Development of Recyclable Waste Plastic Bottles Management And Automatic Money Credit System Using Machine Learning Algorithm

Mrs. C.Thamilarasi[1], Ms.S.Brundha[2]
[1, 2] Dept of Embedded System
[1, 2] PSV college of Engineering and Technology

Abstract- *Plastic bottle waste downside is one amongst the foremost severe environmental problems. different problems that have received intensive public attention are the haze and air emissions. These phylogenesis sources are generated from indiscriminate merchandising of toxicant and unsafe wastes, that has raised the sensitive problems each in terms of amount and quality. it's identified that the technological advancements are increasing at a quicker pace. however, the use of technologies in varied sectors is incredibly low. it's identified that there are not any correct measures for waste disposal. Since the employment of plastics is continually increasing in our everyday life, there's no correct waste disposal for plastics. So, we have a tendency to propose a system wherever the plastics are detected victimization machine learning primarily based video process technique and it method by checking whether or not the placed item is plastic bottle or not. The plastic is then mechanically collected victimization bin mechanism. This at the same time checks the user information with the unbroken NFC tag of user. This NFC tag helps to urge the user details and cash are going to be attributable to account coupled with user given that placed item is plastic and betting on the burden of the plastic bottle waste, the corresponding worth of quantity are going to be attributable and displayed. This machine-controlled cash crediting technique creates associate awareness among public on plastic disposal and motivates them to dispose plastics solely in dustbins which can be useful in effective disposal of plastics and to avoid accumulation of plastics publicly places. This promotes the digital India because the cash is attributable on to account of the user.*

I. INTRODUCTION

Plastic merchandise became AN integral a part of our way of life as a results of that the compound is created at a colossal scale worldwide. On a median, production of plastic globally crosses one hundred fifty Million tonnes each year. Its broad vary of application is in packaging films, wrapping materials, looking and garbage baggage, fluid containers, clothing, toys, menage and industrial merchandise, and building materials. it's calculable that roughly seventieth of plastic packaging merchandise square measure born-again into plastic waste during a short span. roughly nine.4 million TPA plastic waste is generated within the country, that amounts to twenty six,000 TPD. This, regarding hr is recycled, most of it by the informal sector. whereas the usage rate in India is significantly more than the worldwide average of two hundredth, there's still over nine,400 tonnes of plastic waste that is either land crammed or finally ends up polluting streams or groundwater resources. whereas some types of plastic don't decompose in the least, others may take up to 450 years to interrupt down. The Plastics aren't inherently unhealthy, and that they have several redeeming ecological options. several of the techniques we have a tendency to utilize in our styles involve targeted use of plastic merchandise. Their sturdiness and low maintenance cut back material replacement, their lightweight weight reduces shipping energy, their formulation into glue merchandise permits for the creation of built lumber and sheet merchandise from recycled wood, and their formulation into superior insulation and sealer merchandise improves the energy performance of our structures. Once plastic is discarded once its utility is over, it's called plastic waste. it's a undeniable fact that plastic wastes ne'er degrades, and stay on landscape for many years. Mostly, plastic waste is useful however recycled merchandise square measure a lot of harmful to the atmosphere as this contains additives and colours. The usage of a virgin plastic material may be done 2-3 times solely, as a result of once each usage, the plastic material deteriorates because of thermal pressure and its lifetime is reduced. thence usage isn't a secure and permanent resolution for plastic waste disposal. it's been ascertained that disposal of plastic waste may be a serious concern because of improper assortment and segregation system.

OBJECTIVE

- To motivate people to dump plastic garbage.
- To increase the implementation rate of the effective plastic waste management.

- To create awareness among the people about the plastic waste disposal.
- To eliminate the harmful effects that happens due to the accumulation of plastic wastes in several areas.
- To avoid dangerous effects of global warming due to improper plastic disposal.
- To create clean environment by implementing efficient technologies at place.

II. LITERATURE REVIEW

[1]An ultrasonic sensor is used in in this work to detect the amount if waste in the dustbin, and the presence of obstacle is detected using the IR sensor. Once the dustbin is full, the same is communicated to the concerned authorities through the GSM module. If you have multiple Trashes in the same location, the second Trash can only be used when the first Trash is full. Otherwise, the second trash can will not be available.[7]

[2]In this work, photoelectric sensor is used to detect what kind of waste is dropped in the trash can. Individual users are identified with the help of RFID tags. This will send an SMS to the user with information about the type of waste the user has passed. Information about the amount of debris in the recycle bin is sent to the control system via a weight sensor.[3]

[3]The microcontroller sends the data related to the level of waste in that dustbin to the Municipality office. The same data is conveyed by the Municipality to the Truck driver. Hence the dustbins that need to be emptied are identified. The route is thus optimized saving fuel and money.[5]

[4]Data can be acquired in real time with the latest traceability devices such as volume sensors, identification system RFID (Radio Frequency Identification), GPRS (General Packet Radio Service), and GPS (Global Positioning System) technology. This is the basis for implementing an efficient and innovative waste collection and routing model.[2]

III. EXISTING SYSTEM

- This existing method uses RFID (Radio Frequency and Identification) Technology which is used to detect plastics using an image processing technique.
- The system consists of an image processing technique to detect the plastic and other wastes.
- Now the MATLAB provides the info to the controller.
- The controller now uses the load cell sensor to check the weight of the plastic.
- The values area unit compared and therefore the revered cash is attributable to the user
- Users are distinguished using RFID technology.
- Based on this the money is credited to that user.
- The standing is displayed on the liquid crystal display screen.
- Now the dustbin mechanism is operated to dump plastics.

DISADVANTAGES

- This system credits the money right after it detects the waste as plastic waste but before the plastic waste is dumped, so there is a chance for a person to not dump the waste after receiving the money.
- Then the person can use the same plastic waste to get money again.
- This would fail to serve the purpose of the system i.e., dumping plastic waste.

IV. PROPOSED SYSTEM

- This system uses convolution neural network algorithm to detect the waste as plastic bottle in real time.
- An image is taken and divides it into a grid cell. The image splits into grids of matrices. It will divide the image into any number of grids, and resizing looking on the complexity of the image.
- When an image is split, image classification and localization is performed on each grid cell. The noise is removed by using weiner filter and bottle shape & size is detected by the morphological process.
- The convolution neural network algorithm uses which detect the objects plastic bottle by comparing with dataset.
- Now performing a key point extraction for matching the key points in the object after that the detected object image marked with boundary boxes.
- After that the plastic detected the hardware part will be activated by receiving the signal from serial signal communication.
- It uses NFC (NEAR FIELD COMMUNICATION) Technology to detect the person's presence and also to know the identity of the person.
- If the waste appears to be plastic, the garbage can will open and the waste will be disposed of after a load-proofing process.
- After the dumping of waste, the person will be credited money according to the weight of the dumped waste using the account details of the person which is being fetched by the use of NFC reader details that he/she is wearing.

ADVANTAGES

- The shortcomings of existing systems are overcome by this system.
- This system can detect any type of plastic waste as it doesn't use only the trained images as reference for comparison but it uses tenser flow database for reference. It uses video processing instead of image processing technique.
- Since it credits money only after the dumping of waste, there is no chance for any cheating like not dumping the waste after getting the money as in existing method.

SYSTEM FUNCTION

BLOCK DIAGRAM

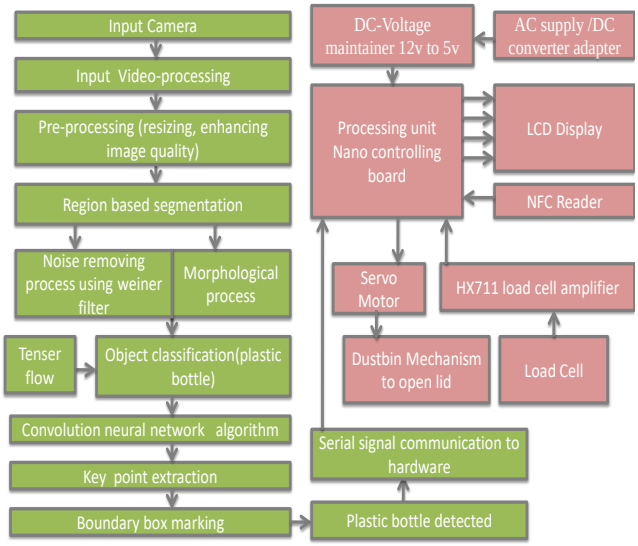

Fig. No 1: Block diagram

CIRCUIT DIAGRAM

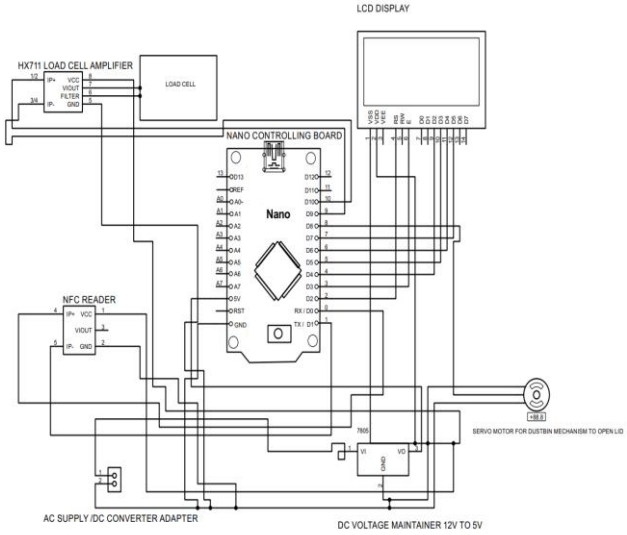

Fig no: 2 Circuit diagram

CIRCUIT DESCRIPTION

- The above circuit consist the core components of Nano controller, LCD display, power supply, voltage maintainer, servo motor ,HX711 load cell.
- The Nano controller is heart of the circuit.it controls the whole circuit.
- The 12v supply is converting to 5v with the help of DC voltage maintainer. Then the 5v supply is given to controller board.
- LCD Display is connected to controller digital pins like d2,d3,d4,d5,d6,d7 respectively.VSS is connected to ground, VDD is connected to 5v.
- Servo motor has three pins VCC pin is connected to 5v supply. GND pin is connected ground. Data is connected to controller digital pin.
- Load cell is connected to HX711 load cell amplifier. In HX711 load cell VCC pin is connected to 5v supply, GND is connected to ground. Data pins are connected to controller digital pin.
- NFC reader is connected to controller TX and RX pin. VCC is connected to 5v and GND pin is connected to ground.

CONVOLUTIONAL NEURAL NETWAORK CNNALGORITHM

In machine learning, a convolutional neural network (CNN/ConvNet) is a class of deep neural networks, most commonly applied to analyze visual imagery. Now when we think of a neural network we think of a matrix duplication but not so with ConvNet. It uses a special method called Convolution.

Now in mathematics convolution is mathematical operation in two tasks that produce a third function that shows how the shape of one is fixed by another.

Neural networks have made the work very simple. Fast CNN all models have shared a crucial role within the field of computer vision. This project focuses in classification and detection area from single class objects to multi class objects. Convolutional neural network of object discovery in real time.

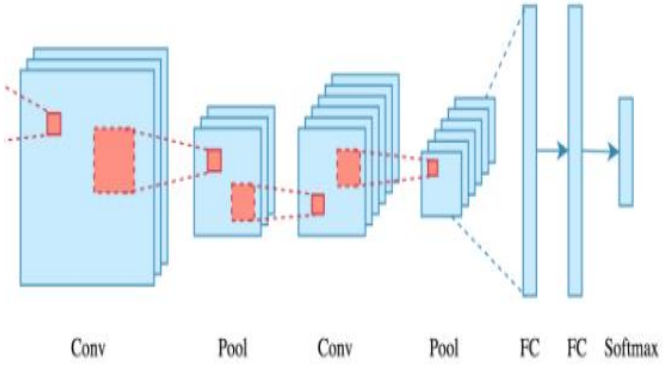

Fig no:5.1 convolutional neural network)CNN(

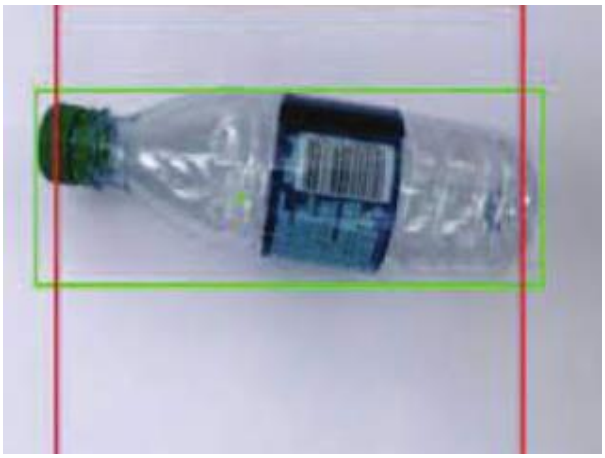

Fig no:5.2 Object 1 plastic bottle detected

MORPHOLOGICAL OPERATION

Morphological modification is a process based on image formation. Two important morphological functions are erosion and elasticity. Working with these methods helps to analyze data to visualize holes in a particular area.

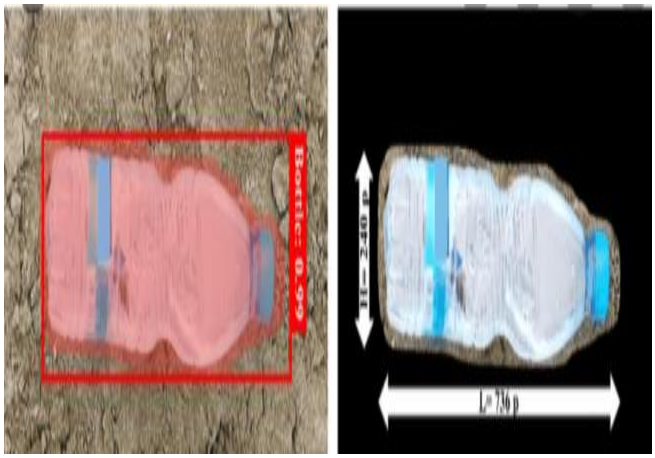

Fig no:5.5 Morphological process

KEY POINT EXTRACTIONS

Once key points have been identified, they should be filtered to obtain more accurate results. DoG has a high edge response, so the edges also need to be removed. In this case, a concept similar to the Harris Detector is used. They used a 2x2 Hessian matrix (H) to calculate the main curve. We know from the Harris Detector that in the end, one Eigen number is greater than the other. So here they use a simple task. If this value is greater than the threshold, called edge Threshold in OpenCV, that key point is discarded. So it eliminates any low-contrast key points and edge key points and what remains is strong interest points.

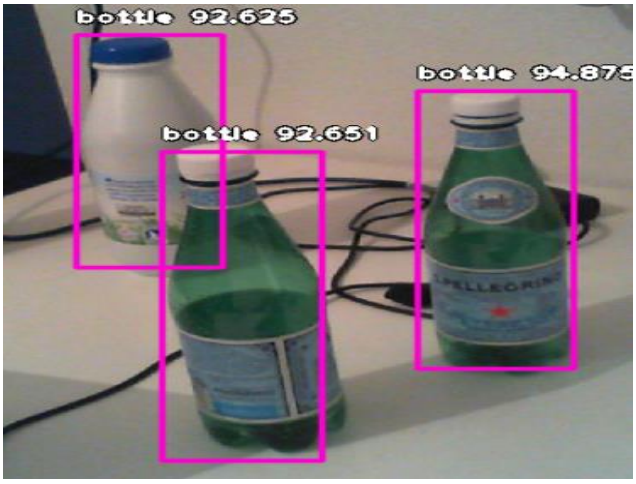

Fig no:5.6 key point extractions

VI. HARDWARE REQUIREMENTS

NANO MICROCONTROLLER

The Nano board is meant in such how that it's simple for beginners to urge started with microcontrollers. This board

is particularly} compatible with bread board it's very simple to manage the association. Let's begin by empowering the Board.

Features of Nano

- It has twenty-two input/output pins in total.
- 14 of those pins area unit digital pins.
- Nano has eight analogue pins.
- It has half dozen PWM pins among the digital pins.
- It contains a quartz oscillator of 16MHz.
- Its in operation voltage varies from 5V to 12V.
- It conjointly supports other ways of communication, which are: o Serial Protocol. o I2C Protocol. o SPI Protocol.
- It conjointly contains a mini–USB Pin that is employed to transfer code.
- It conjointly contains a push button thereon.

Fig no:5 Nanomicrocontroller

LCD DISPLAY

Liquid crystal show (LCD) may be a flat panel show, electronic visual show, or computer screen that uses liquid modeling options of liquid crystals. Liquid crystals don't emit light-weight directly. LCDs area unit out there to show inappropriate pictures (such as during a commonplace purpose pc display) or static pictures that may be displayed or hidden, like pre-set names, digits, and 7-dimensional displays like a digital clock. They use a similar basic technology, except that the photographs mustn't be created with an oversized variety of little pixels, whereas alternative displays have larger options. LCDs area unit utilized in a spread of applications as well as pc monitors, televisions, metal panels, craft cockpit displays, and aggregation. they're common on client devices like video players, toys, clocks, clocks, counters, and telephones, and have replaced electron beam tube (CRT) displays in several applications. they're out there for a wider screen size than CRT and plasma displays, and since they are doing not use phosphors, they're less sensitive to image heat. LCDs, however, area unit in danger of image persistence. The alphanumeric display screen is further energy economical and could be disposed of further safely than a CRT. Its low electric power consumption permits it to be used in high-powered instrumentality. it's academic degree electronically modulated device created of any kind of segments filled with liquid crystals and clothed before a light-weight source(backlight) or reflector to produce photos in color or monochrome. Liquid crystals were initial discovered in 1888.

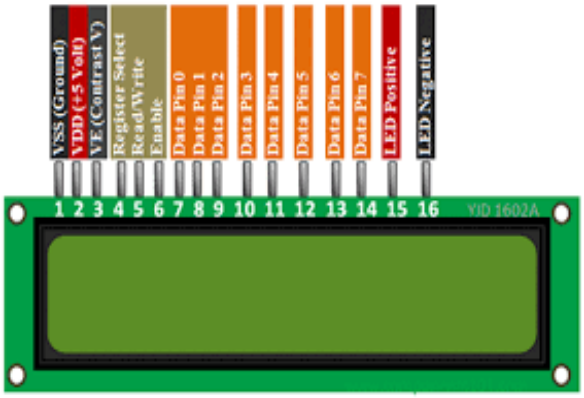

Fig no: 6 LCD display

NFC READER AND TAG

NFC reader is that the use of a wireless non-contact system that uses radio-frequency magnetic force fields to transfer information from a tag connected to AN object, for the needs of automatic identification and pursuit.

FEATURES

- Output- TTL or Wigand26
- Plug-and-Play, needs +5V to become a reader
- Buzzer indicates tag reading operation
- Compact size and efficient

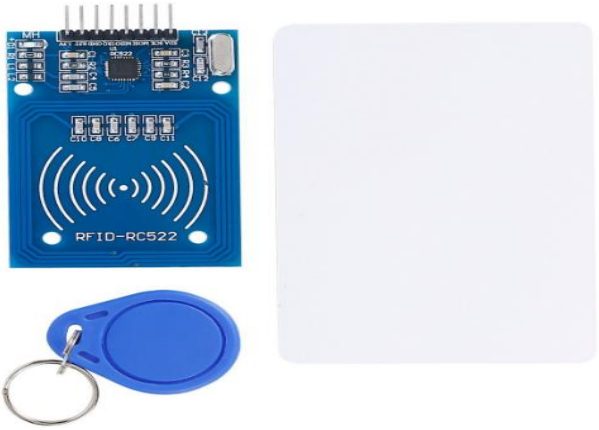

Fig no: NFC reader and tag

LOAD CELL

Load cells square {measure} usually accustomed measure weight in AN industrial atmosphere. they will be fitted with hoppers, reactors ... etc ... to regulate their weight, that is commonly important within the process. alternative purposeful options of the load cells should be outlined and given to make sure that they're going to meet the expected service. Among those style characteristics are:

• Combined error
• Minimum verification interval
• Resolution

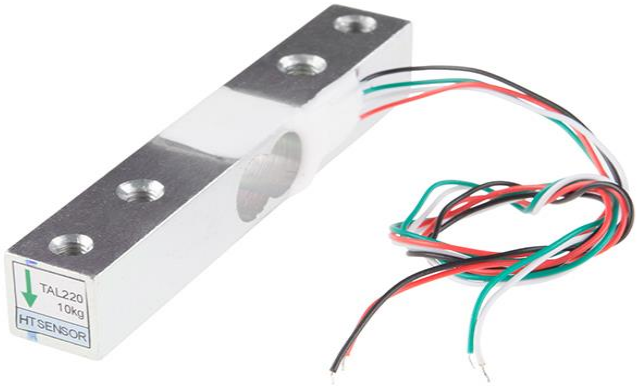

Fig no: load cell

SERVO MOTOR

A servo motor is also a sort of motor which can rotate with nice preciseness. usually this type of motor consists of a bearing circuit that offers feedback on this position of the motor shaft, this feedback permits the servo motors to rotate with nice preciseness. If you'd wish to rotate AN object at some specific angles or distance, then you utilize a servo motor. it's merely created from a simple motor that runs through a servo mechanism

.

Fig. no: servo motor

VII. RESULTS

Implementing this project using machine learning based plastic bottle detection system. we are developing the software part, the plastic bottle detection by using convolutional neural network algorithm. Here the bottle images are collected and stored in database, and dataset are trained using tensor flow training model. The software used as Thonny, the coding is developed in python languages. we want to develop the hardware part. Hardware part for if the plastic bottle is detected in software the serial signal will be transferred to Nano controller board with the help of serial communication. After receiving the signal, the dustbin will be open and weighting the bottle after that the money will be credited to that person account. NFC reader will be used for identity of person account details.

The output screenshots are given below.

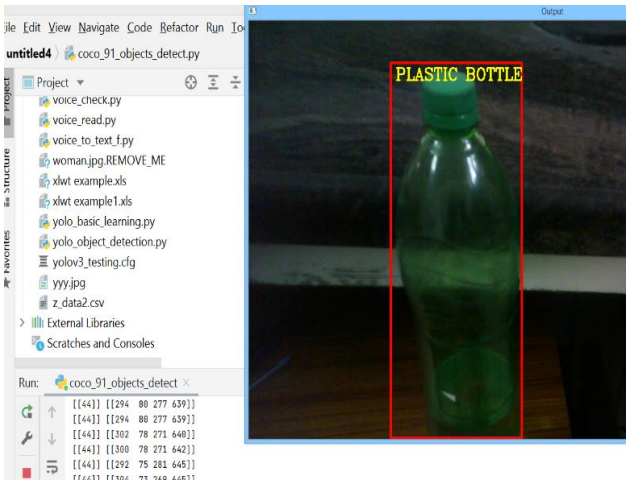

Fig no: 8.1 plastic bottle detected output image 1

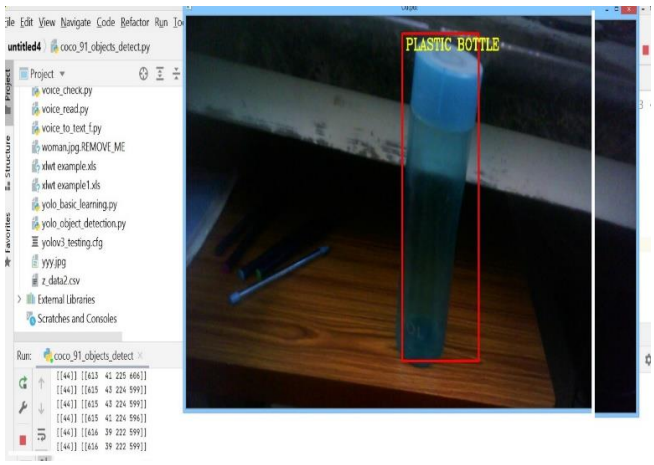

Fig no: 8.2 plastic bottle detected output image 2

VIII. CONCLUSION

If we want machines to revolutionize the waste industry, we need to teach them to see. This study found that

convolutional neural algorithm is well on track to do just that. This automated money crediting technique creates an awareness among public on plastic disposal and motivates them to dispose plastics only in dustbins which will be helpful in effective disposal of plastics and to avoid accumulation of plastics in public places. Indeed, the proof of concept machine learning developed in this research successfully detected the plastic items by material type (plastic bottle) with up to 98% accuracy. Hence to implement it, the system works with a huge data set, pattern predictions for object detection and training algorithms. Further work includes optimization of the results and prediction accuracies for various discrete inputs in real- time. Thus, this approach, aids in reducing pollution levels and in the long run focuses on the development of universal plastic waste segregation framework. Thus, work is an important asset to society.

REFERENCES

[1] Alexey Medvedev; Petr Fed Chekov; ArkadyZaslavsky Waste management as an IoT enabled service in smart cities Conference paper Aug-2018

[2] SonuDhanasatyamanikanta; M.Narayanan Smart garbage monitoring system using sensors with RFID over IoT Journal of Advanced research in dynamical and control system Vol 9,SP-6/2017

[3] S.A. Mahajan; AksheyKokaney; ApporvaShewala;MurunyaShinde; Smart waste management system using IoT International conference of advanced engineering research and science (IJAERS) Vol-4,Issue-4,Apr2017

[4] Santhosh Kumar B R;VaralakshmiN;Soundarya S Lokeswari;Rohitk; Manjunath; Sahana D N Eco friendly IoT based waste segregation and management 2017 international conference on electrical,electronics, communication, computer and optimization techniques(ICEECCOT)

[5] Sahilmirchandani; sagarwadhwa; preetiwadhawa;Richard joseph IoT enabled dustbins 2017 international conference on Big Data, IoT and Data Science(BID)

[6] AayushTripathi; chinmayPandey; AnkurNarwad; Deva shisnegi Cloud based smart dustbin system for metro station IEEE 2018

[7] SharaddhaZavaare;RashmiParashore;Shivanipatil;poojarathod;Vanithababanne Smart city waste management system using GSM International Journal of computer science trends and technology(ICST) Vol-5, Issue 3,may-Jun 2017 .

[8] Aref, M. M., &Mattila, J. (2018). ―Deep Learning of Robotic Manipulator Structures by Convolutional Neural Network‖ Ninth International Conference on Intelligent Control and Information Processing (ICICIP).

[9] Qiurui Wang , Chun Yuan , and Yan Liu , (2019) ―Learning Conventional Neural Network for Image Segmentation‖ , IEEE Transactions On Multimedia, Vol. 21, No. 7

[10] Takuya Kiyokawa , Keita Tomochika, Jun Takamatsu , And Tsukasa Ogasawara , (2019) ―Fully Automated Annotation With Noise-masked Visual Markers For Deep-learning-based Object Detection‖, IEEE Robotics And Automation Letters, VOL. 4, No. 2.