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Design and Development of Mobile Application for Waste Management

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Abstract: ***Smart cities integrate multiple mobile or web solutions to build a comfy human habitation. One of these solutions is to provide an eco-friendly, efficient and effective garbage management system. The current garbage collection system includes routine garbage trucks doing rounds daily or weekly, which doesn't cover every zone of the city but this approach is a inefficient use of government resources. This paper proposes an approach for cost-effective mobile or web based system for the government to utilize available resources effectively and to manage the overwhelming amount of garbage collected each day, while also it provides a better solution for the inconvenience of garbage disposal for the citizens. Our approach is Location Based Garbage Management System for Smart City. This is done by an android or web app is developed for the workforce and the citizens, which primarily provides the generated routes for the workforce and finds the nearest available bin, smarted augmented technology complaint system, doorstep disposal of scrap items, monitoring the collection status of daily waste and incentives for motivation enables a cultural shift in segregation of wastes by the citizens.***

Keywords: mobile solution, environmental friendly, garbage disposal, smart city, android app, incentives.

Introduction

I. INTRODUCTION

An inevitable consequence of development in industrial progress is generation of waste. Therefore, efficient waste management system is a matter of international concern and all countries have to setup a robust regulatory waste management regime for balancing the objectives of development and environment sustainability. In India, the national environment policy 2006, it suggest the measures for collection of wastes and safe disposal of residues. The metro cities and major economic hubs generate the maximum volume of waste, but a survey says that 20 smaller cities selected to be developed as smart cities show that most are struggling to manage waste. So, there must be an improvement in the waste management system and techniques. Waste management is all the activities and actions required to manage waste from its inception to its final disposal. This includes collection of waste, transporting, treating and disposing waste together with monitoring and regulation. Waste collection methods vary widely among different countries, states, cities.

Local government authorities provide a service to collect the domestic waste. Curb side collection is the most common method of disposal in most countries, in which waste is collected at regular intervals by specialized trucks. The collected waste is then transported to an appropriate disposal area.

Nowadays, cities that are getting developed experiencing exhausted waste collection services, inadequately managed and uncontrolled dumpsites and the problems are worsening. Waste collection method in such developing countries is an on-going challenge and many struggle due to weak institutions and rapid urbanization. Following the onset of industrialization and the sustained urban growth of large population centers, the build-up of waste in the cities caused a rapid deterioration in levels of sanitation and the general quality of urban life. Due to the lack of waste clearance regulations the streets have became choked with filth. In the United Kingdom, London, The Metropolitan Board of Works was the first city-wide authority that centralized to regulate sanitation for the rapidly expanding cities .In 1875 The Public Health Act was passed ,it made compulsion for every house to deposit their weekly waste in moveable receptacles: for disposal—the first concept for a dustbin. In early days, garbage removal trucks were simply open bodied dump trucks pulled by a team of horses. And in later 20th century it became motorized .It was introduced in the 1920s in Britain and it was the first close body trucks to eliminate odors with a dumping lever mechanism. To overcome this issue an Application is developed which help user to be environment friendly by segregating organic and plastic waste separately and also help to earn from segregation. This app will also give a chance to pay the electricity bills and water taxes by points getting while segregating and even can use the points for other connecting apps like Apollo, Uber, Ola etc..

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II. PROBLEM DEFINITION

By 2030, almost two-third of the world's population are going to be living in cities. This fact requires the event of sustainable solutions for urban life, managing waste may be a key issue for the health. Efficient and energy-saving waste management, reducing CO2, pollution and vehicle exhaust emissions—these are just a couple of examples for the stress of future cities. In views of that, handlings of resources become more important. Effectively managing waste is important in developed countries. Waste management may up to 50% of a city's budget, but only serve a small part of the population. Sometimes, up to 60%of waste isn't being collected, it's often simply burned by the roadside. It can pollute drinking water; people living nearby can get affected. Even with great route optimization, the worker must still physically attend the dustbin to see waste levels. Because of this, trucks often visit containers that don't need emptying, which wastes both time and fuel. Waste management prevents harm to human health and therefore the environment by reducing the quantity and unsafe character of residential and industrial waste. Improving proper waste management will reduce pollution, recycle useful materials and make more green energy.

A. Related Works

In 2003 authors Yanfeng Ouyang and Carlos F. Daganzo This paper proposes an algorithm that automatically translates the "continuum approximation" (CA) recipes for location problems into discrete designs. It is applied to terminal systems but can also be used for other logistics problems. The study also systematically compares the logistics costs predicted by the CA approach with the actual costs for discrete designs obtained with the automated procedure. Results show that the algorithm systematically finds a practical set of discrete terminal locations with a cost very close to that predicted. The paper also gives conditions under which the CA cost formulae are a tight lower bound for the exact minimal costs. The authors Thibaut VidalTeodor Gabriel Crainic Michel Gendreau Nadia Lahrichi Walter Rei in 2011 proposed an algorithmic framework that successfully addresses three vehicle routing problems: the multi-depot VRP, the periodic VRP, and the multi-depot periodic VRP with capacitated vehicles and constrained route duration. The meta-heuristic combines the exploration breadth of population-based evolutionary search, the aggressive improvement capabilities of neighborhood-based meta-heuristics, and advanced population diversity management schemes. Recently in 2016[1] Benjamin Fish Jeremy Kun _Ad_am D. Lelkes_y proposed a three classical machine learning algorithms in the context of algorithmic fairness: adaptive boosting, support vector machines, and logistic regression where the goal is to maintain the high accuracy of these learning algorithms while reducing the degree to which they discriminate against individuals because of their membership in a protected group.RRB together with bias and accuracy provides a more complete picture of the fairness of an algorithm.

III.SYSTEM ANALYSIS

A. Existing System

Employees heading for their workstations every morning, for them to dispose their waste there are just not enough garbage bins available. In urban cities the streets are often flooded with hundreds of people. The only solution to this act is placing a cleaning staff near garbage bins every day so that they clean the filled garbage bins. This is not a real solution. There are some negative effects when the garbage bins being full. The main effect caused is that the surrounding area will start stinking. The other effects are when the garbage bins are full people put their trash on the grounds surrounding the garbage bins. The challenging of garbage management is one main issues in the urban area especially its collections management. Some cities have specific companies and organizations engaged in the removal of waste product at the refusal place. The organization or company manages the garbage removal management according to the schedule on request of the community or time that has been set by the authority. Garbage management has become a big challenged for both between developing and the developed countries because of the change in lifestyle, increasing urbanization and as well as increasing population where issues end up with a lot of garbage to be disposed. Without proper garbage management, the waste pollution will occur where some garbage is not taken and open to the air that could arise some disease. Garbage pollution increases when there is no proper garbage disposal site in the city or town. The community must collect all the garbage either in plastic or trash can and place it outside the home and the garbage will be collected by the authority or agency. If a particular authority or agency does not play a role and does not take garbage regularly, this will cause environmental contamination to occur and cause serious impacts on health and causes a problem to the surrounding environment. The air pollution also happened when some places accumulated with garbage and cause the damage of the respiratory systems such as asthma and chronic obstructive pulmonary disease. A certain resident there is no waste container in front of their house, so they need to throw the garbage at the main place. Some main garbage bin is full and unmanaged that created an uncomfortable environment in their resident.

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Some irresponsible people have thrown away their garbage in front of their house instead of went to the special place for garbage which is prepared at their place in reason that place is too far from them. Research has analyzed that every day, Malaysia has produced 37,000 tons of waste products. Meanwhile, the cost of managing all the waste weighs RM2.2 billion a year. This paper presents a developed prototype of Mobile Apps for Garbage Collector Tracker Using Google Map mainly designed to overcome that problem of waste management. This project is designed to alert home communities of the current time and location of garbage collector moving around their places to collect the garbage. The Garbage tracker mobile apps contain easy access to the tracking system which the user can track the real-time location of the driver of the garbage collector and the system provided with a real-time schedule of waste management duty.

IV. PROPOSED SYSTEM

The proposed system overview for this system. Solid waste management can be broadly categorized as segregation, collection, and transportation. The data is collected and stored only in the database by the server.. This data will be analysed and displayed on two different dashboards that can be accessed by the workforce and clients. Using data analytics, reports will be generated which can be monitored by the admins through the admin dashboard. Based on the data collected, garbage trucks can be given routes generated through various applications and google maps API to efficiently route through all necessary garbage bins and finally reach the dumping site.

The level of waste is judged by the smart ,sensor based dustbin and the message is sent directly to the municipal corporation. Any type of waste material can be sensed either in the form of liquid or solid. With the help of the "Transportation Software", the municipal corporation chooses the shortest path based on the level of filled dustbins to save the time. As the system is simple, it depends on the "Digital India". If there occurs any problems with the equipments in the future, that part can be easily replaced with the new one without any delay and difficulty.

As the trucks goes only to the filled containers, it requires less time and fuel consumption. Air pollution, traffic flow and decreased noise are considered as the result of less truck on the roads. This smart operating system allows two-way communication between the service operator and the dustbin deployed in the city. Hence, it focuses only on collection of route based fill level of the containers. The real time information on the fill level is provided by the sensors installed in the containers. This information helps to determine when and where to prioritize the collection. In this way both citizens and service providers gets benefit from an optimized system which will result in less urban pollution and major cost savings. This reduces the infrastructure of trucks and containers, operating (fuel) and maintenance costs of the service by up to 30%. Our city would be labelled as “SMART CITY” if we apply this technology, as this technology optimizes management, resources and cost. Collection of historical information helps the deployment of containers to adapt to the actual needs of the city, by reducing the number of containers, as these clutter the road and by increasing public parking spaces. The cities are kept more beautiful by making the surrounding to be clean and green and it is free of bad odour of wastes. The garbage collection requires reducing manpower for handling it.

A. Information Architecture

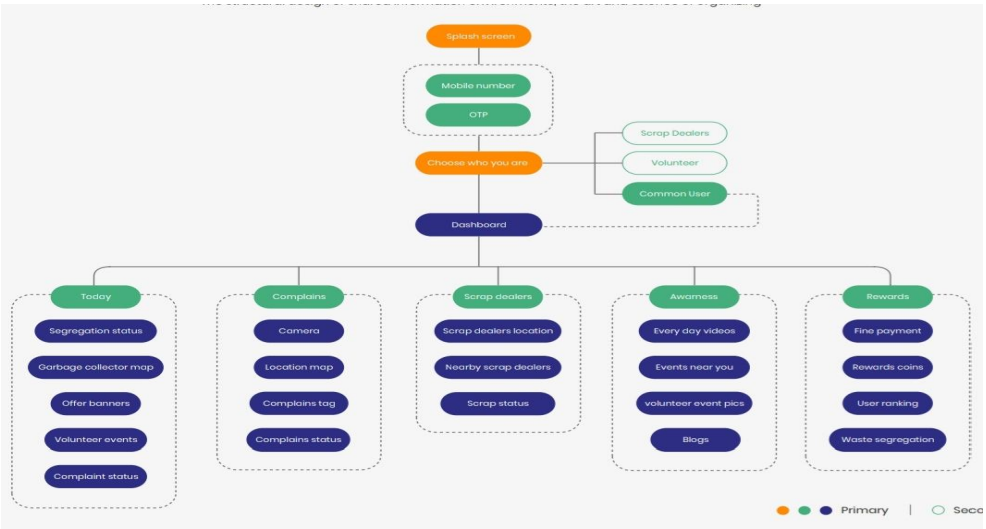


Fig 1 – Information Architecture

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Key principles of the new Android Architecture Guide defines that a good android application should conform to and it also proposes a secure path for the developer to create an application. The guide says that a good android application should drive the UI from a model and provide a solid separation of concerns. The codes that cannot handle the Operating system or UI interaction should not be added in an activity or the fragments, because it is necessary to keep them clean as it allows you to avoid many lifecycle-related problems. Also, the data should be handled by models that are isolated from the UI, and consequently from lifecycle issues. Android team is proposing, we have to know all the elements of the Architecture Components, since they are the ones that will do the heavy lifting for us. There are four components, each with a specific role: Room, View Model, Live Data, and Lifecycle. All of those parts have their own responsibilities, and they work together to create a solid architecture. Let's take a look at a simplified diagram of the proposed architecture to understand it better.

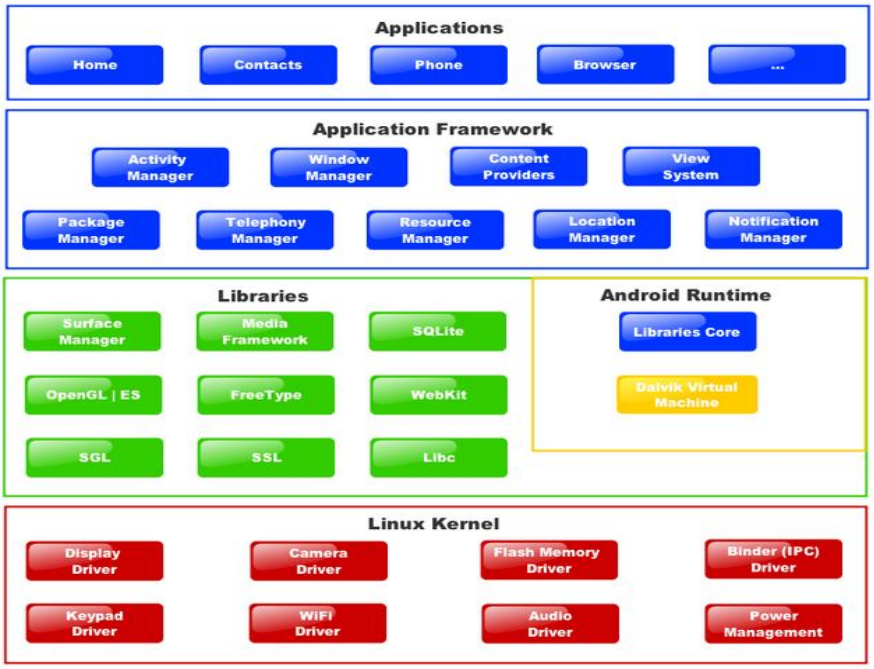


Fig 2 - Android Architecture

V. MODULE DESCRIPTION

A. Administrator

In this module the important role for the user is Login: Create an account for the garbage collection. Then sign into the account and know about the garbage collection. Here create a garbage bin so that we can put the dust in there. The best route for the drivers has been assigned. The driver should be managed to go for the correct place for collecting garbage. They will view the garbage collection in the area which is allotted to the particular person. The public will complain about the garbage collector where they didn't come for long time and the public garbage bin is overflowing.

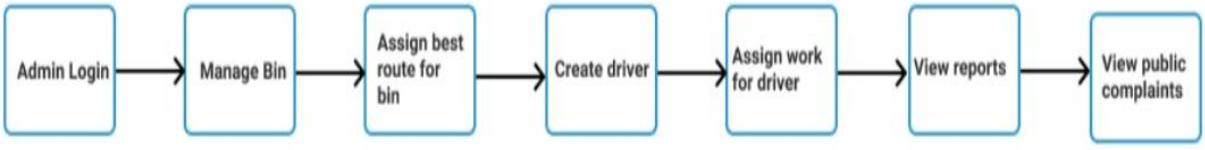


Fig 3 – Tasks performed by the administrator during the disposal and complaint registration by the users

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B. General Public

To Register the public we have to login our account to see the garbage application and know about the updates. Login: The user as a public should view the garbage page, after logging in. Register complaint: If the public had any complaint about the garbage collector or any public bin is overflowing they can register a complaint. My complaint & status: We can view the complaints and the status of our complaint and view it.

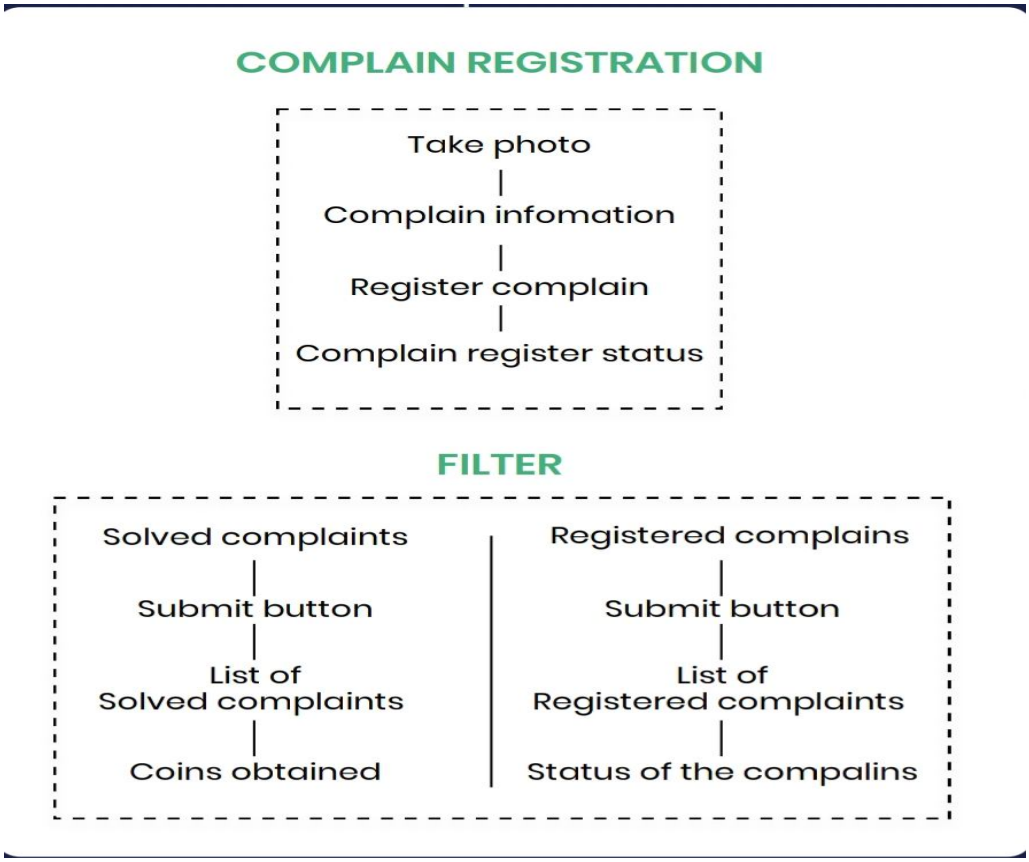


Fig 4 – A complaint registration system where user navigates to complete the task

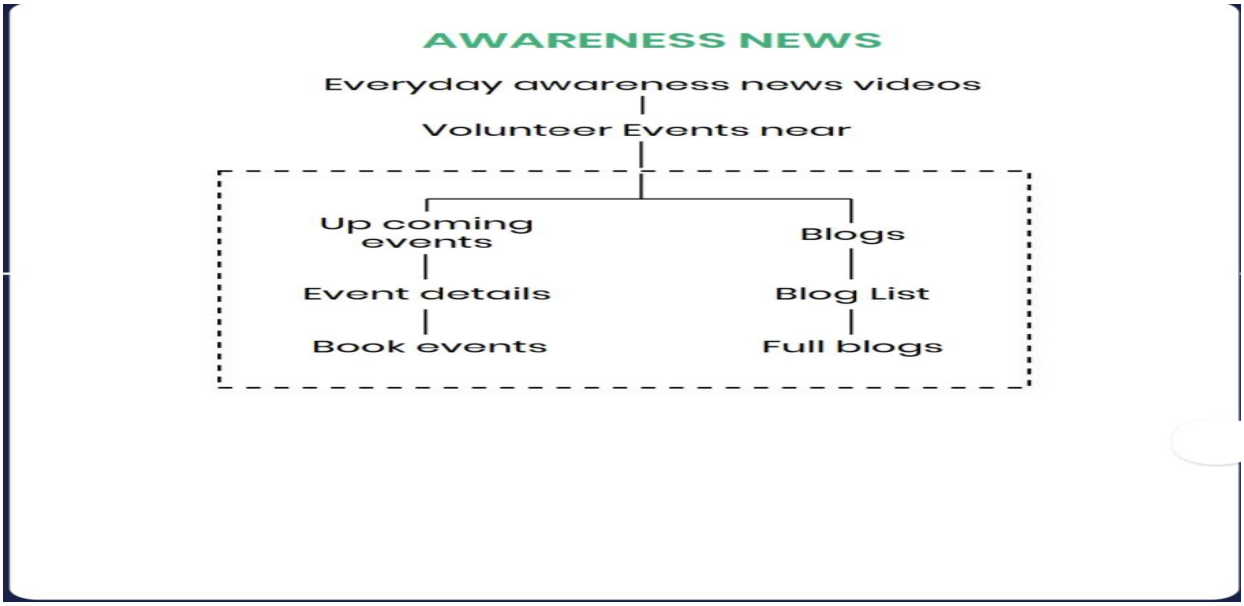


Fig 4.

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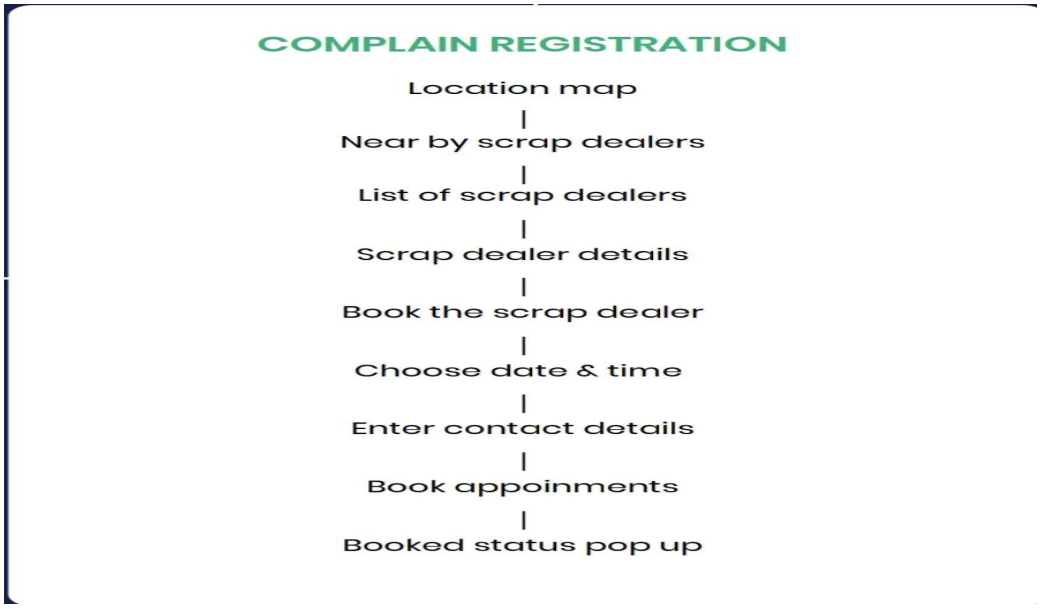


Fig 5.



Fig 6 – An awareness section, booking scrap dealer system and earn reward coins user flow to achieve the specific task

C. Garbage Collector

The garbage collector will login the page and file about the particular house. Check daily work updates: They can check their daily update; like which area they have to go for their garbage collection. Choose best route: They can choose their best route for the garbage collection. Update garbage load: They can upload the garbage which is collected in a particular house.

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VI. SYSTEM IMPLEMENTATION

The system is implemented using Java Script in Pentium 5 environment.

A. Screenshots

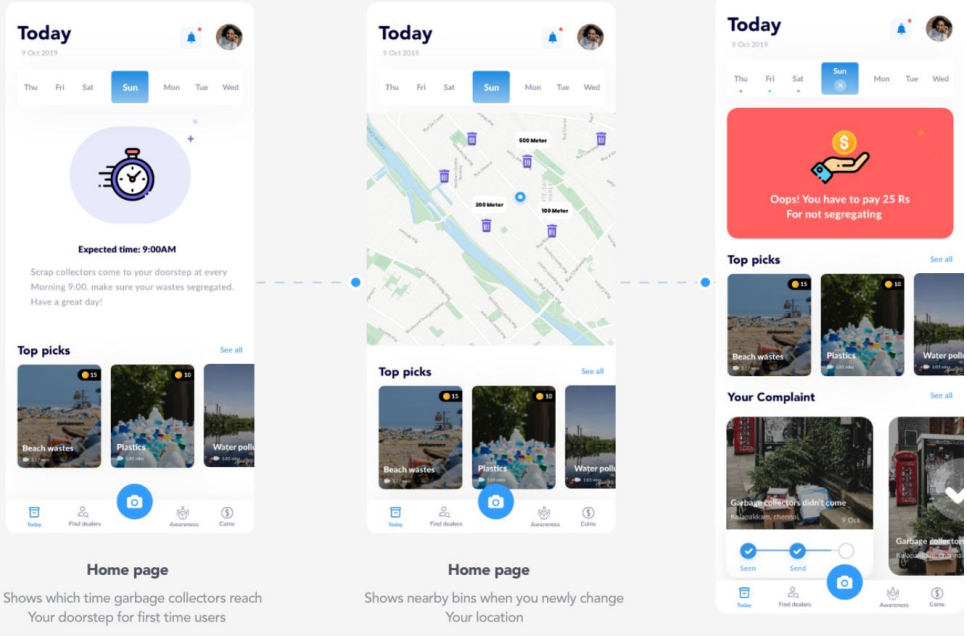


Fig 7.

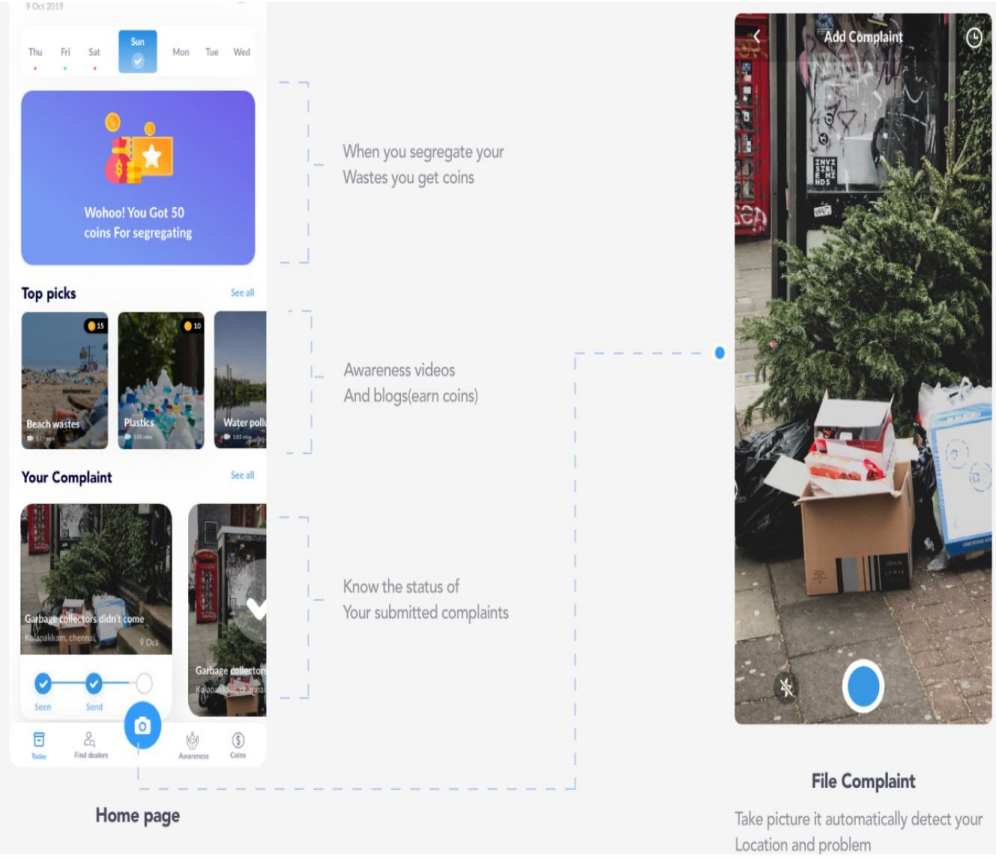


Fig 8.

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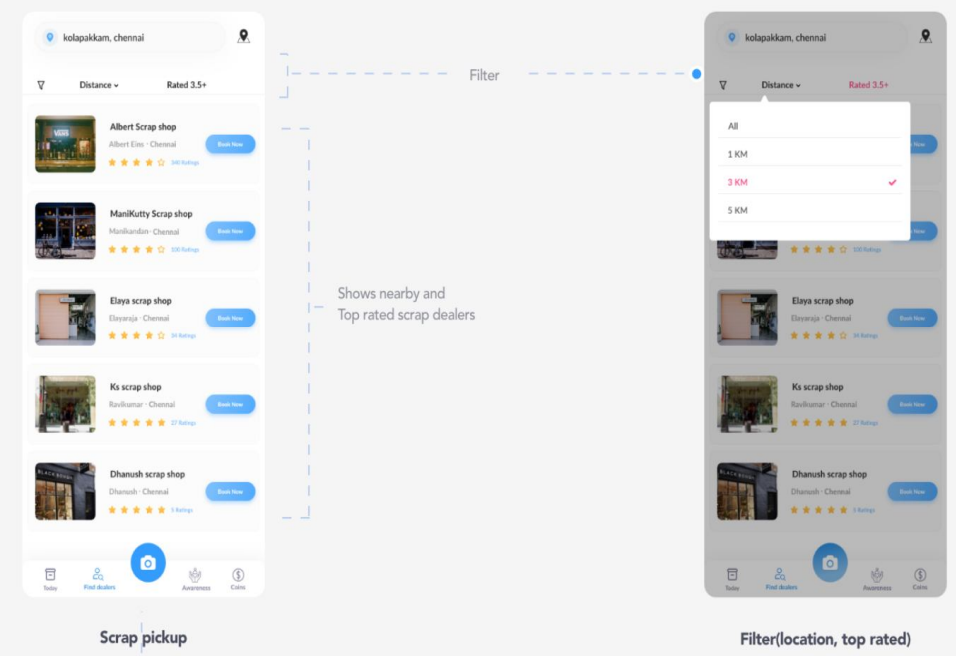


Fig 9.

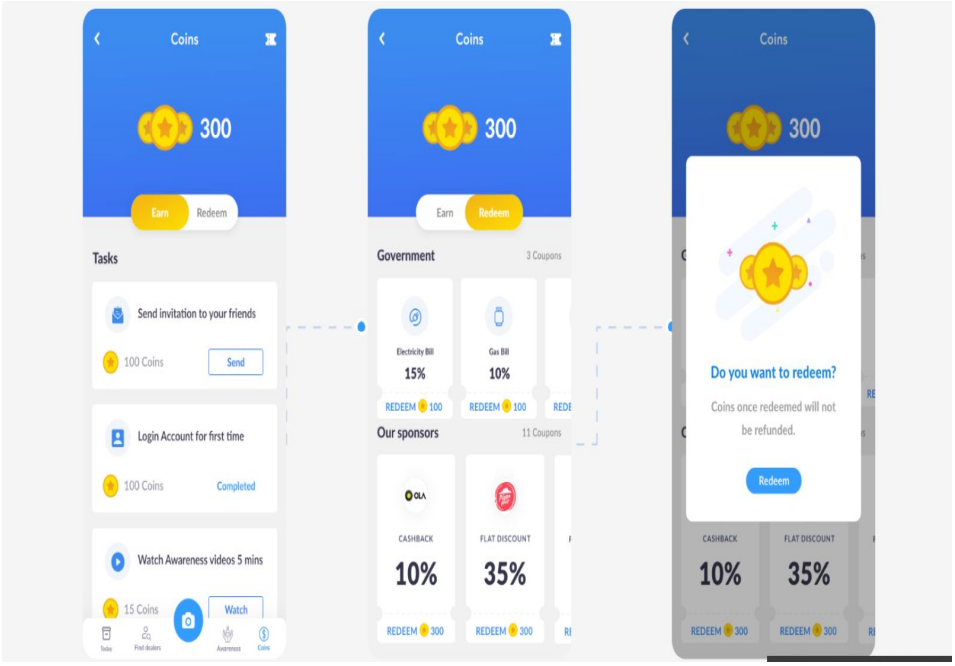


Fig 10.

VII. TESTING

A. Software Testing

The purpose of testing is to get or discover errors. Testing is that of the process of trying to get discover every conceivable fault or weakness during a work product. This process provides a way to check the functionality of components, sub assemblies, assemblies and a finished product. It is the method of processing the exercising software with the intent of ensuring that the Software meets its requirements and user expectations and does not fail in an unacceptable manner. There are various sort of test. Each test type addresses a selected testing requirement.

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B. Developing Methodologies

The test process is initiated by developing a comprehensive decided to test the overall functionality and special features on a variety of platform combinations. Strict quality control procedures are used. The process verifies that the application meets the requirements laid out in the system requirements document and is bug free. The following are the considerations used to develop the framework from developing the testing methodologies.

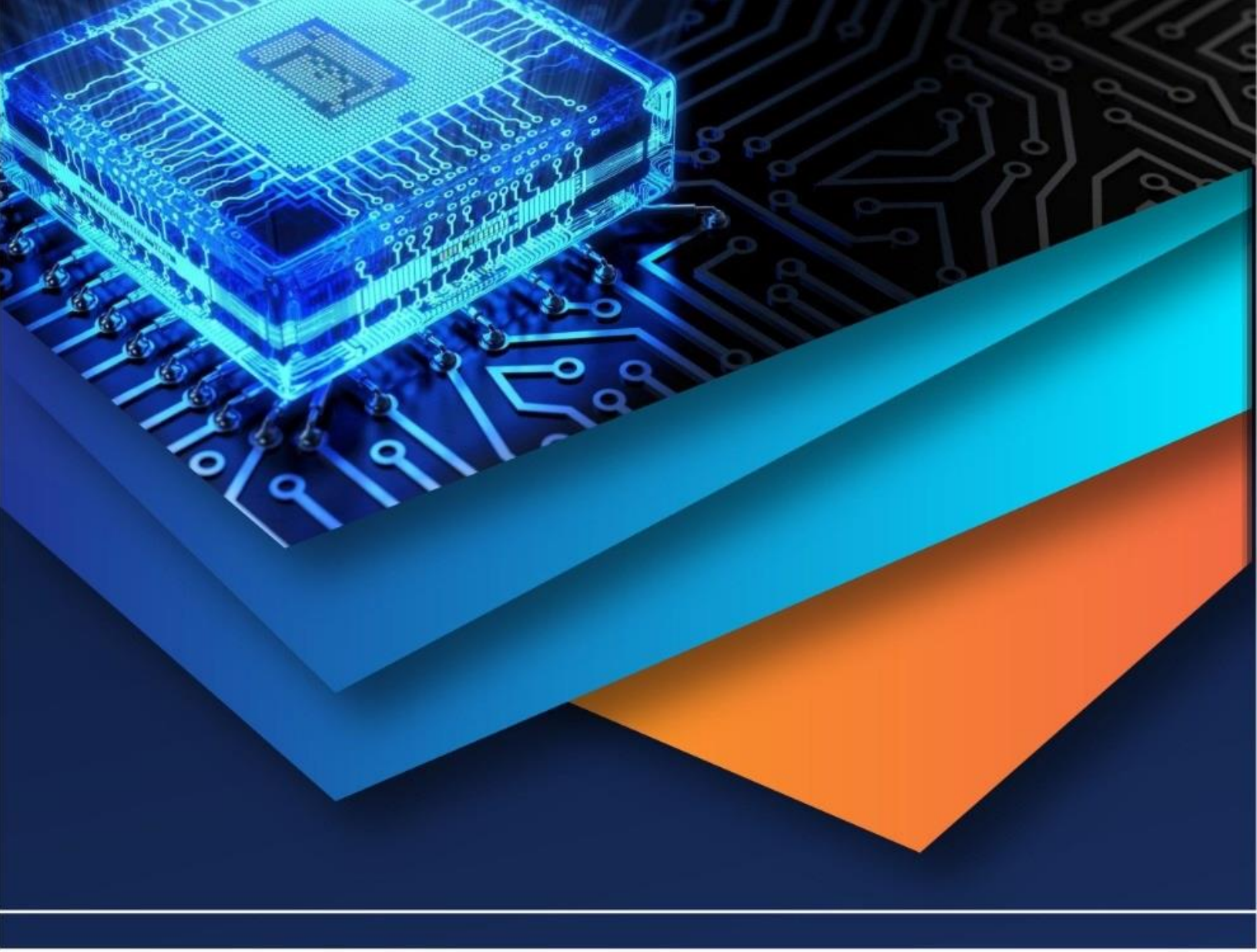
VIII. CONCLUSIONS

By using this method the collection of waste in the city becomes easier. It helps in reducing pollution in air, traffic flow, man power, time and money. With the help of proper technology we can guide the trucks in selecting the shortest path for garbage collection. This project aiming to get smart and people-friendly. The project helps in reducing the time of garbage collection, delay in collecting it and alerting the neighbourhood about it. This system helps both the management and the residents to track the real time location and process of emptying the garbage and rewarding and fining the residents as part of dry and wet waste concepts. The project has a good social cause and can be implemented with Swatch Bharat mission. The application informs the collectors on the nearby scrap dealers as a medium of making money for the government .The society is motivated and educated towards the dry and wet waste collection and the best way to do it is rewarding them and putting fine if they don't. The project can be advanced with an auto sensor for garbage leak and to become smart by sensing the dry and wet waste by itself.

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