WELCOME

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama,Belgaum-591008

GHOUSIA COLLEGE OF ENGINEERING

Ramanagaram-562159

A Project Seminar on

"AN INTERNET OF THINGS BASED SMART WASTE MANAGEMENT SYSTEM USING DEEP LEARNING MODEL"

Presented By

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TUBA KOUSER	**1GC17EC026**
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CONTENTS

INTRODUCTION

- The Internet of Things (IoT) is a concept in which surrounding objects are connected through wired and wireless networks without user intervention.
- Internet of things (IoT) is a communication paradigm that envisions a future paradigm where everyday life objects will be equipped with a microcontroller and some form of communication protocol. One well-known product of IoT is the smart city, which can be defined as a city with smart technology, smart people, and smart collaboration.
- Waste management is a costly operation as it takes up a great deal of resources and labor.
- Efforts have been taken by the authorities to improve waste management systems by setting up the recyclable bin and launching the 3Rs campaign (recycle, reuse and reduce)

OBJECTIVE

- To ensure the protection of the environment through effective waste management measures.
- To protect the health and well being of people by providing an affordable waste collection service.
- Reducing, re-using, recycling and recovering waste.
- Treating and safely disposing of waste as a last resort.
- Promoting and ensuring the effective delivery of waste services.

PROPOSED SYSTEM

- The system consists of a platform where the waste is placed or dropped first.
- This waste will be recognized by the Deep Learning system with the help of the camera.
- Further, the waste will be categorized based on the data and it will be move to the selected category by the help of the conveyor.
- Categorized waste will be dropped to the bin of same category with the help of the servo motor .
- The user with the matching RFID pass Card will be allowed to drop the waste other user will not be let to put in the waste into this system.

PROBLEM STATEMENT

- Whereas many developed countries are searching for ready-made sustainable waste management solutions, India has created institutions to take on the big challenge of formal research on the topic.
- The current waste management practice in India involves collecting waste from sources through a community collective bin system, after which it gets transported to a low-lying landfill system with intermediate processing of Municipal Waste.
- The open dumping practice is leading to various problems like pollution and health hazards. Both surface and groundwater are affected by this in fact, groundwater is in a critical state.

LITERATURE SURVEY

- **“Waste management using Internet of Things (IoT)” Himadari Nath Saha et.al.,**

  Waste management is that the tactic of treating solid wastes and offers reasonably solutions for usage things that doesn't belong to trash. It's regarding but trash bin be used as a valuable resource.

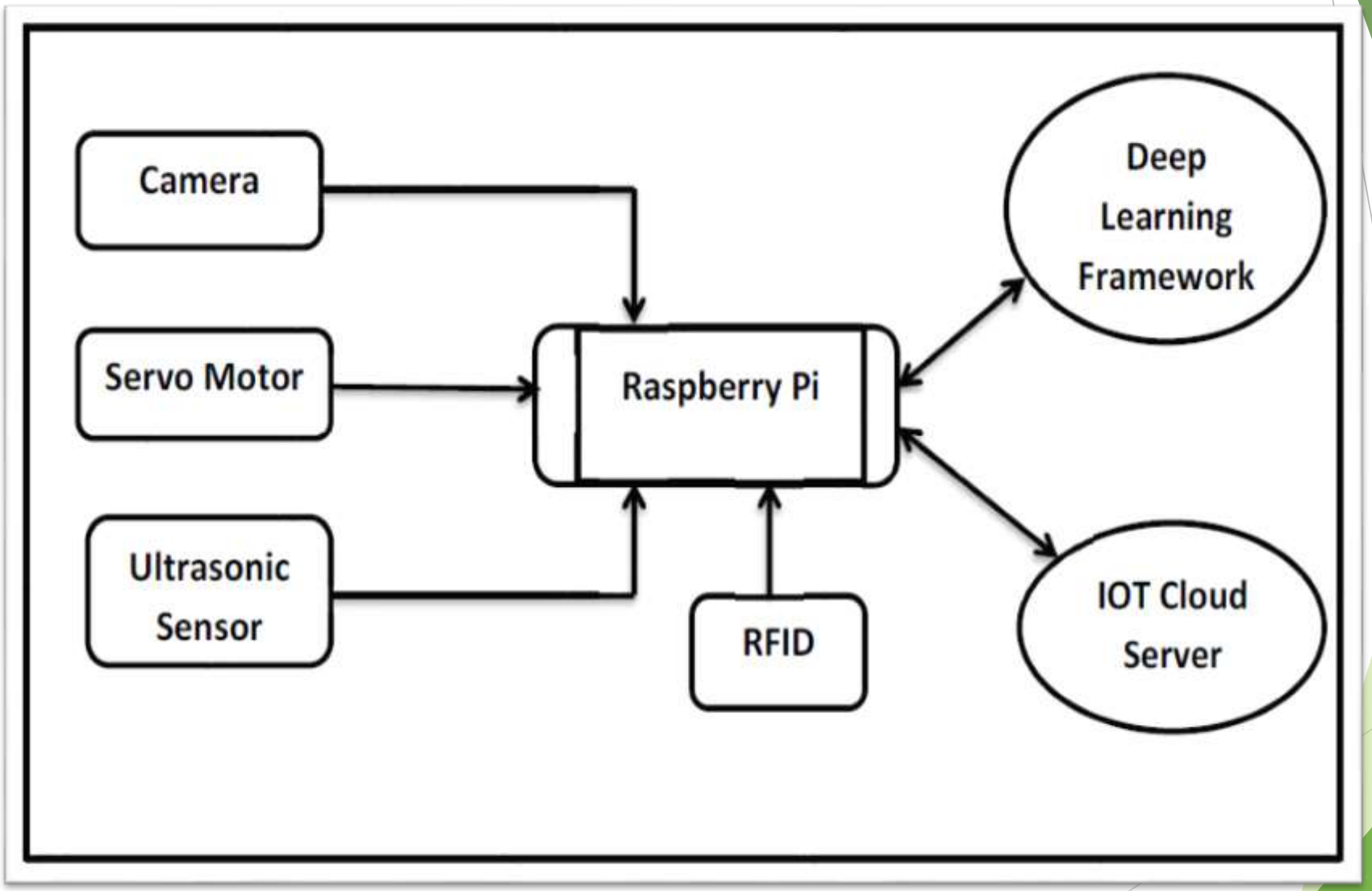
- **“An IoT Based Smart Energy Management System” Jai Krishna Mishra et.al.,**

  This paper introduces an IoT based smart energy meter using the raspberry pi devices as a solution to the aforementioned issue. A small modification to the already installed old meters can make them act as prepaid smart meters.

- **“Smart Dual Dustbin for Waste Management in Smart Cities” G Sai Rohit et.al.,**

  As urbanization is spreading rapidly, there is an increase in production of waste. Waste management is a crucial issue to be considered at public places where waste is overflowed from the bins and may cause different diseases.

METHODOLOGY

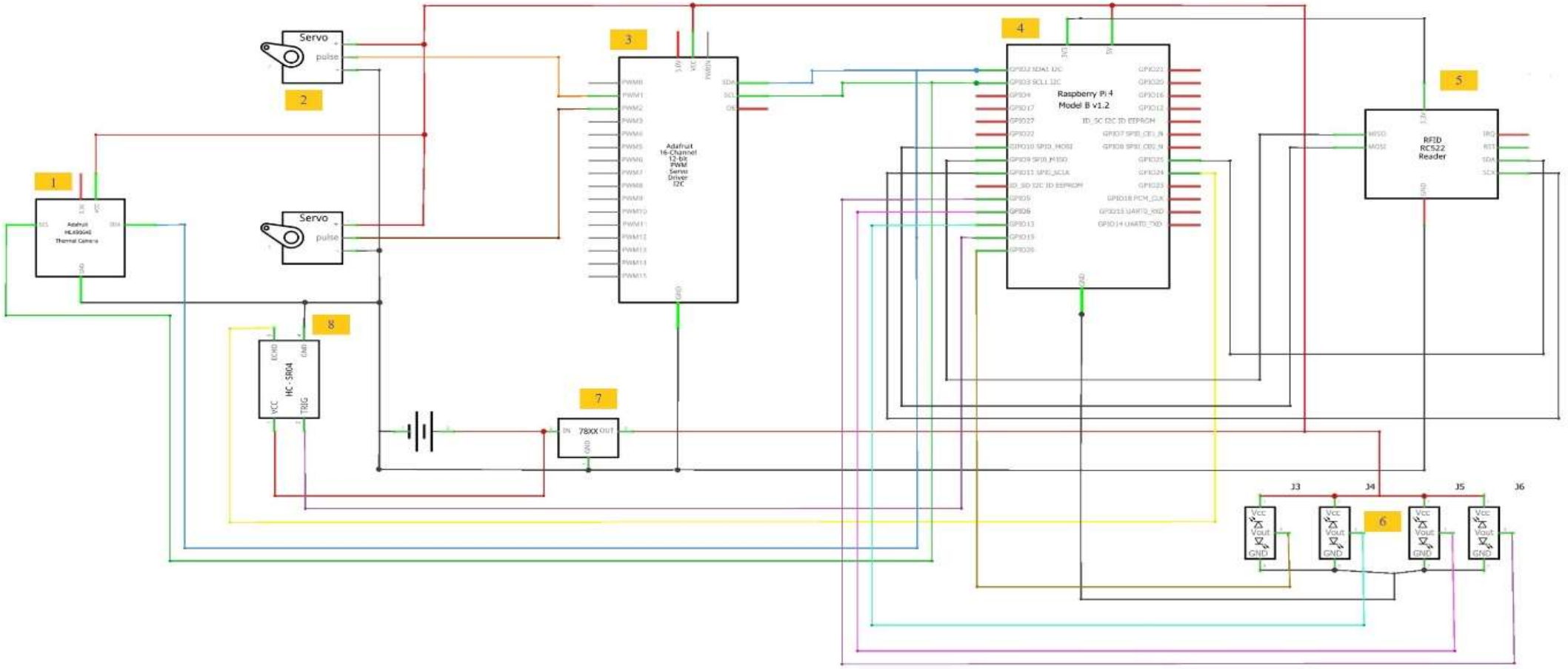


- The setup mainly consists of Main power supply for the controllers and actuators.
- we have a 230V AC voltage which is converted into 5v DC and connected to the controller and power distribution board and the motor drivers
- The camera which traces the waste placed in to the main platform is operated with the help of the ultrasonic sensor which is in communication with the raspberry pi also a RFID
- Once the camera detects the type of the waste with help of the deep learning technique the controller provides the signal to the servo motors via servo motor driver controller
- Here the whole system uses the deep learning method where the system is already saved with approx. 8000 images on different categories using Lobe Deep Learning Tool for best classifying result.

HARDWARE AND SOFTWARE REQUIREMENTS

- Raspberry Pi 4
- Webcam
- Servo MG995
- PCA9685 Servo Driver
- Power Supply for RPI
- Ultrasonic Sensor
- IR Sensor
- IC 7805 Voltage Regulator
- RC522 RFID Module
- IoT Cloud Platform
- Python IDLE
- Raspberry Pi OS
- Blynk IoT Platform

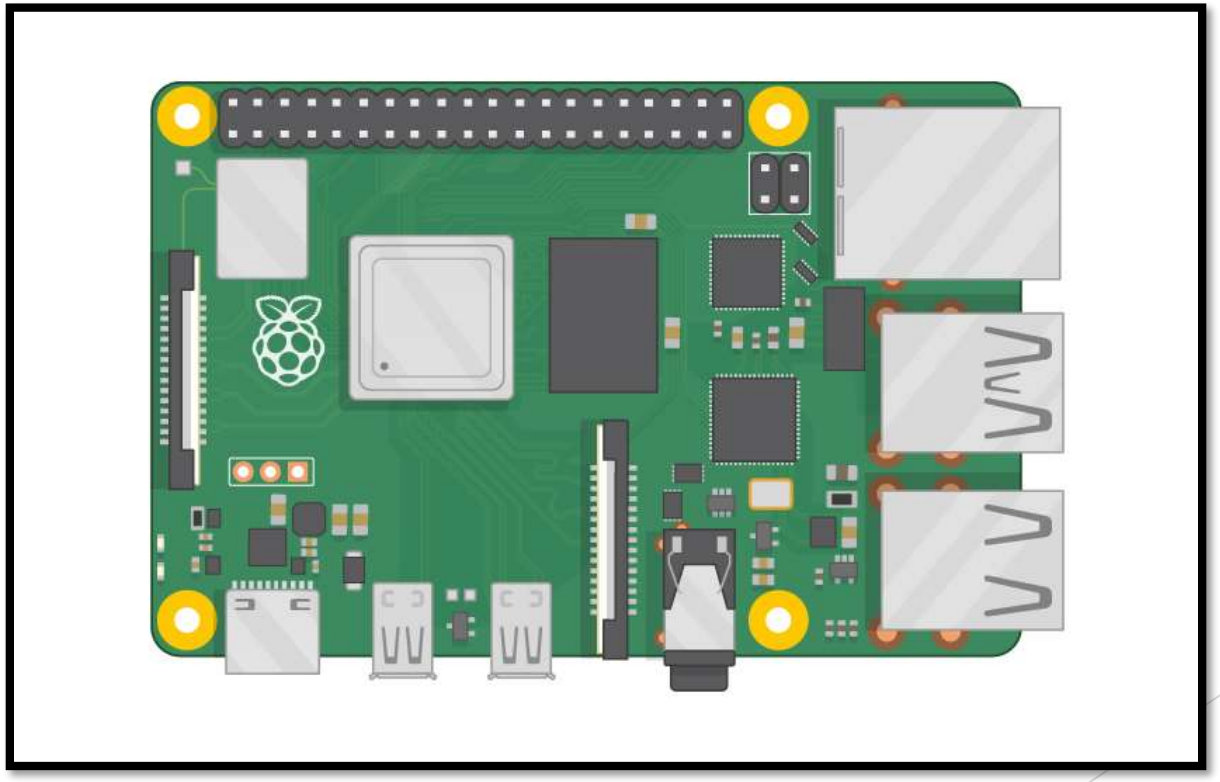
Circuit Diagram For Smart Waste Management System



1.Camera Module
2.Servo MG955
3.PCA9685 Servo Driver
4.Raspberry Pi 4
5.RC522 RFID Module
6.Infrared Sensor
7.IC 7805 Voltage Regulator
8.HC-SR04 Ultrasonic Sensor

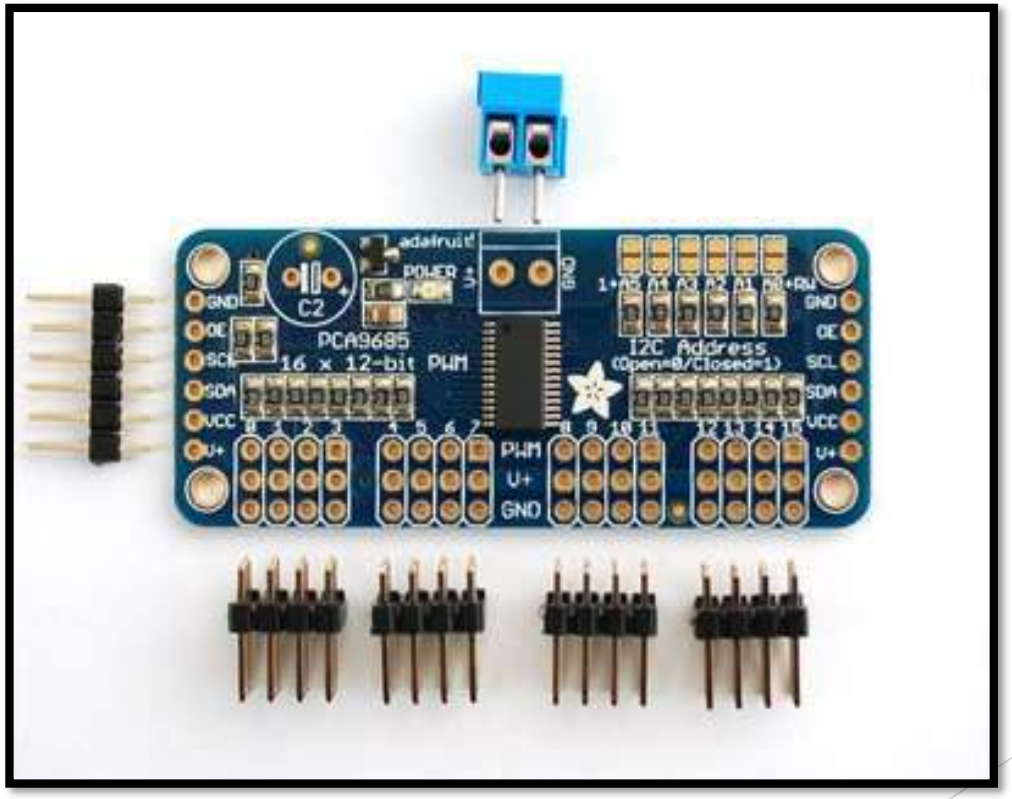
Raspberry Pi 4

- The Raspberry Pi 4 Model B is the latest version of the low-cost Raspberry Pi computer and is simply a credit-card sized electronic board of the type you might find inside a PC or laptop, but much smaller.
- It is now widely used in many areas, such as for weather monitoring, because of its low. cost, modularity, and open design.



PCA9685 SERVO DRIVER

- The Adafruit 16-Channel 12-bit PWM/Servo Driver will drive up to 16 servos over I2C with only 2 pins.
- The on-board PWM controller will drive all 16 channels.
- We can chain up to 62 of them to control up to 992 servos - all with the same 2 pins!



SERVO MG9685

MG995 Metal Gear Servo Motor is a high-speed standard servo can rotate approximately 180 degrees (60 in each direction) used for airplane, helicopter, RC-cars and many RC model. Provides 10kg/cm at 4.8V, and 12kgcm at 6V.

WEBCAM

A webcam – short for ‘web camera’ – is a digital camera that’s connected to a computer. It can send live pictures from wherever it’s sited to another location by means of the internet. Many desktop computer screens and laptops come with a built-in camera and microphone, but if yours doesn’t, you can add a separate webcam at any time.

ULTRASONIC SENSOR

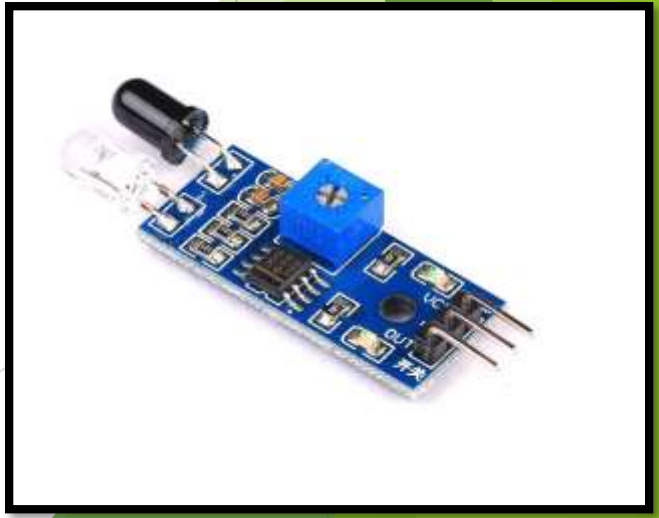
An ultrasonic sensor is a device that detects an object and measures the distance to it. It measures the distance by emitting ultrasound and receiving the wave that the object reflects.

The sensor determines the distance to the target by measuring time lapse between sending and receiving of the ultrasonic pulses.

INFRARED SENSOR

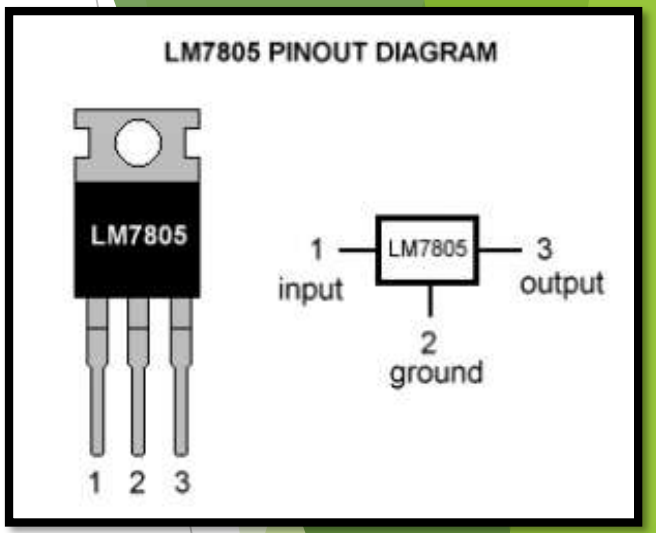
An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment

The IR sensor module consists mainly of the IR Transmitter and Receiver, Opamp, Variable Resistor (Trimmer pot), output LED



7805 VOLTAGE REGULATOR

- Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs.
- A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC).



RC522 RFID MODULE

- The RC522 is a 13.56MHz RFID module that is based on the MFRC522 controller from NXP semiconductors.
- The module can supports I2C, SPI and UART and normally is shipped with a RFID card and key fob.
- It is commonly used in attendance systems and other person/object identification applications.

PYTHON IDE

- Python is an interpreted, high-level and general-purpose programming language.
- Python's design philosophy emphasizes code readability with its notable use of significant whitespace.
- Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

IOT CLOUD PLATFORM

- IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware.
- These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network.
- They exploit integration with critical business systems (e.g., ordering systems, robotics, scheduling, and more) in the execution of related tasks.

ADVANTAGES

- Deployment of dustbin based on the actual needs.
- Real time information on the fill level of the dustbin.
- Cost Reduction and resource optimization.
- Improves Environment quality -Fewer smells -Cleaner cities
- Intelligent management of the services in the city.
- Effective usage of dustbins.

DISADVANTAGES

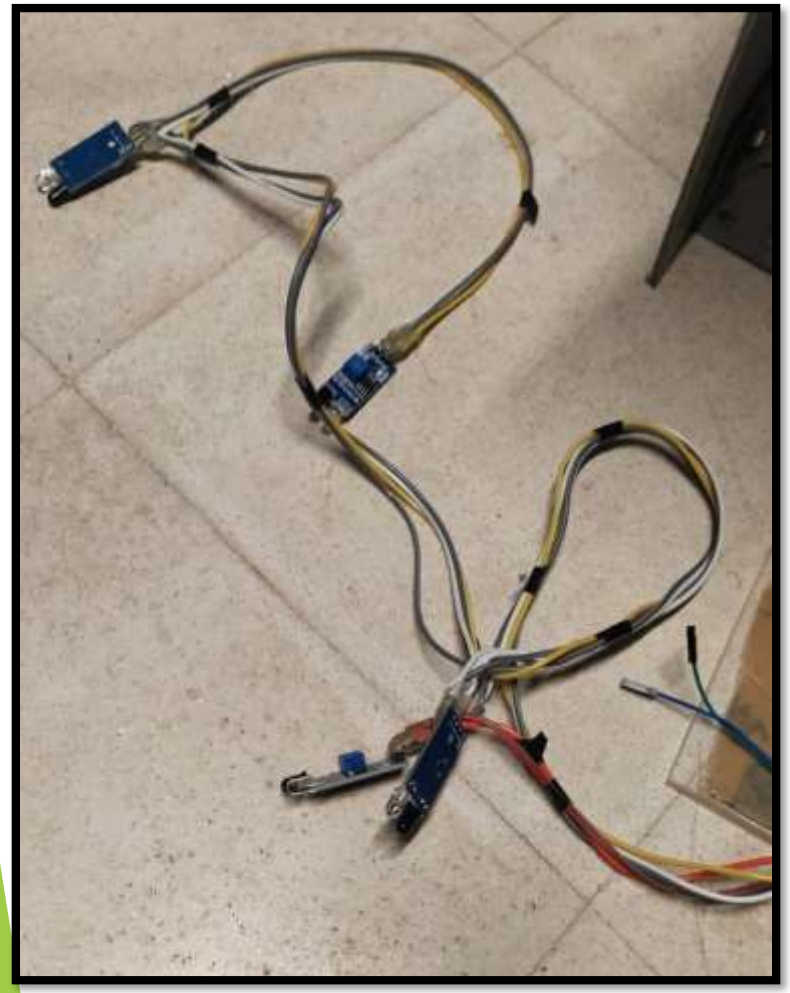
- System requires more number of waste bins for separate waste collection as per population in the city. This results into high initial cost due to expensive smart dustbins compare to other methods.
- Sensor nodes used in the dustbins have limited memory size.
- Wireless technologies used in the system such as Zigbee and Wi-fi have shorter range and lower data speed.
- In RFID based systems, RFID tags are affected by surrounding metal objects (if any).It reduces man power requirements which results into increase in unemployment for unskilled people.

APPLICATIONS

- This can be best used by municipal corporation for their betterment of management regarding collection of wastes.
- With the help of proper technology (GPS & SOFTWARE APPLICATIONS) we can guide the trucks to choose the shortest path.
- It also favors the “SMART CITY” project and “DIGITAL INDIA”.
- The ultimate goal of IoT applications in waste management is producing leaner operations and delivering higher quality services to citizens

RESULTS

Final Setup Working Model



IR Sensor to detect level of Bin

Control Panel of System

Ultrasonic Sensor to detect Presence of Waste

OUTCOME OF THE PROJECT

- The outcomes of this Project are an integrated system model for the useful collection of waste with the help of Deep Learning and IoT-based bins and to reduce the operational cost of the existing municipal system.
- The designed system is equipped with Infrared sensors to detect the level of waste inside the bins. The system consists of a conveyor where in the waste is placed or dropped first and this waste will be recognized by the Lobe Deep Learning Tool with the help of the camera and further the waste will be categorized based on the data and it will be move to the selected category by the help of the conveyor and will be dropped to the bin of same category with the help of the servo motor.
- The user with the matching RFID pass Card will be allowed to drop the waste other user will not be let to put in the waste into this system.

FUTURE SCOPE

- Integration of many bins each with unique id can be done by implementing principles of IOT.
- Many times garbage dustbin overflow and many animals like dog or rat enters inside or near the dustbin. This creates a bad scene. Also some birds are also trying to take out garbage from dustbin.
- Database can be created for each bin by using SQL technology.
- Automated system can be developed which is able to pick up waste in and around the bin, segregate them and put them in respective bins.

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And many more..,,

THANK YOU