

SOCIAL ACKNOWLEDGMENT ON SMART GARBAGE DISPOSAL USING PYTHON AND CNN

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Abstract- Waste management is a challenge for modern world it impacts on environmental sustainability and on the level of quality perceived by citizens. In the recent years, several progresses have been made in this direction with the introduction in the city of door-to-door separate waste collection. The only way to achieve success is cooperation from citizens. The Transformation process in this sector will require more time other than a careful management of the data collection associated with the waste collection processes. At this point of period, the future of hardware and software technologies enabling the Internet of Things (IoT) will contribute significantly to accelerate the whole process.

Index Terms: Raspberry pi, IOT, Convolutional Neural Network.

I. INTRODUCTION

In cities waste management is a huge process. These cities produce the several tons of garbage in a day. It makes the waste segregation process too complex and takes lot of time. Large number of manpower and effort also requires segregating these waste items. Many cities cannot handle these much of garbage and dumping all together in waste dumping area. This causes various type of problems and pollution . In waste management process, segregation of waste is one of the important and complicated steps. If we segregate the waste into degradable such as paper and cardboard and non degradable such as glass and plastic it will be easy to process. We can recycle plastics and glass products and degradable items can be vanished. To make this easy one we should motivate the people to put garbage in respective container. Based on this they will get score and reward points[1]

In our proposed system, we designed a dust bin with IR sensor, camera and advanced microcontroller Raspberry pi. Dustbin labeled with QR code. User need to register their details into android app to get their credit. Before putting the garbage into container they should scan the QR code labeled on the dustbin, Fig[2]. This smart dustbin consists of separate holes to put degradable and non-degradable waste. Each hole consists of IR sensor to detect event. Camera triggered to capture the image of the garbage after the occurrence of event. Using CNN model we can identify the type of garbage and using detected IR sensor ID we can identify whether user

putting it on right container. If user put garbage in right container we will add the credit score in their database. With the help of pre-trained CNN model we can classify the garbage more accurately. Large set of images are pre-processed for training a CNN model[8].

In Data set, images are saved in separated folders as plastic, metal, glass and paper and each folder contains thousands of images. By using these data set CNN model will created and used for classification of garbage. Raspberry pi is a small and efficient microcontroller which can perform like a computer and able to do complex tasks as image processing, sensor handling, robot control, signal processing etc.



Fig 1: rocess of Machine Learning.

The smart city exploits the Information and Communication Technology (ICT) to integrate a plethora of physical devices connected to the network, the so-called Internet of Things (IoT), in form of optimizing the efficiency of city operations and services. From a technological point of view, the solutions that are nowadays available for designing and developing new smart systems are innumerable, mainly due to the exponential spread of devices connected to the Internet.

In this way the citizen would be more incentive to select the different types of materials in order to minimize the quantity of waste to be disposed and also contain the relative taxation. The proposed system consists of smart bins, such that each smart bin consists of fill out sensor and IoT unit. Such that the sensors detect the filling level of the trashbin and the IoT will send an alert of these reading to the cloud. In the control center Due to the growth of IoT technology, there is an increasing need and importance to design and implement waste management systems that attract and involve the citizens in the waste management process[4] by motivating them by providing rewards.



Fig 2: QR Scanning process



Fig 3: IOT Based Smart Dustbin

II. RELATEDWORK

A. SELF MOTIVATIONS AND SYSTEM REQUIREMENTS ANALYSIS

Due to its environmental impact, effective waste recycling is a more and more discussed topic from both research and industry fields. Despite door-to-door waste collection is spreading and the recycling is consequently increasing, some cost-effective technological improvements could motivate even more citizens to perform a correct and sustainable waste disposal[1]. For this reason, this work aims at designing and experimenting an innovative waste management system for door- to-door collection. The proposed system would make the process more efficient and would allow to gather useful data to support municipalities in increasing citizens' collaboration and their level of satisfaction The way to improve

- store information related to anomalies detected by the dustman (e.g., incorrect waste disposal) in order to stimulate interventions towards less store virtuous citizens;
- A summarized information is sent to different users (citizen, municipality, waste company, etc.);
- make available and reusable collected information as Open Data for the creation of additional services useful to improve the management of smart cities.

In regards to the component requirement the system requirements are

- Raspberry Pi
- USB camera
- IR sensor
- QR code and smart phone

These are the components used in the dustbin to make the things get worked and its an easy process. The software requirements are python, convolutional neural network for processing the data of the thrown garbage.

B. SYSTEM INTERACTION

The interaction between system components. Therefore, we will show the interaction performed between the user and the system as shown in Fig.5:- .

Raspberry pi:

Raspberry Pi is the low cost (35 dollar), credit card sized, computer and that will performs various applications. Some features of raspberry Pi include 1GB of RAM, 4 USB Ports, General Purpose Input Output pins, Linux support. These features of Raspberry Pi gives programmers and users a wide range for diverse applications. Raspberrypi contains linux oprating system based raspbian and it supports various operating system i.e.(Ubuntu Mate, Snappy Ubuntu Core, Windows 10 IOT Core, OSMC, LIBREELEC, PINET, RISC, Pidora). It is system-on-chip based multimedia processor which is heart of the Raspberrypi contains Broadcom Arm processor Bluetooth,

Infra Red sensor:

The Infra Red sendor is an IR LED (Light Emitting Diode) and the detector used in is an IR photodiode. Photodiode is sensitive to IR lights of an equivalent wavelength which is reflected by the IR LED. When the infra red light falls on the photodiode, the resistances and therefore the output voltages will get changed in their proportion to the

magnitude of the IR light which is received received.

In an infrared detection system there are five elements namely: a transmission medium, an infrared source, infrared detectors or receiver, optical component and signal processing. Infrared sources with particular wavelength is uses in IR lasers and Infrared LED's



Fig 3: Raspberry PI

C. CLOUD SERVER

The Firebase console is a Realtime Database is more like a category of cloud-Based NoSQL database server that lets you to store and synchronize between your data and your users in realtime server. The Realtime Database consists of one big JSON object that the developers can manage their application and runtime application in realtime process



Fig 4: Firebase services.

Realtime Database ==> A Tree of Values of the given data.

With a single API, the Firebase console database provides your the application with both the current values of that processed data and any updates to that respective data.

The Following methods can be used to authenticate your application's users:

- Email and password

- Phone number
- Google
- Facebook and Twitter

By using Firebase Authentication system it makes the building a secure authentication systems much easier and better experience in sign-in and clean user experience for end users. Firebase Authentication system was built by the people who created Google Sign-in methods.

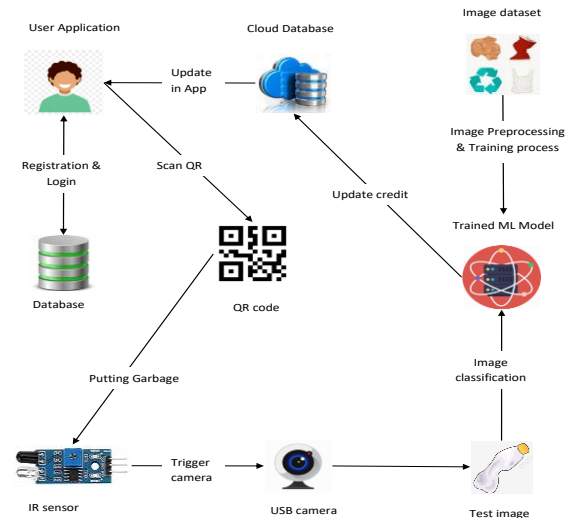


Fig 5: System Architecture

III. EXPERIMENTAL SETTING

A smart recycling bin is proposed by using system Raspberry Pi 3, a convolution neural network containing 34 pre-trained layers to perform waste classification management. The get data collected from the bin are transmitted using a network from a IR sensor node to the gateway. The system obtained a detection accuracy of 92.1% with an average processing time of 1.94 seconds. However, the system does not perform any form of waste segregation after waste classification management. Once the type of garbage disposal is identified successfully using Convolutional Neural Network(CNN), according to its property of plastics, glass, paper, trash or cardboard. If the user has thrown their respective waste is precise(if the user puts the plastic or glass in Non-Degradable hole that is given in the particular Non-Bio Degradable hole and throwing paper, bio waste, wood in Bio-Degradable hole) the user gets a grading point. Their ID are updated by either sign up or already existing by signing in and their data are stored in google server *Firebase console*. Once the user is successfully signed a Bar code scanner tab opens user are requested to scan the QR code. Once the user finish scanning the points updated in *Firebase console* is sent to their respective smart phone as pie chart activity. Once the point chart is completed a reward like coupon code gets unlocked.

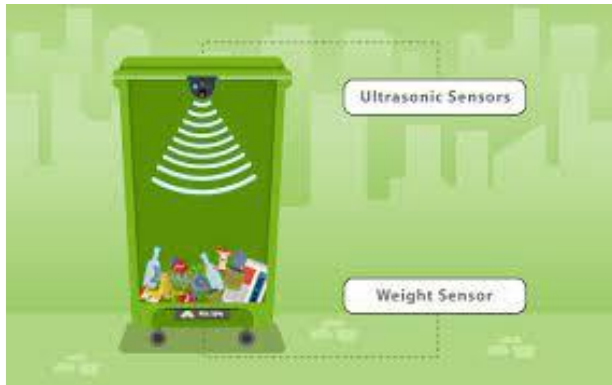


Fig 6: Experimental Setting

IV. FUTURE ENHANCEMENT

Securing the system of user's authentication system and atomic lock for garbage which would help in securing the garbage from any most of the damage or theft. Concept of reward points that would encourage the involvement of the residents or the end users making the idea successful and helping to achieve effective cooperation for a better waste management and hence fulfilling the idea of immaculate cities. Improving of IOT and sensors for the Server and complete cloud based application has more possibility of extending the system and adding other use cases and applications for a clean municipal and waste free cities. The problems for controlling foul odour smell and manual controlled of waste management are the future scope which includes the odour control mechanism is to get rid of foul smell of organic garbage. Also, realising the requirement of an autonomous smart dustbin, GPS module and ultrasonic sensor can be implemented for path planning combined with ultrasonic sensor(fig 6)

V. CONCLUSION

In this paper, we propose a solution to enhance waste collection efficiency using the Raspberry Pi and IR sensor. The presented system helps the user in correctly sorting and disposing wastes and in addition providing reward to user to motivate to use waste management efficiently. We propose a solution to enhance waste collection efficiency using the RFID technology. The presented system helps the user in correctly sorting and disposing wastes and in addition reward user by converting the weight into points. In summary the obtained results demonstrated that the proposed solution is capable of facing the problem of the waste management and improve differentiation be exploiting novel IoT-oriented, low cost and scalable architectures and devices

VI. REFERENCES

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