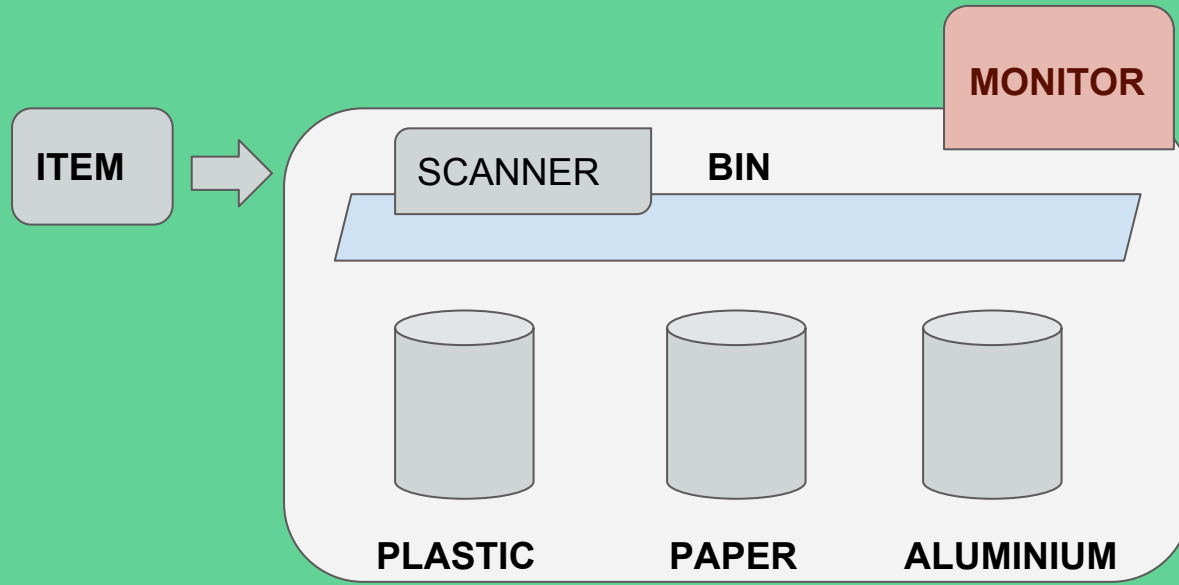
We present to you **BINC**

An electromechanical machine
that source the item into
recyclable and non-recyclable
containers automatically

3-D Design of BINC



How does it work?



1. Take as input the trash item
2. Scan it to classify into one of the three categories
3. Dispose into the container

Implementation

The demo video of Binc at work can be [found here](#). The mechanism of BINC can be divided into three stages.

- (1) Scanning - BINC runs a motion detection algorithm that helps detect if there is some object kept in the scanning area. BINC does not employ any extra sensors for the purpose and achieves it solely using the camera. The powerful motion detection algorithm implemented in the raspberry-pi does the task of motion detection
- (2) Classification - In the traditional approaches for classification, many sensors are used to do the task of classification. We have used an entirely new method by employing neural network for image classification
- (3) Disposal - Once the classification is done the object has to be disposed off in the right bin. BINC has a layer solely aimed to serve this purpose

Model

- (1) Camera
- (2) Scanning Area
- (3) Disposing Area



Technology

The important components of BINC are:

- (1) R-pi and tiva board
- (2) Camera
- (3) Motors

Motion Detection - Motion detection is done by taking photos using the webcam at small regular intervals and checking for difference with the background. When the difference exceeds a threshold value, program considers it as an object being put. First frame just after each object is deposited in a bin is taken as background frame for the next round of detection.

Technology

Image Classification - The task of image classification is done by using computer vision approach. We employ a neural network to do the task of detecting class for objects. The neural network training is done offline on a machine of high configuration. The final weight vector learned from training the neural network is employed on the Raspberry Pi to detect the images. The separation of training and task of online classification helped us to make BINC more modular wherein the learned weight can be changed anytime in BINC. The complete code can be found in the git repository.

Disposal - Object is initially put on a panel where photo of it is taken. Once the classification is done, a rotatable ramp points to the dustbin as per result of the classification. The panel then rotates and drops the object onto the ramp.

Two servo motors power the depositing mechanism: one for the panel and one for the ramp. Power supply for servo motors are taken from Tiva board. Angle of the servo is determined by the PWM output from the Raspberry Pi.

Testing

Testing is done on a dataset consisting of selected materials that were used for training which would be like a charm. For training we used one material for each category with 15 images for each and trained the neural network which successfully did the task of classification on those objects.

What makes BINC special

- Hassle free waste disposing
- Separation for easy recycling
- Lots of money saved for final stage segregation
- Low cost of transportation

Apart from the highly efficient task of image classification BINC can be used for any other task involving image classification. We could train the neural network for any other task that involves segregation and the whole system would still work just by importing new weight vectors into BINC. This modular design makes it special because it can be deployed to solve any classification for any real life tasks.

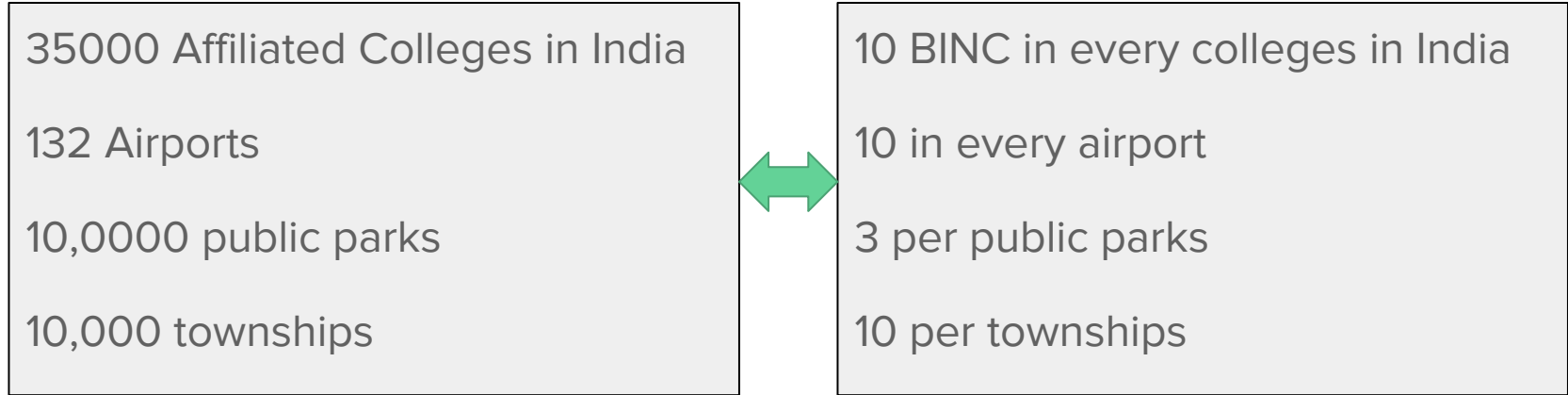
Business Model

- Employ bins in all the colleges, airports, townships and public areas
- Integrate it with **Swach Bharat Abhiyan** to get government support

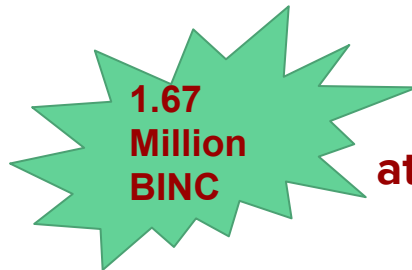
GOAL: Sell billions of BINC

VISION: Make India clean

Expected Sales



3351330 BINC



at just 5% of sales from total possible options

Attracting Users

- Hassle free waste disposing
- Separation for easy recycling
- Lots of money saved for final stage segregation
- Low cost of transportation

Competition and USP

First of its kind initiative in India

BIG market

Environmental Cause

Revenue and Cost

Microcontroller - ₹ 300

Metal Casing - ₹ 500

Camera - ₹ 600

Display - ₹ 400 (Optional)

Basic Cost: ₹ 1400

Billions saved in Waste Segregation

Investment Recovery

The initial investment of 1 million
INR can be recovered by just
sale of just 400 - 500 BINC at a
market price of ₹3000

Profit

The profit margin of BINC are high
but even if we make minimal profit
out of it given the broad areas we
could expect significant profit and
popularity among the government
institutions

Shortcomings

The current version of BINC is not trained extensively to deal with lots of other items except the ones in the testbed. Apart from that because everything is done by a simple camera it takes up some seconds to do the object detection using motion controller. Other classification techniques can be tried out to make the system better and more robust. We could take a middle way out by employing a magnetometer to detect metal and using the neural network classify plastic vs paper.

Important Links

- (1) BINC: Demo, Setting Up
- (2) [Reports and Surveys](#)
- (3) [CodeBase Link](#)
- (4) [Investor Pitch](#)

References

- (1) <https://github.com/jorgenkg/python-neural-network>
- (2) <https://www.raspberrypi.org/forums/viewtopic.php?t=45235>
- (3) <https://www.raspberrypi.org/documentation/usage/camera/python/README.md>

Future Works

- (1) Improving the network by using more images for classification
- (2) Automatic notification when the BINC is full
- (3) Indication of the tasks in the pipeline using a LED

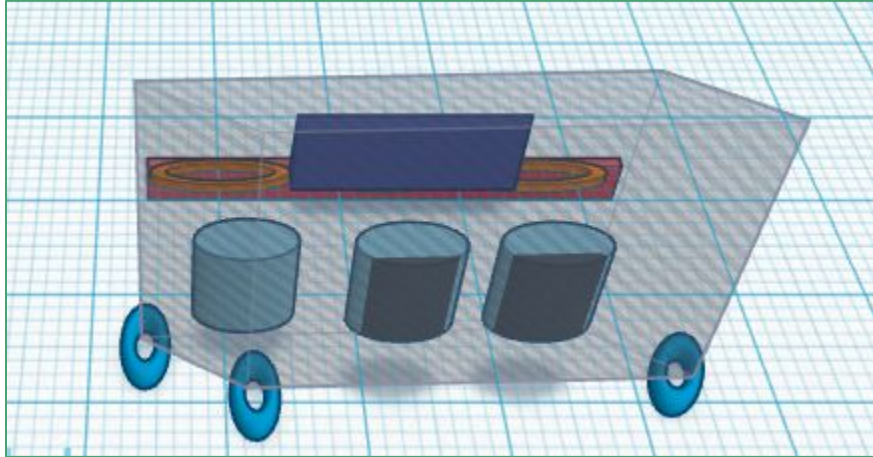
Additional Features

Automatic Bin-Full notification
and garbage collection alarm to
the in-charge

So situation like this:



BINC



LETS MAKE INDIA CLEANER
