

# Garbage Collection And Management System Using Cross-Domain Application

Stephin Stanly <sup>1</sup>, Ankit Kumar Pandey <sup>2</sup>, Shivam Choudhury <sup>3</sup>, E.Manish Kumar <sup>4</sup>  
<sup>1,2,3,4</sup> B.Tech Student , SRMIST

**Abstract-** In today's life when the cities are rising the major problem faced by the developing economies are the inadequately managed and uncontrolled dumping areas or sites which makes the surrounding unclean and is a major cause in the spread of diseases[2]. One another bad effect of this problem is the bad odour which it creates waste collecting systems today are very slow as well as inadequate for such a large pile of garbage and waste. Breeding of insects, pests and mosquitos creates a havoc and spreads dreadful diseases promoting unclean environment in the nearby societies. So to overcome this problem we have proposed a system through a mobile application which will act as an interface between the garbage collectors and garbage throwers or waste producers . And thus making an effective system which will stop the littering of garbage around the garbage cans and nearby areas. As a result we'll be able to squash the dustbin in time and promote cleanliness in our societies.

**Keywords-** Waste management, mobile app,

## I. INTRODUCTION

It is frequently noticed that the garbage bins or dustbins placed in societies and public places like parks, roads, and market areas are overloaded with trash. In earlier times due to no proper usage of internet and less developed technologies all of the garbage collection and management work was done manually. But with the introduction of upcoming technologies we will be able to manage our resources as well as time efficiently in collecting and managing garbage. Meanwhile the absence of garbage monitoring systems leads to overflow of garbage from the trash pans or bins. The lack of recycling in some cities of Saudi leads to mass dumping areas which remain unclean for years and years. For Eg. In Mumbai the estimated rate of garbage productions is over 2,000 tonnes per day but the estimated collection and removal of the garbage is only around 1,400 tonnes per day[2]. So to overcome this issue we have to work through the core of the problem the problem is now our days in our societies garbage collection is a scheduled process which does not occur very frequently rather the garbage collectors are given specific time slots in a week for garbage collection.

So, through this paper we want to introduce garbage collecting mechanisms which are not based on time schedules

or slots but rather are based on the filling of garbage cans upto the brim. That is, we are proposing a system which will be defined to work on collection of garbage cans only when they are filled till the brim. This will increase the efficiency of the system and will remove the old method of scheduled garbage collection.

Our matter of concern in this project is the development of cross domain based application system for the management of garbage[1]. The major problem with the implementation of this project is how the garbage collectors or administrator will know "when is the garbage can full?". To solve this problem we made a survey of what all feasible solutions can be made and out of all the solutions we discovered that the ones who face the problem of unorganized garbage management , will be able to give us the best solution for the problem. So in our project the users play the most important role. The main advantage of our proposed system is that we ask the garbage throwers themselves to notify the system when the garbage is filled, this reduces the overhead cost of using expensive machinery or mechanism for collection and notification of filling of garbage[3].

Once the user has notified the garbage managers of the current state of the trash bin, the next problem that arises is the collection of garbage as soon as possible so that the garbage doesn't litter ,so in our proposed system we will be taking the help of garbage administrators to allot or assign the drivers/garbage collectors to pick the garbage up and empty the can.

The next problem with the system is how are the administrators going to allocate suitable drivers for collecting garbage, since the garbage cans from which garbage has to be collected is in huge numbers whereas the drivers are very few, so to solve this problem we'll be using route planning algorithm for garbage collection which will select which the most suitable route for a driver to collect 'n' no of garbage cans.

## II. PROPOSED SYSTEM

So in our proposed system we are trying to make the most out of what mobile applications today are all about. Mobile application in today's era is the most frequently used

resource as they are available free of cost and available for all to use. When we look in today's scenario we are able to find that from the starting of our day till the end all of us are so indulged in using mobile applications that sometimes we forget the worth of mobile applications.

So in our system we thought of using the same resource since it is accessible by all and easy to use and fast to interact with because of the advancements in mobile applications and internet[1].

We have come up with a system which will be used by the garbage thrower that is the user and the administrator that is the garbage managers. In our proposed system we are trying to create an interactive interface between the garbage thrower and the garbage manager so as to build up an efficient and very handy system.

- Once the user installs the mobile app he/she will be able to track all the dustbins surrounding his/her locality and also will be able to request to empty the garbage can once it is full. The user also has the power to request for a new garbage can in his/her locality if the given garbage cans are not sufficient. The user will also be able to lodge requests or complaints on the app if he/she is not satisfied with the garbage managers work. An algorithm is also present in the system which will count the no. of users who lodge the same problem and accordingly prioritised action will be suggested to the garbage managers/administrators.
- Administrators or garbage managers will be the ones who monitor the smooth functioning of the garbage collection system. They will have the access to the location of each bin placed by them and the location of the individual drivers. The allocation of drivers to the specific garbage bin collection will also be in their hand, so that no garbage can goes unemptied and each driver is assigned specific amount of task per day, in the admin module we'll be using a suggestive route planning algorithm which will suggest the admin on how to divide the workload of 'n' number of dustbins among a very few or small number of drivers. Administrators also have the responsibility of solving the problems lodged by different users and seeing to it that the issue gets solved in minimum time with minimum efforts.
- The drivers or garbage collectors will be the ones who will be responsible for garbage collection.

The drivers will get notified by the SMS system of the admin module which will contain the location as well as the garbage can no. of each of the cans which the driver has to pick in one slot as well he will be notified with the assigned amount of time under which the driver will have to finish his job.

So basically this will be how our proposed system will work.

- When the user installs the app he/she will get the suggestions of nearby dustbin in which he/she can put the waste.
- If the user finds that the garbage can is full he/she just on a touch of button can notify the admin for collection of garbage.
- Once this happens the notification will be sent to the admin and the garbage can will go 'red' on the map notifying other users that it is full.
- Once the admin receives the request for garbage collection the admin will allot the driver for the collection and will monitor the driver.
- The driver will get the location as well can no. of the garbage can via SMS from the admin which the driver will have to collect in allotted time.

### III. SYSTEM ARCHITECTURE

The proposed system architecture comprises of four main components and they are mobileapp, driver module, user module, and the administrator module. These four modules one combined together form the system architecture of our proposed system.

Below given the schematic dig. of our system architecture:-

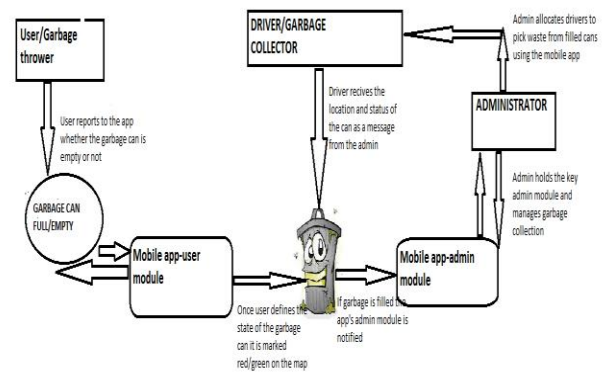


Fig.1 System Architecture of proposed system

Some key points from system architecture:-

- i. User/garbage thrower is the first key component and is the user of the mobile app for locating the nearby garbage bins as well as can request for new bins.
- ii. Administrator is the next key component of the architecture ,admin gets the request of filled dustbin cans, admin also has the authority to allocate drivers for the garbage collection.
- iii. Mobile app is the next key component it binds the two components that is the user module and the admin module and acts as an interface between the two.
- iv. Driver the last and final component and thus is the most important component of all as driver component is responsible for garbage collection.

#### IV. MODULES OF THE PROJECT

##### A.) USER SIDE MODULE:-

- **Registration:-**The user first will have to install the app from his smartphone and will then have to register to use the app. He/she will have to give normal info. about themselves like phoneno, address, name etc.
- **Login:-**Once the user registers successfully he/she will have to login in his/her account using the credentials given during registration.
- **GetLocation:-**After the user is logged in successfully the first thing they will be asked for will be the permission to access their GPS location and if the user permits the app to do so then in the next page he/she will be able to see a map which will show the locations of all the dustbins around his/her society.
- **Full dustbin(red marking dustbins):-**If the user finds that the dustbin to which he/she went to throw the garbage is full then they will get an option to mark the dustbin as red, meaning the dustbin is full and that dustbin will be marked red on the map.
- **Request Dustbin:-**If the user feels that not enough dustbins are available in his/her society then he/she can request for a dustbin.

##### B.) ADMINISTRATOR MODULE:-

- i. **Register:-**The admin also has to first register and need to give specific documentation as a proof that he/she is the real employee or manager. Once the document gets verified the admin is registered.

- ii. **Login:** The admin once registered has to login using the credentials which he/she gave during registration.
- iii. **Allocating and monitoring drivers/garbage collectors:-**The admin has the prime responsibility of allocating drivers for specific garbage cans and to monitor those drivers, to the admin's aid, system has route planning algorithm which suggests the admin allocation as well as route for the specific drivers.
- iv. **Modification/addition of garbage cans:-**On the basis of user input or feedback the admin has the power to add a garbage can to the system as well as to change the can info.
- v. **Send data of full garbage cans to drivers:-**The admin module while allocating drivers for specific bins also sends them the bin location along with garbage bin id and time allotted to complete the task.

#### V. ALGORITHMS USED

##### 1) ROUTE PLANNING ALGORITHM:-

This algorithm is used in the system to suggest the admin drivers to be allocated for specific bins at different locations. This algorithm is used specifically used for planning the route for a driver.

The algorithm works like this:-

Say we have 100 dustbin cans which are full to do and 10 drivers. And we want to know which 10 appointments go to each driver and in what priority.

So for doing that we built a time/distance matrix to calculate the time to get from each point to the other 99 points. We need to calculate from points A to B but also from point B to A as the times are not always the same.

Then the system applies the brute force algorithm to calculate the best combination of appointment assignments to each driver. As the system churns out answers, our system gets more efficient, but still is time consuming as we apply brute force approach here.

There is no priority based filtering since each dustbin which completely filled is given the same priority.

##### 2) DIJKSTRA'S ALGORITHM:-

Dijkstra's algorithm is used to find the shortest distance from a point in a graph to another point in the graph.

We used dijkstra's algorithm to find which driver is nearest to the the dustbin , that has been requested to be emptied and then we use route planning algorithm to find the route for the specific driver which is near that dustbin.

Algorithm:-

[4]Let the node at which we are starting be called the initial node. Let the distance of node Y be the distance from the initial node to Y. Dijkstra's algorithm will assign some initial distance values and will try to improve them step by step.

Mark all nodes unvisited. Create a set of all the unvisited nodes called the unvisited set.

Assign to every node a tentative distance value: set it to zero for our initial node and to infinity for all other nodes. Set the initial node as current.

For the current node, consider all of its unvisited neighbours and calculate their tentative distances through the current node. Compare the newly calculated tentative distance to the current assigned value and assign the smaller one.

For example, if the current node A is marked with a distance of 6, and the edge connecting it with a neighbour B has length 2, then the distance to B through A will be  $6 + 2 = 8$ . If B was previously marked with a distance greater than 8 then change it to 8. Otherwise, keep the current value.

When we are done considering all of the unvisited neighbours of the current node, mark the current node as visited and remove it from the unvisited set. A visited node will never be checked again.

If the destination node has been marked visited (when planning a route between two specific nodes) or if the smallest tentative distance among the nodes in the unvisited set is infinity (when planning a complete traversal; occurs when there is no connection between the initial node and remaining unvisited nodes), then stop. The algorithm has finished.

Otherwise, select the unvisited node that is marked with the smallest tentative distance, set it as the new "current node", and go back to step 3.

When planning a route, it is actually not necessary to wait until the destination node is "visited" as above: the algorithm can stop once the destination node has the smallest tentative distance among all "unvisited" nodes (and thus could be selected as the next "current").

## VI. ACKNOWLEDGEMENT

We would like to take this opportunity to thank our mentor and guide for this project Prof. Ganeshan Dhandapani for his guidance and support throughout this project, as well as we would like to thank the Department of CSE, SRMIST, Ramapuram, Chennai for giving us this opportunity to work on this project.

## VII. CONCLUSION

This paper represents developed garbage management as well as monitoring system with the help of mobile application, where the user is the one who gives the information about the status of the garbage can and the admin , who transfers the information to the garbage collector with the location of the can as well as the garbage can id, and thus if proper implementation of this system is done the garbage can be managed efficiently and can be collected in time.

The main objective of our project is to overcome the drawback which we are use now our days.

The application provides a connection between all the users /garbage throwers and garbage managers /administrators. This system is proposed with the objective that is to stop the littering of garbage around the can and on the roadside ,thus we can achieve a proper garbage management system, and this system will be able to help us keep our surroundings clean, hygienic.

## REFERENCES

- [1] P Haribabu, Sankit R Kassa, J Nagaraju, RKarthik, N Shirisha, M Anila,"Implementation of an smart waste management system using iot",International conference On Intelligent Sustainable Systems(ICIS 2017)
- [2] Sam Aleyadeh,Abd al Ehmaid M.Taha,"An IOT-based architecture for waste management"
- [3] Sagnik Kanta,Srinjoy Ghosh, "Internet Of Things Based Garbage Monitoring System"
- [4] Dong Kai Fan, Ping Shi,"Improvement of Dijkstra's algorithm and its application in route planning", 2010 Seventh International Conference on Fuzzy Systems and Knowledge Discovery (FSKD 2010)