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Optimising of Solid Waste Management System using Graphical user Interface

S. Mathangi[1], Dr. S. Gavaskar[2]
Mphil Full-Time Scholar[1], Assistant Professor[2]
Department of Computer Applications,Bharathiar University, Coimbatore [1,2]

***Abstract*- In urban areas solid waste management is a very big challenge for developing countries. Municipal solid waste is the major problem which causes health problems and various diseases such as cholera, skin problem, typhoid, diarrhea and environmental hazards and diseases are caused by the presence of insects like flies and mosquitoes due to improper disposal of solid waste. Due to increase in populations and urbanizations solid waste is produced. One of the main issue in solid waste management is overflowing of waste and throwing waste in public areas. There are several kind of waste thrown in many areas such as organic waste, household waste, industrial waste. An ecological factor of solid waste management includes global warming and pollutions.**

The main objective of this project is to prevent overflowing of waste and throwing waste in public areas. The first objective is to identify the level of the bins. When the bin reaches its particular level and it is manually proceeded by giving the corresponding level. The second objective is to provide amount and it is calculated automatically based on the weight given by the user. The third objective is to segregate the waste type as wet waste and dry waste using image processing and classification using machine learning algorithm.

Keywords : Solid waste management, Municipal Corporation, GUI, Image Processing.

1. INTRODUCTION

The internet presents a unique inter connected system which enables devices to communicate globally using set of standard protocols and connecting various heterogeneous networks like academic, business, governments etc. In the beginning, the internet was represented by static web sites and email communication. Different forms of internet implementation could be seen everywhere around us, part of many different aspects of our lives providing plenty of service and application, and trying to meet each user's needs no matter time and place. The main secret is hidden behind the digitalization of the users and all of the user friendly and automated mechanisms. The demand of using internet technologies reflects respectively into our user's entire device in one way or another, and they have become mobile and closer to the users than ever. A computer network consists of two or more connected computers. This connection is twofold: (a) physical, through wires, cables, and wireless media (the atmosphere with, say, cell phones), and (b) logical, through the transport of data across the physical media. Solid Waste Management in developing countries like India, is a challenging task for achieving a healthy environment in cities and municipalities. The activities involved in Municipal solid waste management include the collection, transportation and final disposal of the collected solid waste. The solid waste policy in India specifies the duties and responsibilities for hygienic waste management for cities and citizens of India. This policy was framed in September 2000, based on the March 1999 Report of the Committee for Solid Waste Management in Class1 cities of India to the Supreme Court, which urged statutory bodies to comply with the report's suggestions and recommendations. These are also serving as a guide on how to comply with the Municipal Solid Waste (MSW) rules. Today, india is one of the places in the world where most garbage is disposed. Indian landfills contain dangerous materials, including plastics and chemicals. Both the report and the rules, are based on the principle that the best way to keep streets clean is not to dirty them in the first place. So a city with street bins will ultimately become clean and stay clean. The decrease Solid Waste Management in developing countries like India, is a challenging task for achieving a healthy environment in cities and municipalities. The activities involved in Municipal solid waste management include the collection, transportation and final disposal of the collected solid waste. The solid waste policy in India specifies the duties and responsibilities for hygienic waste management for cities in cost of old bottles has created waste disposal problem in Kerala, India. This is not only because composting is a cost-effective process practiced since old times, but also because India's soils need organic manures to prevent loss of fertility through unbalanced use of chemical fertilizers.

By 2025 , the waste management market size in India is projected to be worth ~USD 14 Billion with an annual growth hovering around 7 percent. Considering the current urban trends, it is not at all surprising to mention that the MSW quantum in India can see an increase of double the existing volumes by ten years down the line. In fact, it is projected to hover around 80-85 MTs by 2030, offering a business case of approximately USD 20 Billion. Growing economy, soaring urban population, rising living standards and increasing consumption levels – is what trending in the emerging economies across the globe . With India flourishing on the same grounds, an increase in the purchasing power parity has led to more affordability, accessibility to resource use and a rapid surge in the waste volumes as well.

2.LITERATURE SURVEY

Networking is an essential part in encompassing environmental things to the network and made simple to get to those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. Normally, people are facing problems on solid

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waste management. In this research,we have analyzed some of the existing works on solid waste management. The works are categorized as segregating of waste such as wet waste and dry waste, giving level of the bin and providing amount. The action or process of interacting with others to exchange information and develop professional or social contacts. The linking of computers to allow them to operate interactively. It connects as or operates with a network. Interact with others to exchange information and develop professional or social contacts. Computer networks also differ in their design approach. The two basic forms of network design are called client/server and peer-to-peer. Client-server networks feature centralized server computers that store email, Web pages, files and or applications accessed by client computers and other client devices. On a peer-to-peer network, conversely, all devices tend to support the same functions. Client-server networks are much more common in business and peer-to-peer networks more common in homes.

[1] S. R. Jino Ramson et Al. (2018) proposed a variety of technologies provided solution for innumerable problems. Solid waste management is the method of collecting, transporting, processing or dumping, managing and monitoring the waste materials. Radio Frequency Identification (RFID) and Wireless Sensor Networks (WSNs) plays a vital role in the field of solid waste management. A small number of RFID and WSNs based solid waste bin level monitoring systems have been deployed to handle solid wastes. This article presents the review of various bin level monitoring systems with the insight for advanced researches in the field of waste management.**[2] K. Al-Jubori et al.** (2018) reviewed a Collecting, transport, disposal, and managing Municipal Solid Waste (MSW) within urban context is a challenge worldwide. It directly impacts; environmental, health and economic aspects of modern and smart urban cities. MSW transport is the most expensive item in MSW management and in some cases might take up most of the municipalities' budget. This paper is aimed at developing a framework that can be utilized in planning and determining the optimum MSW transportation route. Samples from developed, developing and under developed countries were studied thoroughly. Selecting the optimal route depends on a whole array of information that include; cost, time, environment, etc. The proposed framework provides the advantage of both static and dynamic routing models. ArcGIS network analysis and multi-level criteria are used to locate the optimum route. From the review of the previous literature, it is expected that the proposed framework would yield an acceptable semi optimum route comparable to other commonly used algorithms such as ant-colony organization (ACO), genetic algorithm, backtracking search algorithm, or mix-integer programming. It is expected that the proposed framework, when developed and implemented, will help create a smart MSW management system.

2.1 REVIEWS ON SOLID WASTE MANAGEMENT SYSTEM

[1] Ruhin Mary Sajiet et al. (2016) describes a survey based on Smart Garbage Management using sensor. This system also involves different smart garbage management ideas that can be simply implemented and it uses sensors, microcontrollers and GSM module are used to assure the cleaning of garbage bins when the garbage bin level reaches its limit. The proper action will be process if the garbage bin is not cleaned in specific time and then the record is send to the higher authorities and take actions against the contractor. This process also helps to identify the fake reports and can reduce the corruption in this management. This reduces the overall expenditure which is associated with the waste collection. Sensors used here will show the different levels of garbage in the garbage bins and when the threshold level gets crossed the weight sensors gets activated to send its particular output. This process are performed for collecting the details of smart waste management to identify effective way which will be useful for providing sanitation. This survey will be helpful in identifying all possible smart waste management methods that can be implemented to make city clean.

[2] Norfadzlia MohdYusof et al. (2016) proposed the development of smart waste bin management system to measure the level of waste generated in the garbage bin and if it reaches the particular destination an alert message is send to the municipality. In proposed system, ultrasonic sensor are used to measure the level of waste produced, GSM module are used to send message to the particular location, Arduino Uno are used to control the system operation. When the bins are filled and almost filled an alert message and warning will be sending to the municipality. The height or the level of the waste bin can be measured by using ultrasonic sensor and by the process of Arduino Uno information is received, it will determine whether the garbage level has been surpassing the threshold level, there are two threshold levels sets: the first threshold is at 70% of the bin height, and the second threshold is set at 90% of the bin height. If the garbage level in the bin is crossing the first threshold level, then the first warning message is generated and sent to the municipality. Besides, the green LEDs will be turned ON in order to alert all the residents at every floor Next, if the garbage level in the bin is crossing the second threshold level, then the second warning message is generated and sent to the municipality. In this case, all the residents will be alerted when the red LEDs are turned ON. **[3] Anitha A et al.** (2017) proposed an immediate cleaning of waste bins. As dustbin is considered as a basic need to maintain the level of cleanliness in the city, so it is very important to clean the and it is placed at the top of the bin which will be helpful in sending the information to the corporation office that the level of the garbage bin reaches its maximum level. As soon as possible the garbage bin should be emptied. By using this process minimum number of smart bins can be used for the whole city.

[3] Dr.Vinayak Bharadi et al. (2017) proposed a framework to collect garbage in cities in smarter way. Each bin is fitted with sensors which are used to receive a command based on the garbage level and according to

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this the priority level is provided. The garbage truck will first reaches the place where the bin is filled depending on the filled level of garbage bins the garbage truck are visited to save time and power. **[4] Kanubhai K. Patel et al.** (2017) developed smart waste bin and solution for effective waste monitoring and management using arduino hardware and the level of the garbage bins are continuously monitored through sensors.LED panel used for displaying the status of the bin whether the level is high, low and more than middle. Developed smart waste bins and system have initially installed in the campus-sized area.

[5] S. Vinoth Kumar et al. (2017) offers an IOT based smart waste clean management system to check the level of waste in the dustbins using sensors. Through GSM/GPRS system altered to concern authorized if detected immediately. Microcontroller used as an interface between the GPRS/GSM and sensor. Android application is to develop and monitor the information related to various level of waste in different location. Android application is developed to find the various level of waste in different locations. **[6] Dung D. VU et al.** (2017) provides a new method of smart waste city management to
make the city clean and at the same time with low cost. They have used sensor models which are used to measure and detect the data and transmit the data via internet. The data collection includes the trash bin's serial number and go location i.e. to identify a person or device by means
of digital information processed via the Internet. This is preceded using some of the technique such as classification, graph theory and regression. These methods are managed efficiently by predicting the status of waste, location of the trash bin is classified and the amount of waste is monitored. **[7] Aaditya Jain et al.** (2017) worked on the process of solid waste generated at global levels or at local regions. Solid waste is not disposed properly and these pollute the components
of green environment such as land, air and water at global and regional levels. Due to increase in generating waste quantity, there is a increase in urban society. The overflow of garbage in all public places where people move creates unhygienic situations and may cause injurious diseases to nearby person.. To overcome this situation the waste in the dustbins are monitored with the help of sensors and information is passed through GSM/GPRS to required control room. The
communication of sensor system with GSM is process through microcontroller. To monitor the information for waste android application are used for different locations.

[8]Namakam bomuyunda et al.(2017) exploits the solution to provide a smart garbage monitoring which will allow the city authorities for resources in garbage collection and to provide a display place that allow efficient collection of garbage. Sensor device are developed to monitor the status of the garbage bin. The collected data from each of the garbage bin will be displayed on the webpage so that it can alert to the authorities of various status of garbage bin in that particular area. The collection of data is stored for each garbage bins so that it can provide analytical information for each of the garbage collection areas. Route planning should be
provided for the collection based on the priorities of each bin and selected fill level. Each node of sensors enters into the database and directly receives any data back from the server. The stored information on the server is made to access through webpage as well as to a mobile phone. **[9]Sagnik Kanta et al**. (2017) reviewed garbage monitoring system using IOT. It helps to develop and to eradicate or to minimize the disposal of garbage. Arduino is equipped with the objects, microcontroller transceivers' for the purpose of suitable protocol stack and digital communication to communicate with the uses and one another. **[10] Krishna Nirde et al**. (2017) proposed a wireless solid waste management system for smart cities which allows Municipal Corporation to remotely monitor real time status of the bin through web server to keep cities clean and efficient. Two sensing systems are used in this process such as waste filled level sensing and weight sensing. The waste filled level sensing is based on the measurement and weight sensing is used to estimate the weight. In this method
when the bins reaches its maximum level, an alert message will be sent via SMS through GSM module placed at bins so the respective department will send garbage truck where the garbage is to be collected. **[11] Dr.N.Sathish Kumar et al**. (2017) describes the smart alert system for garbage clearance by giving an alert signal to the municipal web server for instant cleaning of dustbin with proper verification based on level of garbage filling. This is done by using ultrasonic sensor which are interfaced with Arduino UNO which is used to check the filled level garbage in garbage bin and
send sends the alert to the municipal web server if garbage bin gets filled. With the aid of RFID tag the driver confirms whether the garbage bin is empty. RFID is a computing technology that is used for verification process and in addition, it also enhances the smart garbage alert system by
providing automatic identification of garbage filled in the dustbin and sends the status of clean up to the server affirming that the work is done. Android application is developed to link a web server to intimate the alerts from microcontroller to perform remote monitoring of cleaning process done by the workers and notifications are send using Wi-Fi module to android application. **[12] P.SivaNagendra Reddy et al.** (2017) offers an effective garbage collection using Embedded System. The aim of this method is to collect waste in dumping vehicles and whenever the bin is filled to particular levels the module which is placed on the bin will send an alert message to server node and then from server node the message is again send to the concerned authorities. In this method ultrasonic sensor are used to measure the dust level inside the dustbin. Controller in this design is used by Arduino. Whenever the dust in dust bin reaches the threshold
level it will send the information to server node using Bluetooth. Server node receives the values given by the sensing node and it alerts the user by sending an SMS to

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the concerned authorities through the GSM module. If the hazardous gases released by the Garbage by using MQ4 sensor alerts the user by sending alert message and preventive measures. Bluetooth and Global System for Mobile Communication (GSM) are the Wireless communication modules. The levels of the garbage are detected by the Arduino then the data will be processed. The processed data is transmitted through wireless network to the master Arduino UNO. **[13] Prof. Dr. Sandeep M et al**. (2017) proposed smart garbage monitoring using IOT helps to eradicate or to minimize the disposal of garbage. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page and it also uses
ultrasonic sensors placed in the bin to detect the level of the garbage and compare it with the trash bins. It also uses Arduino family microcontroller, LCD screen, Wi-Fi modem for sending data and a buzzer. The system is powered by a 12V transformer. The LCD screen is used to display the status of the level of garbage collected in the bins. **[14] Gaikwad Prajakta et al**. (2017) worked on the process of automatic garbage collection
and information is gathered based on the process of image and GSM module. The aim of this work is fixing a camera at each and every bin at collecting point with load sensor placed at the bottom of the garbage bin. Threshold level is set which compares the output of camera and load sensor. With the help of microcontroller the comparison is done. The level of garbage in the can and from the load cell sensor can be analyzed to know the weight of garbage bin. The threshold level information is processed that is controller checks whether it is exceeded or not. GSM module acts as the controller which sends a message to Garbage collection local office to notify
that garbage bin is exceeded its capacity and disposal of waste is required. The authority will send the garbage bin collecting vehicle to collect the garbage with the mechanism of robot. **[15] Md Manik Mian et al**. (2017) compared municipal solid waste management in china. And other developing countries to analyze and identify the problems of existing MSWM, and evaluated suggestion to overcome the limitations. The main factors of increasing MSWM in China are due to economic growth and rapid urbanization. The increasing rate of incineration unit and disposal capacity is higher than the landfill. A proper taxation system for MSW disposal is not fully implemented in China, which has a negative impact on overall MSW recycling. The comparative study of MSWM revealed that the source separation MSW collection, effective landfill location and management, high energy recovery from incineration plants, increase waste recycling and disposal in China for MSWM need to be improved. **[16] Monjur Mourshed et al**. (2017) prevent a system for managing the plastic waste production and current plastic waste management system in Bangladesh have been reviewed extensively. The proposed system will execute the quality of plastic waste management offers enormous energy from waste in Bangladesh. There is a lack of different factors such as policy, economic resources, in appropriate technology, regulatory, lack of awareness of the mass community people, environmental effect, mass community people and inadequately trained manpower to manage the plastic waste properly. The municipal authority had a micro level initiatives could not help to solve the solid waste plastic problem in the cities and towns. **[17] Shinjini Ray et al.** (2017) propose an IOT based optimization technique for garbage collection system to monitor garbage collection. This system is not only to monitor the garbage collection but also optimize it, using machine learning. It utilize is K Means Clustering, widely used in data mining and analytics. Ultrasonic sensor is used to find dustbin's current content level. If the level reaches threshold percentage of the total capacity of the dustbin, it informs our servers, via an online application programming interface and it stores related data – fill time, cleanup time, and location. Algorithm is used to show the locations and also to determine the times of the day, when a regular cleanup should be performed for the maximum possible portion of the day. This process is inspected individually scanning out – items which are the furthest away from its closest centroid; and multiple items related to the same dustbin**. [18] Palaghat Yaswanth Sai et al.** (2017) implements an idea of IOT based on smart garbage bin with the help of water proof sensors which are placed at the particular level of the garbage bin connected to arduino and esp8266 wifi module. When the level of the garbage reaches its particular height it will immediately process the information the information to the web based software as garbage is being filled by using wifi module. If once it reaches its limit the message will be send to the garbage bin driver using GSM. **[18] Monika K A et al**. (2017) presents a smart bin with a microcontroller based on the platform of Aurdino Uno board which is interfaced with GSM modem and Ultrasonic sensor. To
measure the status of the bin an ultrasonic sensor is placed at the top of the bin. When the dustbin is being filled, remaining height from the threshold height will be displayed with the help of programmed arduino. If the garbage reaches the threshold level ultrasonic sensor will trigger the GSM modem which will continuously alert the authority until the garbage bin gets cleaned. **[19] Ruhin Mary Saji et al**. (2017) describes a survey based on on Smart Garbage Management using IoT. This system also involves different smart garbage management ideas that can be simply implemented and it uses sensors, microcontrollers and GSM module are used
to assure the cleaning of garbage bins when the garbage bin level reaches its limit. The proper action will be processed if the garbage bin is not cleaned in specific time and the record is send to higher authorities. This process also helps to identify the fake reports and can reduce the corruption in this management. Sensors used here will show the different levels of garbage in the garbage bins and when the threshold level gets crossed the weight sensors gets activated to send its particular output. 2.3

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2.2 REVIEWS ON SUPPORT VECTOR MACHINE ON NETWORK

Support-vector machines (SVMs, also support-vector networks) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier although methods such as Platt scaling exist to use SVM in a probabilistic classification setting. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall. **[1] Danish Rafique et al**. (2018) describes a Machine Learning for NetworkAutomation:Overview,Architecture, and Applications Networks are complex interacting systems involving cloud operations, core and metro transport, and mobile connectivity all the way to video streaming and similar user applications. With localized and highly engineered operational tools, it is typical of these networks to take days to weeks for any changes, upgrades, or service deployments to take effect. Machine learning, a sub-domain of artificial intelligence, is highly suitable for complex system representation. In this tutorial paper, we review several machine learning concepts tailored to the optical networking industry and discuss algorithm choices, data and model management strategies, and integration into existing network control and management
tools. It describes four networking case studies in detail, covering predictive maintenance, virtual network topology management, capacity optimization, and optical spectral analysis.

3.METHODOLOGY OF THE RESEARCH WORK

We always face across dustbins in the streets where we either have to touch or press the lid by our feet to make it open, or in many cases we come across has uncovered dustbins. So, to improve the cleaning system here I'm presenting here a digital dustbin. One of the main concerns with our environment has been a solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies This is our solution, a method in which waste management is automated. This is our Garbage Monitoring system, an innovative way that will help to keep the cities clean and healthy.This section explains the proposed system architecture of solid waste management to avoid throwing of waste in roadsides.

3.1. WORKING PRINCIPLE

According to the proposed system includes mat lab software. The software uses a Graphical User Interface for the concept less time and fuel consumption Decreased noise, traffic flow and air pollution as a result of fewer trucks on the roads. Our smart operating system enables two-way communication between the dustbin deployed in the city and service operator.

Therefore, the focus is only on collection of route based fill level of the containers. The software installed in process provides information on the level, such as Quarter Level, Half Level and fill level. This information helps determine when and where to prioritize collection. In this way both service providers and citizens benefit from an optimized system which results in major cost savings and less urban pollution. Reduces the infrastructure (trucks, containers), operating (fuel) and maintenance costs of the service by up to 30%. The process is tested with six different images and finding out results depend on that particular image. The result will get differ for each image to find out the type of waste produced. Applying this technology to the city optimizes management, resources and costs, and makes it a “SMART CITY”. Historical information on collections helps adapt the deployment of containers to the actual needs of the city, therefore reducing the number of containers that clutter up the road and increasing public parking spaces.

It keeps the surroundings clean and green, free from the bad odor of wastes, emphasizes on healthy environment and keeps cities more beautiful. Reducing manpower required to handle the garbage collection.

3.2. MONITORING SYSTEM

The idea struck us when we observed that the garbage truck use to go around the town to collect solid waste twice a day. Although this system was thorough it was very inefficient. For examples, let's say street A is a busy street and we see that the garbage fills up really fast, whereas maybe street B even after two days the bin isn't even half full. What our system does is it gives a real time indicator of the garbage level in a trash can at any given time. Using that data, we can then optimize waste collection routes and ultimately reduce consumption. The monitoring module will exchange signals with the sensors and sends the data to the server and mobile application. The software will help in detecting the temperature higher than the predefined temperature and Gas will detect the toxic gases produced which can be harmful for the living creatures. The Depth Analysis Algorithm is used to find the level of the bin.

a. Start.
b. Initialize setup, Calculate depth(X) of bin and set multiple threshold level.
c. Set flag f = 0
d. Check real time level i.e. fulfillment of garbage in bin and flag status.
e. If level > 50% of X and f = 0 then send notification to control station, increase flag by 1 and go to step d.

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f. If level > 70% of X and f = 1 then send notification to control station, increase flag by 1 and go to step d.
g. If level > 90% of X and f = 2 then send notification to control station else go to step c.
h. Stop.

3.3. WASTE MANAGEMENT

Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes collection, transportation, treatment and disposal of waste together with monitoring and regulation. Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities. Curbside collection is the most common method of disposal in most countries, in which waste is collected at regular intervals by specialized trucks. Waste collected is then transported to an appropriate disposal area. Nowadays, cities with developing economies experience exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. The waste collection method in such countries is an on-going challenge and many struggles due to weak institutions and rapid urbanization.

3.4. DATA PROCESSING AND CLASSIFICATIONS

The status of each bin is not homogeneous and significantly differs from each other according to the state of each location. In this section, we introduce an algorithm that can be used to dynamically and efficiently manage waste collection strategies. To obtain a set of waste data, we use an open source database, which has a significant amount of Geo-location information and status of trash bins in the largest city. The proposed system is based on the waste status of each trash bin in the city. At here, it is used for monitoring and predicting the status of each trash bin daily. Moreover, it will be utilized for calculating the optimal garbage truck routes, accordingly. The prediction status of each bin can be analyzed based on the given training data before it occurs. Since the garbage truck needs time to collect every trash bin, it is very delightful if a status of a trash bin can be predicted. Hence, after predicting, the system will recommend which one should be collected to prevent the overload phenomenon. The Support Vector Machine is
one of the most successful classification algorithms in the data mining area.SVM uses a high dimensional space to find a hyper-plane to perform binary classification.SVM approach is a classification technique based on Statistical Learning Theory (SLT).It is based on the idea of the hyper plane classifier. The goal of SVM is to find a linear optimal hyper plane so that the margin of separation between the two classes is maximized. While intrusive behaviors happen, SVM will detect the intrusion. A classification task involves a training set and testing set which consist of instances. Each instance in the training set contains one “target value" (class labels: Normal or Attack) and several “attributes" (features).The goal of SVM is to produce a model which predicts the target value of the data instance in the testing set which is given only attributes. From the verification of the above three algorithms SVM proves the best one to find the attackers in the network.

4. IMPLEMENTATION RESULTS AND DISCUSSION: SEGREGATION OF WASTE

The garbage collection is mostly prepared in the urban part of India. More than 65% waste is collected from urban cities. Many times, we see the garbage bins are place in public places are overflow. Due to this unhygienic condition are occurring and causes deadly diseases. To avoid these conditions we implement real time waste management system using our system. In these proposed systems using an automation technique we reduce human efforts. The ultrasonic sensor
is provided for detection of garbage levels and passes the signal to the microcontroller and micro controller provide signal to the system and our module send the message to the authorized person and he collects the garbage from located bins. So, it reduces transportation cost and least time consuming system. To manage the waste of a smart city, the system incorporates a model for sharing data between truck drivers in real time to perform garbage collection. In this work , the
collected data from the sensors is sent over the internet to a dedicated for monitoring its status. While the network of ultrasonic sensors enabled smart bins to connect through the cellular network and to generate a large amount of data which was further analyzed and visualized in real time to gain insights about the status of waste around the city, a smart waste management with self-describing objects detected. The experimental setup of the Smart Waste Management system in which the first dustbin contains the empty area.

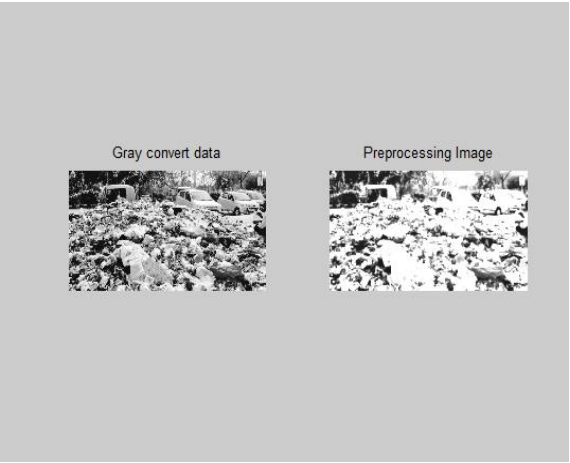

Fig 4.1.1 Preprocessing image of waste

The image pre-processing engrosses segmentation and normalization. The segmentation localizes the iris district that lies in between the limitations of the noisy images. The segmented section maps to a rectangular region of dependable dimension in normalization.

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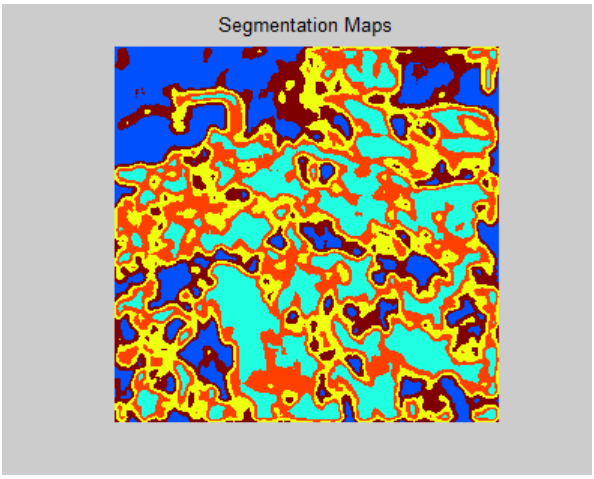

Fig 4.1.2 Segmentation on maps

Image segmentation methods can be classified into three categories: edge-based methods, region based methods, and pixel-based methods. For maps segmentation, two types of segmentation techniques have been adopted in the literature; i.e., region detection methods and boundary detection methods. Mostly, the existing methods are dedicated to specific objects.

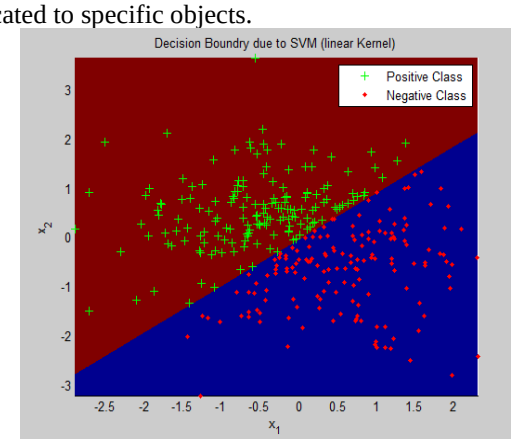

Fig 4.1.3 Boundary analysis of SVM method

Distinctive strategies have been proposed with the end goal to identify map items. With regards to visual observation, approaches depending on foundation, demonstrating are usually utilized since they permit considering slow enlightenment changes in the scene, by always refreshing the foundation display. Fundamentally, such techniques permit figuring a foundation demonstrate (BG) of the scene, which contains the static articles, and also a frontal area display (FG) of the scene, which contains the map items.

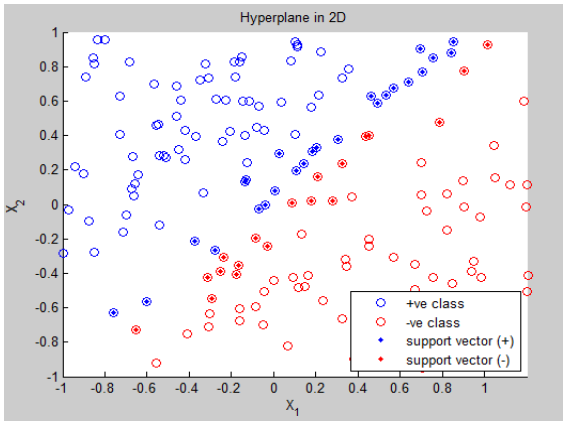

Fig 4.1.4 Hyperplane of 2Dimension

$$Accuracy = \frac{TP + TN}{TP + FP + FN + T\,N}$$

$$Precision \frac{TP}{TP + FP}$$

$$Recall \frac{TP}{TP + FN}$$

$$F - Measure = \frac{2 * Precision * Recall}{Precision + Recall}$$

Here, true positive (TP) and true negative (TN) are the number of pixels correctly labeled as positive (object) class and negative (background) class, respectively. False positive (FP) is the quantity of pixels inaccurately named as question class. Essentially, false negative (FN) is the quantity of pixels initially from question class however not marked so.

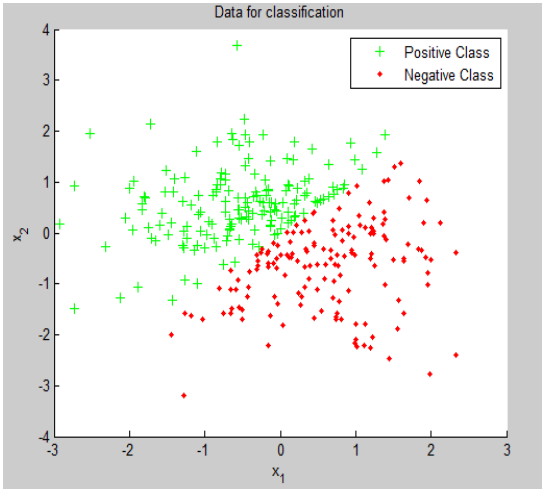

Fig 4.1.5 Classification positive and negative classes

4.2. IMPLEMENTATION TOOL

MATLAB is a programming dialect created by Math Works. It began as a grid programming dialect where direct polynomial math, writing computer programs was basic. It very well may be run both under intuitive sessions and as a clump work. This instructional exercise gives you forcefully a delicate presentation of MATLAB programming dialect. It is intended to give understudies familiarity with MATLAB programming dialect. Issue based MATLAB models have been given in straightforward and simple approach to make your catching on quickly and powerfully. MATLAB (grid lab) is a multi-

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worldwide numerical processing condition and restrictive programming dialect created by Math Works. MATLAB was first received by scientists and experts in control building, Little's claim to fame, yet rapidly spread to numerous different species. It is currently additionally utilized in training, specifically the educating of straight variable based math, numerical investigation, and is prominent among researchers engaged with picture handling. MATLAB permits framework controls, plotting of capacities and information, execution of calculations, formation of UIs, and interfacing with projects written in different dialects, including C, C++, C#, Java, Fortran and Python. In spite of the fact that MATLAB is planned principally for numerical processing, a discretionary tool compartment utilizes the MuPAD emblematic motor, enabling access to representative figuring capacities. An extra bundle, Simulink, includes graphical multi-area recreation and model-based structure for dynamic and installed frameworks.

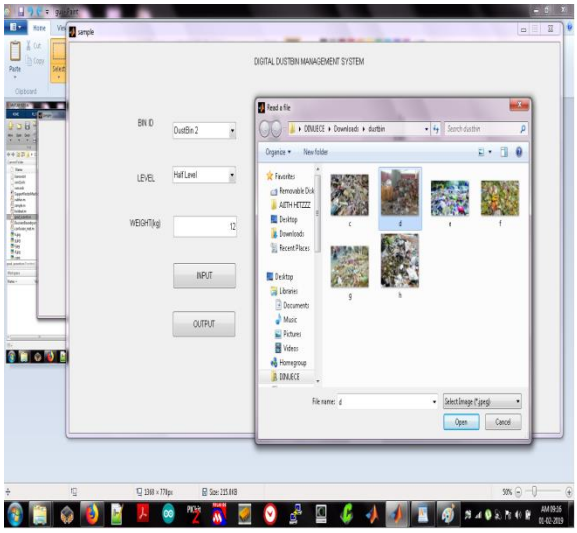

Figure 4.2.1Digital Dustbin 2

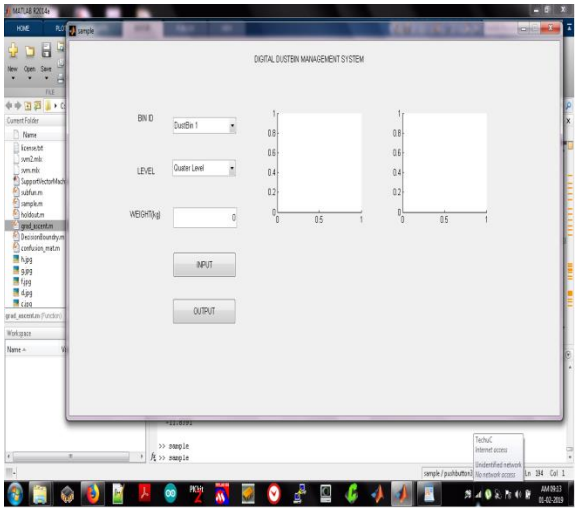

Figure 4.2.2 Quarter Level for Dustbin 1

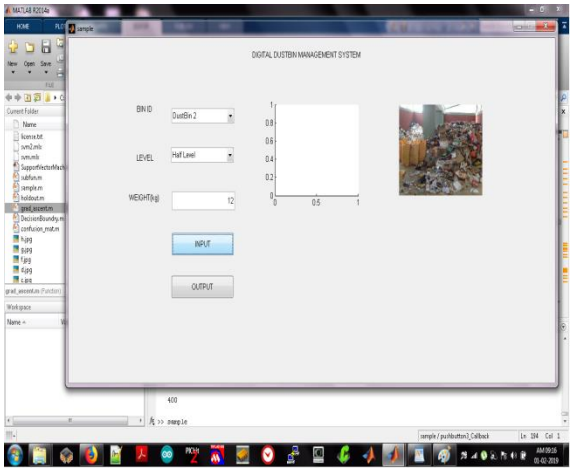

Figure 4.2.3 Input for Dustbin 2 Half Level

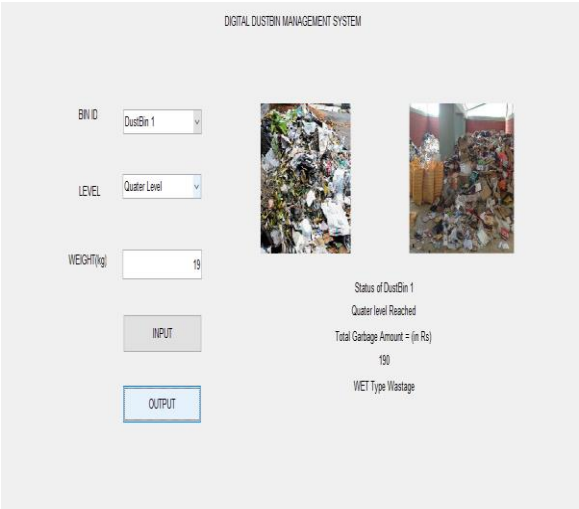

Figure 4.2.4 output for Dustbin 1 Quarter Level

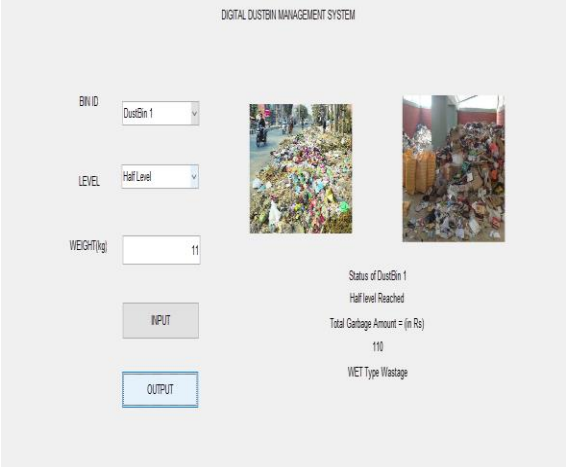

Figure 4.2.5 output for Dustbin 1 Half Level

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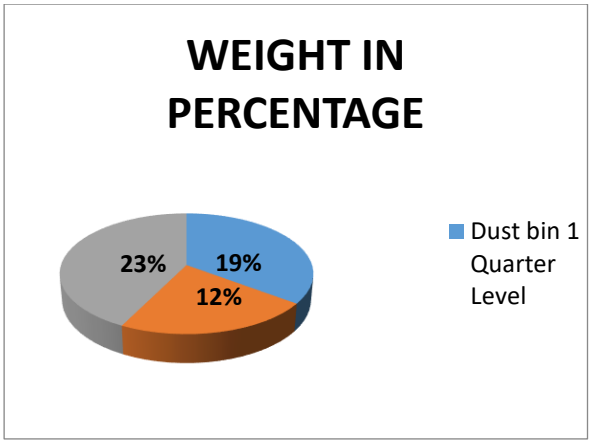

Figure 4.2.5.1.1Interpretation for bin 1

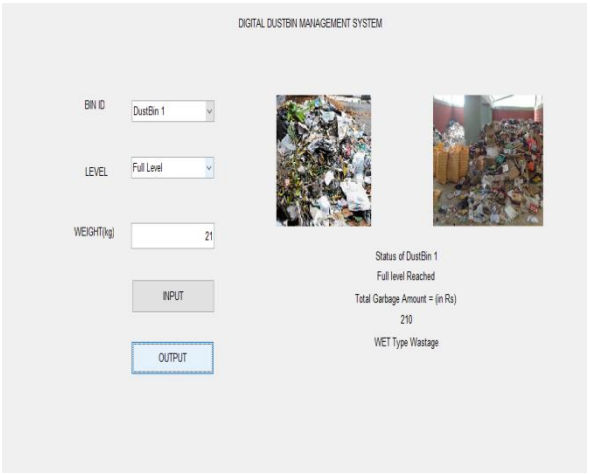

Figure 4.2.6 output for Dustbin 1 Fill Level

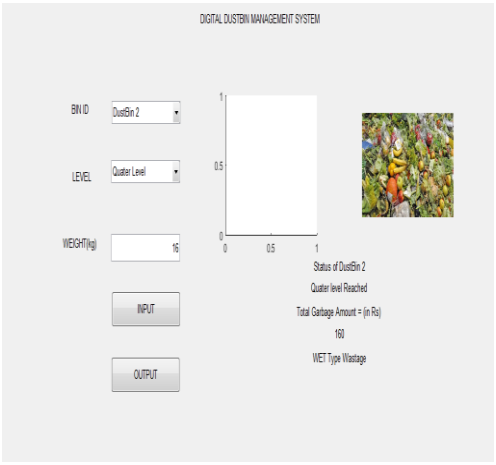

Figure 4.2.7 output for Dustbin 2 Quarter Level

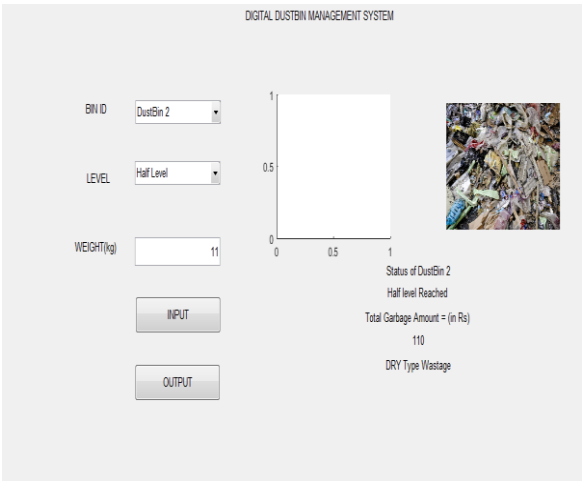

Figure 4.2.8 output for Dustbin 2 Half Level

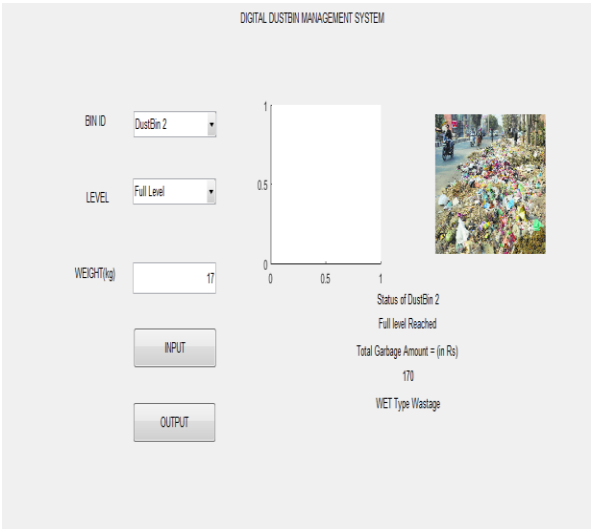

Figure 4.2.9 output for Dustbin 2 Fill Level

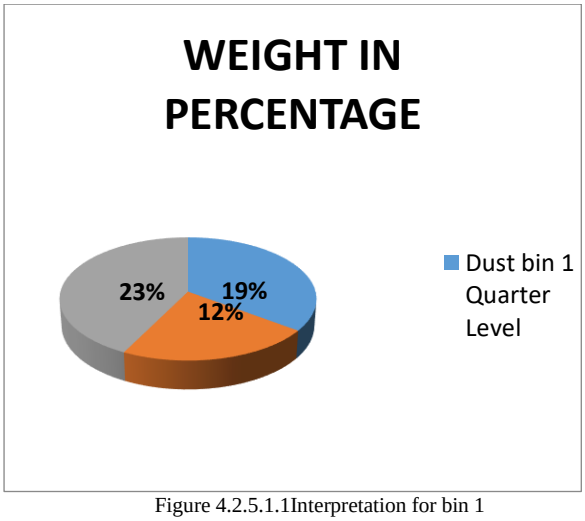

Figure 4.2.5.1.1Interpretation for bin 1

5.CONCLUSSION AND FUTURE WORK

This system has been developed efficiently for avoiding of waste thrown in the public areas. The software used for finding the level of the bins i.e. dustbin 1 and dustbin 2 such as Quarter Level, Half Level and Fill Level. The image shows the amount of organic waste produced and

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dry waste produced. The Support Vector Machine are the most successful algorithm for classifications and it uses "high dimension" technique used to predict the images which are tested and to show the result accurately.

This proposed project is an comes under Networking platform that can able to create vital research opportunities on various strategies like

- Network auditing and monitoring software
- Structured cabling
- Network adapter
- Network operating system

As a future work, a further analysis can be tried to use sensors to find the level automatically using level monitoring kit.The same technique can also be applicable for IOT platform.. It is suggested that the researchers to investigate in the field of waste produced, and technique used for recycling process. So that the waste can be easily disposed and can also reduce the waste produced. For the purpose of recycling it will be very efficient by using this technique because the wastes are identified such as wet and dry waste.