



Retrash : the smart recycling bin system for environment

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Bachelor of Science Program in Computer Science

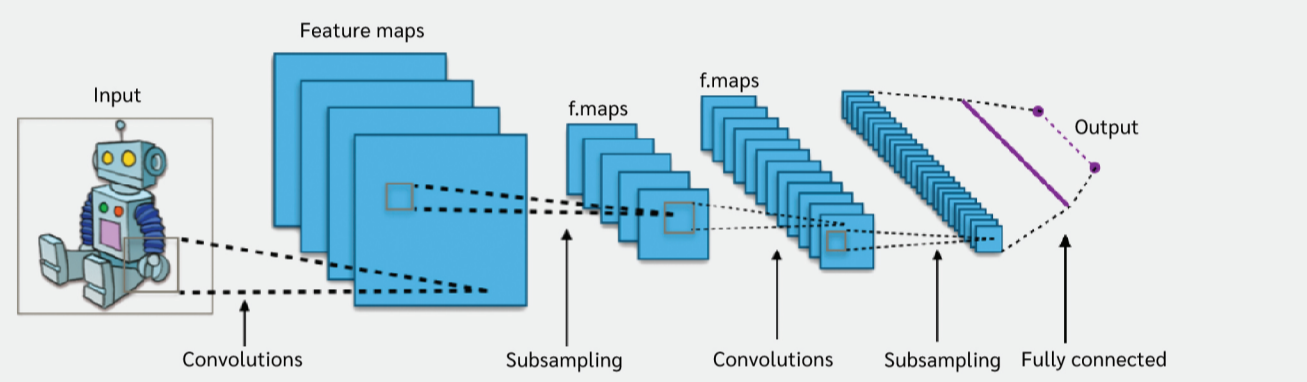
ABSTRACT

This research will propose a new smart recycling bin system that develops from the Trashy project that is an IoT - based. This system proposed to waste management for being one of the main problems in the world. In addition, the waste management leads to many problems such as health issues due to germs and global warming. A possible solution for this problem is to properly classify each type of garbage. However, the many waste separation systems are not efficient enough and people confuse about how to separate the type of garbage. So, this research will propose a reTrash prospect to adapt the prototype project that can automatically separate the type of garbage: glass, plastic, metal cans, and other waste. The proposed system uses the Raspberry pi to the main controller. In addition, this system classifies a waste from learning previous photos by using the resnet50 model to analyze the images and classify the garbage. And then, a waste is sent to the bin by motor drive. From the experimental results, the proposed system represents the accuracy to 98% from testing and 84% from real implementation.

BACKGROUND KNOWLEDGE

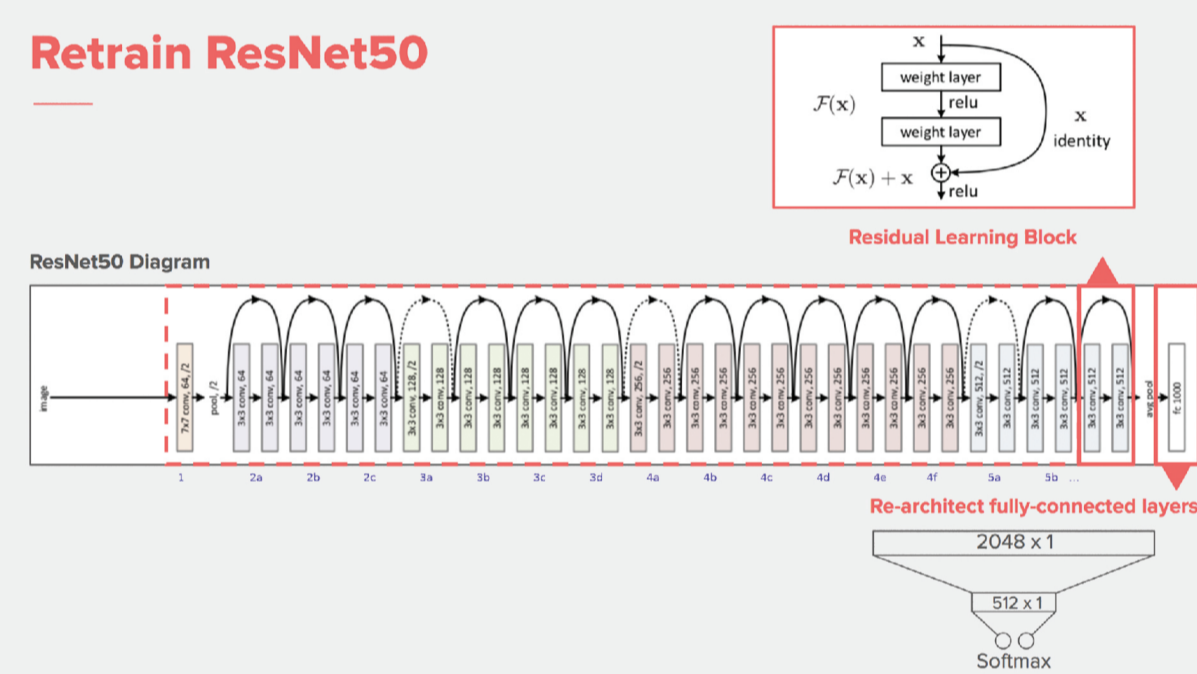
Convolutional Neural Network (CNN)

A Convolutional Neural Network is a Deep Learning algorithm which can take in an input image to assign importance (learnable weights and biases) for various aspects/objects in the image and be able to differentiate one from the other.



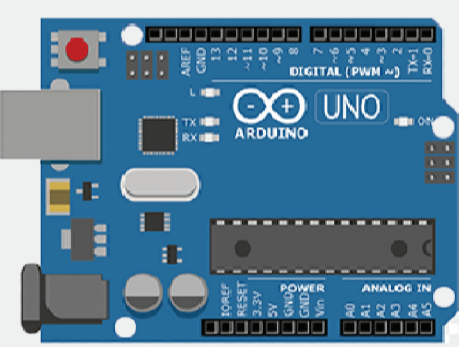
Residual Network (ResNet)

ResNet-50 is a convolutional neural network that is 50 layers deep. This can load a pre-trained version of the network trained on more than a million images from the ImageNet database. The pre-trained network can classify images into 1000 object categories. From this result, the network has learned rich feature representations for a wide range of images. However, this network has an image input size of 224-by-224.



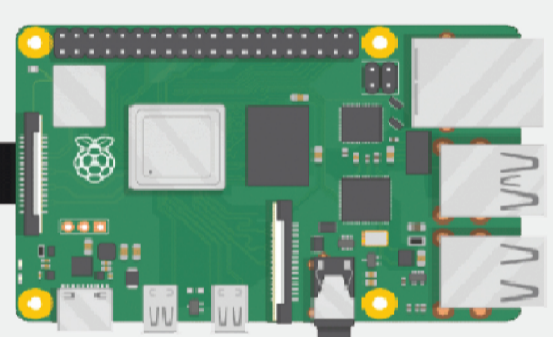
Arduino Uno R3

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. This board has 20 digital input and output pins that can be easily loaded a program onto it.



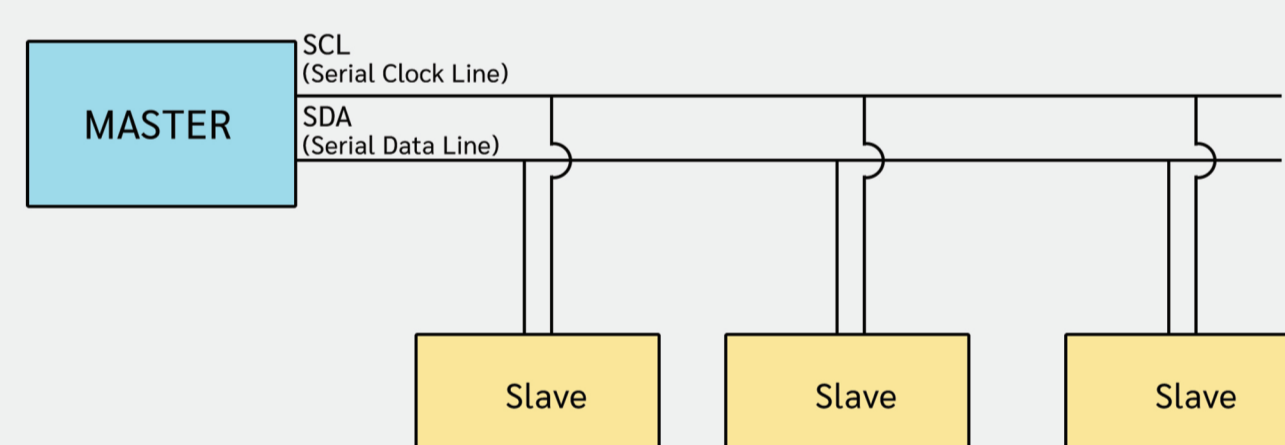
Raspberry Pi

The Raspberry Pi is a small computer and low price. However, it works like a computer, everything can be connected to a computer monitor or TV screen.

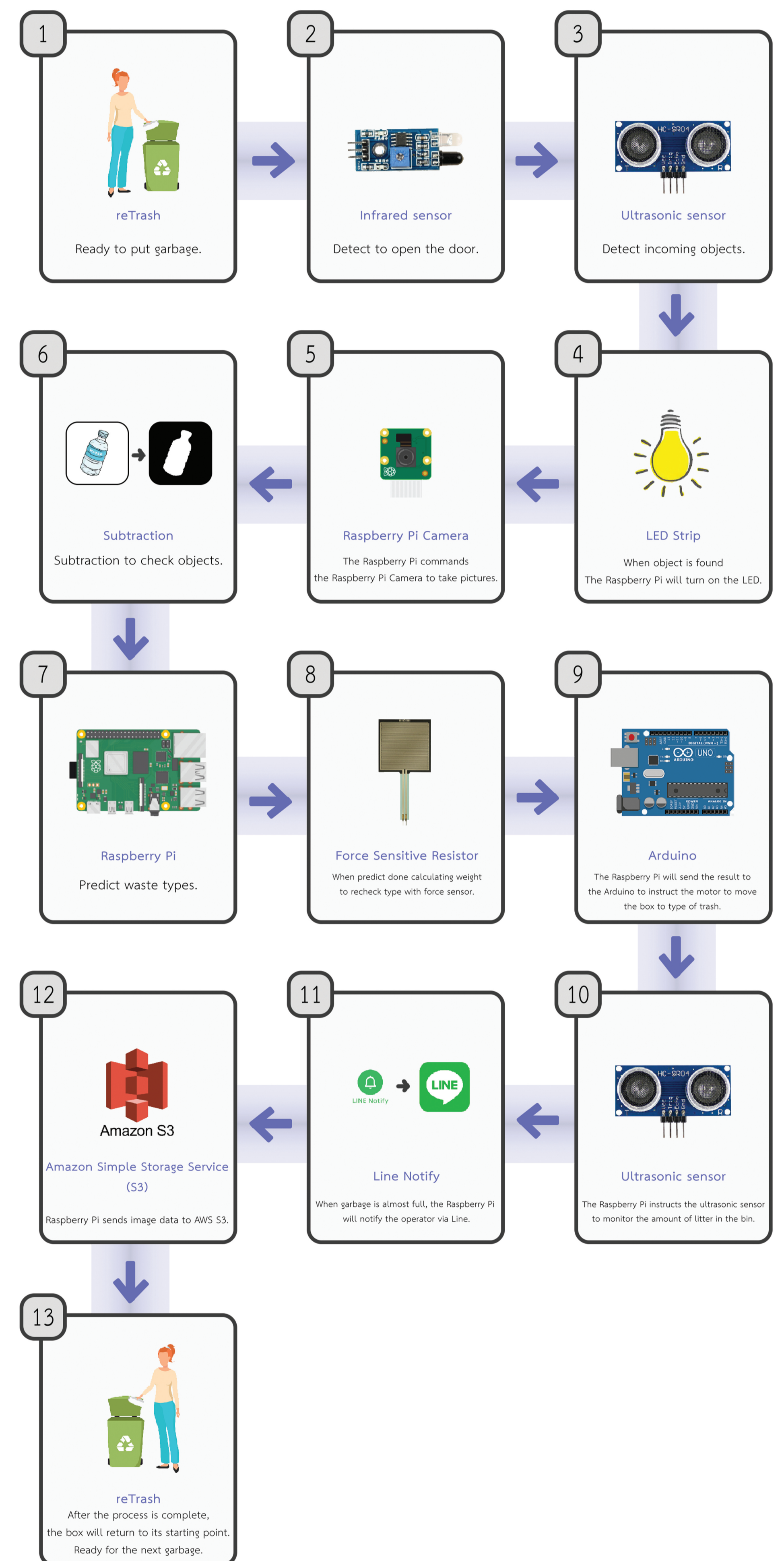


Inter Integrate Circuit (I2C)

Inter Integrate Circuit is a serial protocol for two-wire interface to connect low-speed devices like microcontrollers, EEPROMs, A/D and D/A converters, I/O interfaces and other similar peripherals in embedded systems. It was invented by Philips.



PROCEDURE

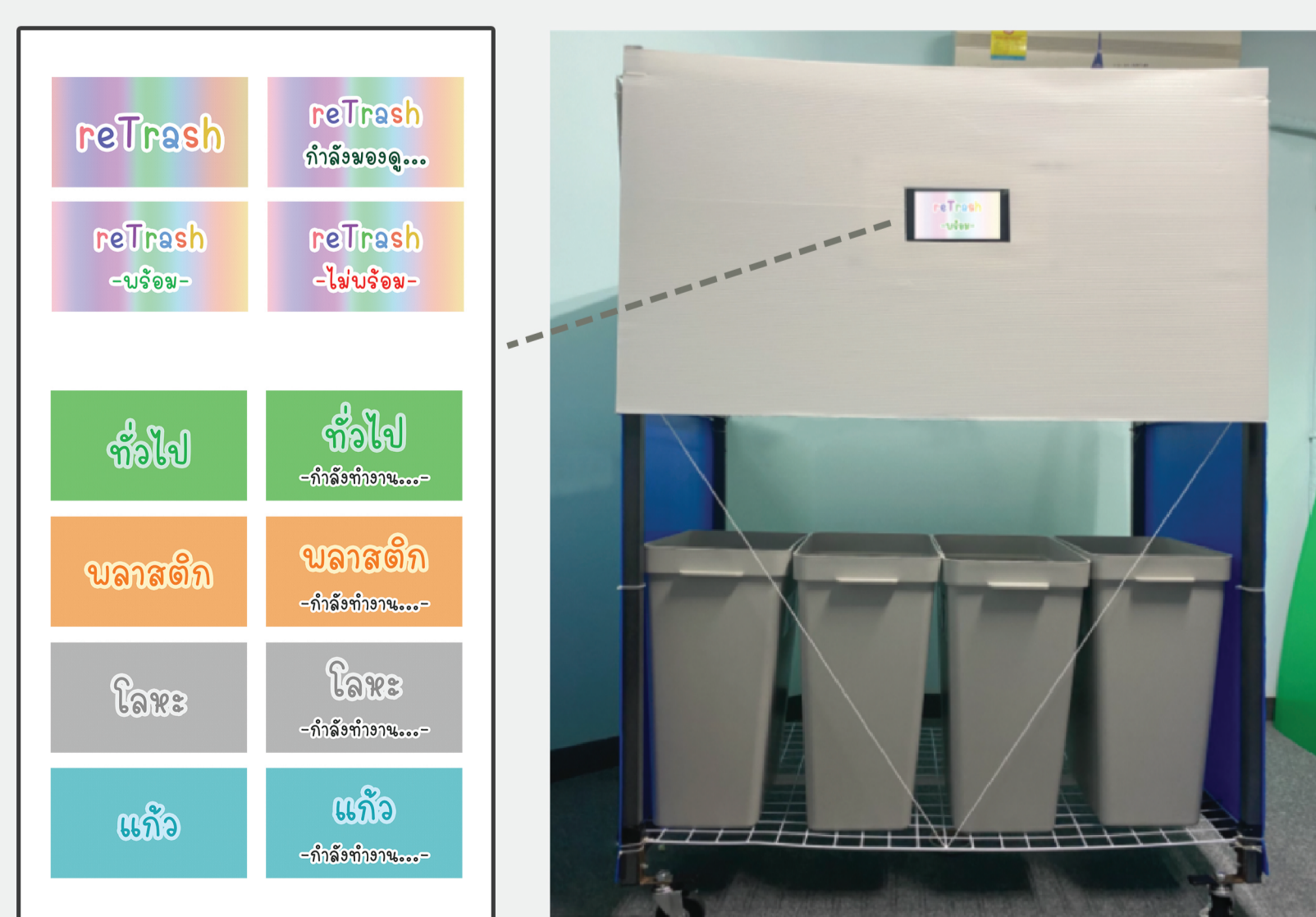


EXPERIMENTAL RESULTS

The monitor display

In practical use, there must be a part that can be contacted. And tell the user how the trash system works that is consistent with the waste that has been dumped or not. There is a visual display indicating the type of waste processed and the steps that are currently being performed. Instead of showing the code programs.

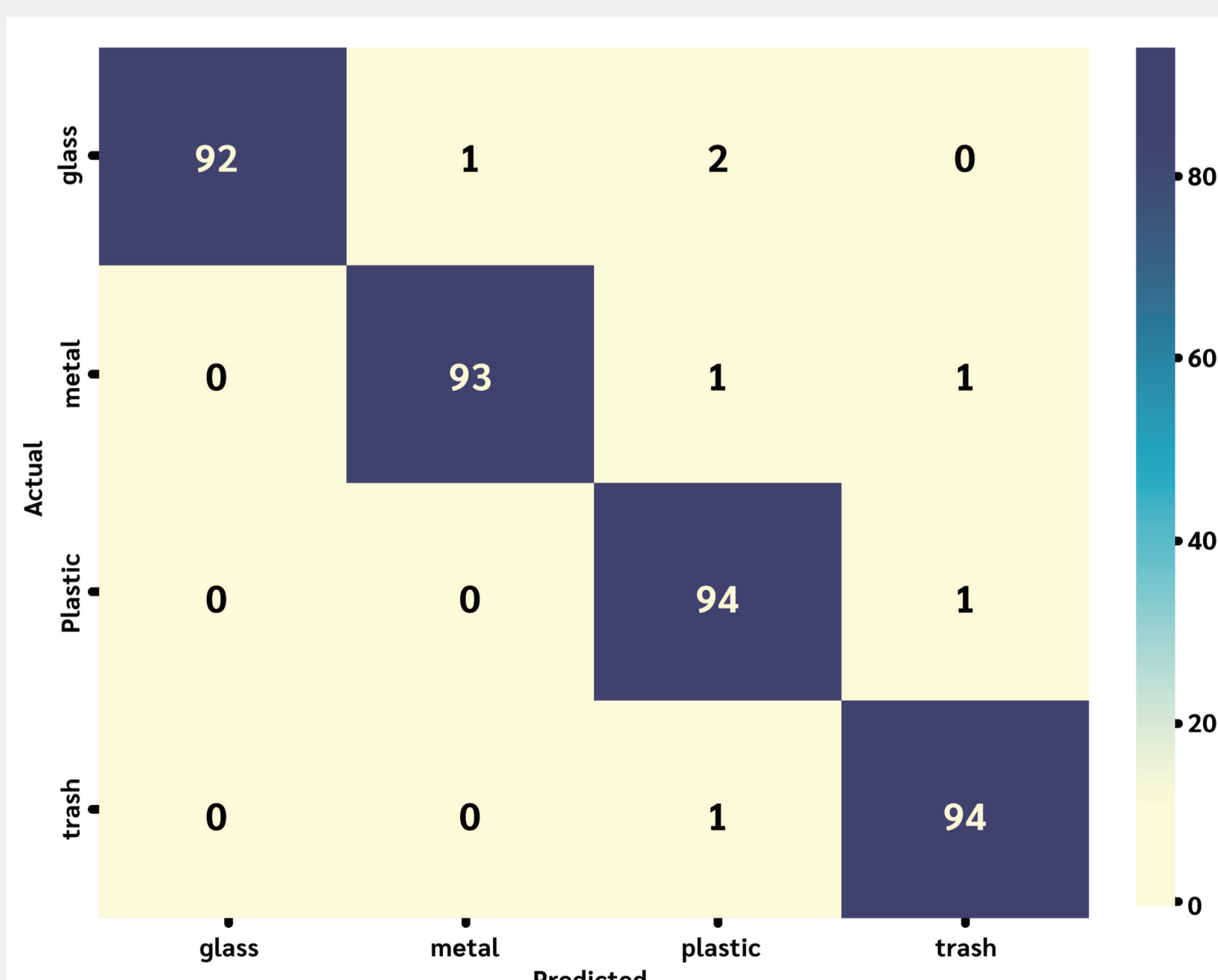
This display shows the trash system for representing the information. The user will receive a type of garbage and the status of dropped garbage that is thrown into the smart trash. In addition, this represents each step of the trash procedure.



Automatic door

The automatic door is developed for opening and closing the area of the smart trash to put the garbage. It works by the control of the arduino board that forces the motor to be detected by the object.

Accuracy of work



SUMMARY

From the development of reTrash: The Smart Recycling Bin System for environment, IoT has been used in conjunction with AI to sort waste that can be recycled, divided into 4 types: glass, plastic, metal cans and other waste, with the addition of other functions of the trash to look more suitable for practical use.

REFERENCE

[1] Suphainee Buathong, Pimpin Sannuagdech, Kwanchanok Panuakuk, "Trashy : An IoT - based Smart Recycling Bin System", Retrieved May 29, 2020, from Srinakharinwirot University
[2] Pollution Control Department, (2559), "Master Plan for Solid Waste Management of Thailand 2016 - 2021", Retrieved June 5, 2020, from <http://infofile.pcd.go.th/waste/WasteMasterPlan.pdf?CID=2748363&mpcf=15K&N=86290581>
[3] Aggregated news around AI and co., (2561), "Let's take a look at how cnn thinks.", Retrieved June 5, 2020, from <https://mc.ai>
[4] Thaisayalee, (2563), "Arduino Uno R3", Retrieved June 6, 2020, from <https://www.thaisayalee.com/arduino-uno-r3.html>
[5] Chutthawan Niyomthum, (2562), "What is the 'Convolution Neural Network'", Retrieved June 6, 2020, from <https://medium.com/@pradyasin/what-is-convolution-neural-network-b2e52508995>
[6] Thaisayalee, (2563), "Load Cell", Retrieved June 6, 2020, from <https://www.thaisayalee.com/article/wiki/review-product-article/how-to-use-load-cell-and-hx711-amplifier-module.html>
[7] Amazon Web Services, (2545), "Cloud computing with AWS", Retrieved June 6, 2020, from <https://aws.amazon.com/ib/what-is-aws/>
[8] Amazon Web Services, (2545), "Amazon S3", Retrieved June 6, 2020, from https://aws.amazon.com/ib/h3/nc2-hz_of_prod_st_s3
[9] ThaiEasyElec, (2559), "Program development on Raspberry Pi with Qt", Retrieved June 6, 2020, from <https://www.thaisayalee.com/article-wiki/embedded-electronics-application/raspberry-pi-programming-with-qt-ch1.html>
[10] netway.co.th, (2562), "Cloud Computing", Retrieved June 7, 2020, from <https://netway.co.th/blog/Cloud%20Computing%20%E0%B8%84%E0%B8%87%E0%B8%AD%E0%B8%AE%E0%B8%B0%E0%B9%84%E0%B8%A3%20>
[11] Kritsada Jaiyan, "Force sensor with UNICORN", Retrieved November 20, 2020, from <http://doc.linux.co.th/force-sensor-with-unicorn/>
[12] Gus, "How to Setup a Raspberry Pi Pressure Pad (FSR)", Retrieved November 20, 2020, from <https://pimlifestyle.com/raspberry-pi-pressure-pad/>