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Waste Collecting Smart Robo

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Abstract: **Waste Collecting Smart Robo is a robotic vehicle designed to collect, detect and separate the waste into degradable and non-degradable . The collection of waste is done by rotating the fan placed in front of the vehicle which is controlled by a wiper motor. The movement of the vehicle is controlled by an android app. The detection of the waste is done using deep learning technology with the help of software Matlab with neural network as Alexnet. .The next step is the separation of the waste into degradable and non-degradable by using a conveyor belt after the detection of the object.**

Keywords - android app,Matlab,Alexnet.

I. INTRODUCTION

The serious issue world is facing today is in the field of solid waste management and its disposal. Garbage is the major problem not only in cities but also in rural areas of India. It is a major source of pollution. Indian cities alone generate more than 100 million tons of solid waste a year. In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste-management programme that would include household collection of segregated waste, recycling and composting. These directions have simply been ignored. No major city runs a comprehensive programme of the kind envisioned by the Supreme Court.
There are already different type of garbage collection robots which mainly aims at collecting garbage from full cans and dispose it designated area and Dust cart which is designed to navigate through urban areas avoiding static and dynamic obstacle and waste door to door. These robots which are in use have various disadvantages like high implementation cost, not user friendly and aims at only collecting filled dustbins but not on collecting mechanism, etc.
Also, Municipal solid waste workers, expose too many work related health hazards and safety risks, like allergic and other diseases of the respiratory system. Health impacts could also cause musculoskeletal, gastro intestinal and infectious diseases as well as injuries caused by work-related accidents.
Waste Collecting Smart Robo is a robotic vehicle designed to collect, detect and separate the waste into degradable and

The robotic vehicle reduces the human intervention in waste management.
The collection of waste is done by rotating the fan placed in front of the vehicle which is controlled by a wiper motor.
The movement of the vehicle is controlled by android app. The detection part is done using deep learning technology using the software Matlab with neural network as Alexnet. Alexnet is a huge database having large number of combination of different object images. The next step is the separation by using a conveyor belt after the detection of the object. As a future development the vehicle can be used for recycling of the waste also. Thus it reduces the human intervention to a particular limit.

2. LITERATURE SURVEY

In India, degradable and non-degradable wastes in streets are separated by humans. Hence humans are facing lot of communicable diseases. Android mobile with apk file is used to detect the degradable (vegetables) and non degradable (plastic cover) objects and it will send that information to the micro controller unit via Bluetooth module [1]. When micro controller unit receives 1,from the blue tooth it will find the non-degradable object and it will take and put it on to the separate box. Similarly when it receives 0, means robotic arm will find the degradable objects and it will take and put it on to the separate box. It is developed using Eclipse android app development software [1].
Up till now, research has been carried out by developing a Software Applications for indicating dustbin status, another by Shortest path method for garbage collecting vehicles by integrating RFID, GSM, GIS system; but no any active efforts has been taken paying attention towards managing such waste in atomized way[2].
There SLAM technology for way finding and 3-D object recognition using GMM-PC which can be for the robotic vehicle [3].but, it's an expensive method of approach.

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Efficient detection is achieved using the Faster RCNN (FRCNN) framework. The first approach is to pose a multi-class task where each detection is its own class to be detected, referred to as multi class-FRCNN. The second approach poses the task as two parallel layers (Parallel-FRCNN): one layer to perform detection; and a second to estimate identification. The FRCNN is a region proposal network which also outputs scores which represent the presence of desired object(s) or a background class. The network is constructed with multiple convolutional layers and final is used with fully connected layers to aggregate the filter scores. They fine-tune a version of the FRCNN network implemented in Tensor Flow1 based on the VGG-16 architecture for both proposals, the initial weights for this network are based on ImageNet22.[4]

3. SYSTEM OVERVIEW

WASTE COLLECTING SMART ROBO

The project provides an efficient and simple method for waste collection and separation. A simplest image processing technique with deep learning is used as the technology. The robotic vehicle will collect all the waste, then it will separate with the help of conveyor belt. The project consists of mainly three parts. The robot will move front, back, left and right with help of remote control fig 1. Hence the human can control the motion of robot accordingly to the amount of waste. The main controller used here is Arduino UNO.

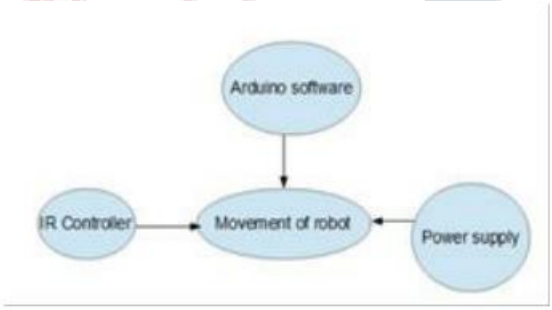

Fig 1: Movement of robotic vehicle

The waste collection is done by the rotating fan which is fixed at front of the vehicle. The fan is rotating with the help of wiper motor which have two gear system. So the speed of collection of waste can be controlled by changing the gear. For the working of the wiper motor there used a UPS battery or SMPS is used as in fig 2.

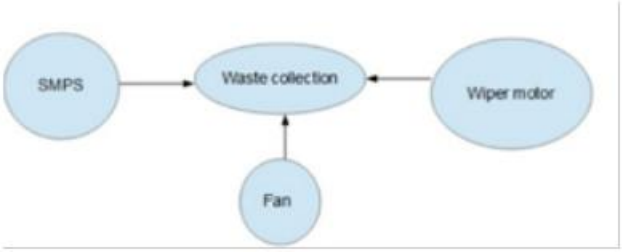

Fig 2: Collection of wastes

The waste separation is done by software called MATLAB. In MATLAB we used neural network as ALEXNET for making the database. ALEXNET have layers which can use as database. In the database, training of plastic and non plastic is done. With the help of the camera phone, the images of waste will be captured and then send to the MATLAB. The program in the MATLAB will say that whether the given image is plastic or non plastic.

In the next step,the detected object waste is planning to be separated.It is done using a conveyor belt and Node MCU. The output is degradable and non degradable waste. The output from the Node MCU is 3.3V and that voltage is used to work a relay .When the relay is ON the power supply-motor circuit will starts working . In front of the motor we have placed a rod to separate the waste.

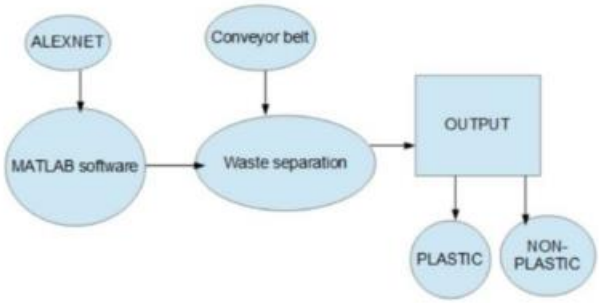

Fig 3: Detection and separation of the wastes

CODES

1.Transfer learning:- Fine-tuning a pre trained AlexNet network to classify a new collection of images. It is much faster and easier than training a new network . The code in used in AlexNet for training of images is as shown in fig 4

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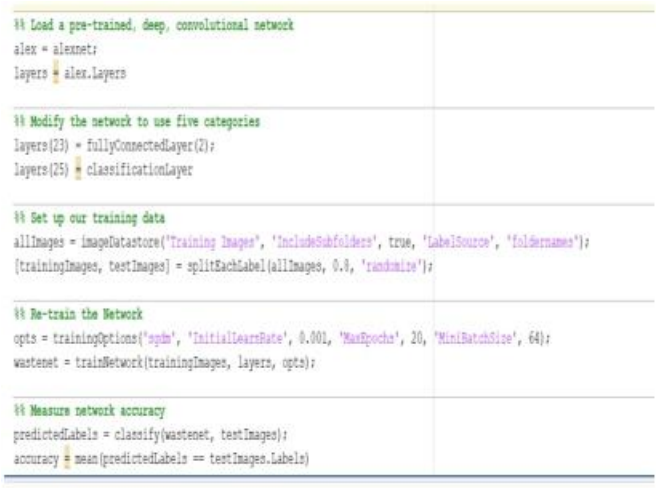

Fig 4: Codes used for training of images

2. Initialization of camera:- The camera need to be initialized for capturing of the image. The code used is shown in fig 5

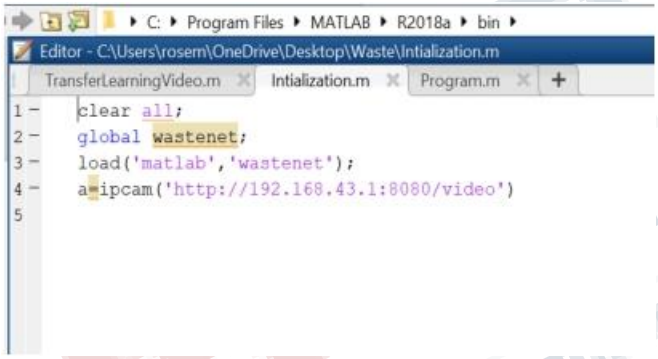

Fig 5: Codes used for initialization of camera

3.Detection :-The code use for detection of plastic and non plastic wastes is as shown below in fig 6

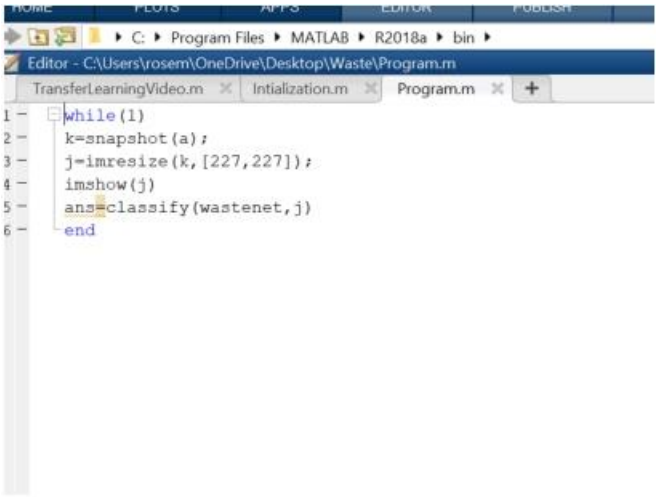

Fig 6: Code used for detection of plastic and non plastic waste

CONCLUSION

By implementing image processing using deep learning technology in Matlab and Alex Net as the neural network, a simple microcontroller can perform better image processing effectively. We have designed a robotic vehicle for collection, detection and separation of waste into degradable and non degradable so as to limit the human interaction in direct contact with the solid wastes.

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