Mobile Application Model for Solid Waste Collection System

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***Abstract*: To create a comfortable human habitat, smart cities incorporate many mobile technologies. Offering a garbage management system that is efficient, effective, and ecologically beneficial is one of these alternatives. The current garbage collection system comprises routine garbage trucks making daily or weekly rounds, which not only uses up a tonne of resources but also doesn't cover the entire city.**

Using this software, the administrator can fully monitor and evaluate the system while managing the garbage app online. Bins, drivers, and driver work reports are all handled by the admin here. The government can more effectively manage the enormous volumes of rubbish that are collected every day by using the mobile-based system that is proposed in this article. Additionally, it provides the general people with a better remedy for the nuisance of garbage disposal. A driver performs this; an app will offer suggested and guided routes for garbage trucks. After that, the driver will update the status of the task that has been completed.

1. INTRODUCTION

1.1 Aim

This is a smart app developed for Municipal Corporation to manage and analyse the garbage transportation system. Through this app admin can track garbage transportation trucks working".

1.2 Project Description

We already know that the "Smart City" issue is popular, therefore I'll start by presenting an app related to it. To make a cosy and comfortable human home, all smart cities have a choice of mobile or web options. Giving a competent, persuasive, and ecologically responsible trash the board structure is one of these solutions. The current situation for waste and trash is incompatible if we talk about the current trash collection system, which relies on routine dump trucks that make adjustments daily or weekly but doesn't reach every area of the city and represents a complete waste of resources on the part of the government. This android app consisting of the three modules namely admin, employees and the lorry drivers. Admin is a super user of the application. Admin is mainly responsible to add the staff information to the database, once the admin is entered staff information to the database the auto generated login credentials will be displayed to the staff. Admin can view the report of trucks garbage disposal work. Staff mainly responsible to add the dustbins information with GPS location. Staff also assign the dustbins to the lorry drivers. Lorry drivers is mainly responsible to view the dustbins location in Google map. Lorry drivers can update their status regarding to the clearance of the dustbins in an android application. This app helps admin to keep eye on work of lorry drivers. Lorry drivers can report their work easily without using paper logs. The best techniques for data verification and analysis are combined in our Location-Based Garbage Management System for Smart City app to produce the most efficient routes for garbage trucks and other vehicles that are generated through maps using our algorithms. Android app is developed for the administrator to make it simple for them to keep an eye on the waste or trash disposal process

2. Literature Survey

A literature review is the writing method of summarizing, synthesizing and/or critiquing the material that was found as a final outcome of a literature search. It can also provide as background information or context for a major research project. There are countless justifications for reviewing the literature, including: Determine the character traits relevant to the subject area. Learn about the factual reassessments and the research methodology. Identify any gaps in the body of literature that can lead to new research topics. verify a research project's originality Review the procedures Determine mistakes to avoid List the field's advantages, disadvantages, and current debates. Determine the experts on the situation.

The exponential growth of industrialization and urbanization brought waste management issues. Mitigate with this problem is one of the roles of the municipality. Solid Waste management covers all activities beginning with the collection to recycling and waste reuse. All these activities can benefit from technology to improve functioning at each level. Waste (also known as trash, refuse, rubbish, garbage, and junk) is unwanted or useless materials (Haghi, 2010). As its name sounds, waste is an unwanted and unprofitable material that attracts less attention from the community. It is one of the reasons why not much work in that field about software development aimed or targeted to improve the work of society or organization, has been set up for its management (Adebayo, 2014). Solid waste is the term used to describe non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities, and public services (Palniktar, 2018). Solid waste which is one of the sources and causes of environmental pollution has been defined under the Resource.

2.1 Status of the Existing Solid Waste Collection

It is estimated that cities worldwide currently generate 1.3 billion tonnes of waste per year, which is expected to rise to 2.2 billion by 2025 (Hoornweg, 2012). Each city, town or municipality is responsible for establishing waste and single-use processing facilities. Compliance with the provisions of the regulations is the responsibility of the central and district government.In most African cities and urban centers, the accumulation of solid waste is estimated at 0.5 kg per capita/day with a density between 205 and 370 kg m-3 and in other cities with 3.5 million inhabitants, research shows that one million m3 of solid waste is generated annually

The state of Africa's MSW is critical. Due to population growth and urbanization, the amount of municipal waste is increasing dramatically. Africa is the fastest growing area of high population growth and the only region in the world projected to experience strong population growth for the remainder of this century. Between 2020 and 2100, Africa's population is expected to increase by 1.3 billion to 4.3 billion (Anthony Cilluffo, 2019). According to Mitsuo, the capacity of public authorities to implement the municipal solid waste disposal service in each country is limited. As a result, much municipal solid waste is not properly collected and treated, which has raised environmental and public health concerns.

2.3 Waste Collection Process

Municipal solid waste is collected in different ways (Hoornweg, 2012):

- House by House: Garbage collectors visit each house to collect the garbage. The user usually has to pay a fee for this service.
- Community Bins: Users bring their trash to community bins placed at fixed points in a neighborhood or location. Waste is collected by the municipality or its designee in accordance with an established program.
- Curbside collection Above: Users leave their rubbish right outside their homes according to a rubbish collection schedule established with local authorities (secondary door-to-door collectors are not typical). Own delivery: Producers deliver waste directly to landfills or transfer stations or commission third-party operators (or the municipality)), with which the pick-up dates and fees are coordinated. Hardoy, Mitlin and Satterthwaite comment that for solid waste collection, the commonly used method is door-to-door collection from various households in urban areas. Thereafter, also in most suburbs and cities, each homeowner places their rubbish in plastic bags, sacks, baskets, or other suitable material at the door for the refuse collectors to collect and temporarily transport in the shared wheelbarrow (Hardoy, 2001).

2.4 Type of Waste

Typically, waste can be liquid or solid. According to the World Bank, there are eight main classifications of solid waste producers (Griffin, 2018) and it is stated that the first seven can be classified as municipal waste.

Rest - single-family and multi-family houses

Industry - light and heavy manufacturing, construction sites, Electrical and Chemical Plants

Commercial: shops, hotels, restaurants, markets, offices buildings

Institutional: schools, hospitals (non-medical waste), prisons, government buildings, airports · Construction and Demolition - new construction, road repairs, renovations, building demolition

- Municipal Services - street cleaning, landscaping, parks, beaches, others recreation areas as, water and sewage treatment facilities
- Process: Heavy and light industry, refineries, chemical plants, power plants, mineral extraction and processing.

2.5 Route Optimization in Solid Waste Collection Process

Efficient routing of collection vehicles is one way to improve solid waste collection performance. Routing represents a path between places as source and destination for the routed object (Reinhardt, 2011). In order to be able to offer competitive prices and services, today's transport must be profitable. One of the challenges faced by the solid waste collection system is how to optimize routes, as we are all forced to find ways to reduce expenses. In solid waste collection, Routing involves planning and defining routes that trucks must traverse during the collection process.

If there is no scientific or technological intervention in the selection of the routes taken by the collection vehicles, the collection systems will be defective and costly (Tavares, 2009). There are many kinds of algorithms that help solve routing optimization by giving us the shortest path between nodes. In 1956, a scientist named Edsger Dijkstra developed one of the most famous algorithms for solving the shortest path problem. This algorithm is often used in routing and as a subprogram in other graphing algorithms.

Solves the shortest path problem for any weighted directed graph with non-negative weights and generates a shortest path tree. Vertex (node) in the graph, the algorithm finds the path with the lowest cost (i.e. the shortest path) between this peak and all other peaks

2.6 Importance of Mobile Apps in Solid Waste Management

Solid waste had to be properly stored, collected, transported, treated and disposed of, and the primary concern was to minimize environmental and health impacts.Therefore, the technical and logistical tools were sufficient to plan and implement waste management systems. But today, resource management and social behavior are an integral part of all waste management systems, increasing the need to develop mobile applications for the sector(Antonis Mavropoulos,2015).mobile technology is beginning to transform the way waste and recycling companies do business. The new tools allow waste and recycling operators and the average consumer to access information on

Waste disposal companies use the system to make their waste disposal operations more efficient, to register their customers and to receive information on how to make money from waste. Additionally, municipal or NGO staff working in waste management can use the system to promote waste management at their sites using the system to track important related data (Kayleemasa, 2018). The Integrated Municipal Solid Waste Management System is a Model accompanied by a prototype. The system guarantees solid waste reduction through collection monitoring, waste monitoring initiatives and environmental education. It is an integrated system that integrates a global positioning system, radio frequency identification technology connected to a microcontroller and a web graphical user interface that can be accessed from anywhere.
The web GUI allows for real-time interaction of the head office with the waste collection processes (Lovemore, 2016). Recycling services for households and businesses through mobile applications currently operating in Kampala, Uganda. But it does not cover all aspects related to waste management, designed to understand how the mobile model can effectively contribute to excellent solid waste collection management, examine in depth all the necessary information and details that were important , to achieve our first goal of crop research study. Information, study and analyze it. The purpose was to provide design knowledge in the field of solid waste collection management. Then it was about designing, implementing, testing and validating the Solid Waste Management system model.

2.7 Related Solid Waste Management System and Models

Developed a system called Aweb-based GIS Waste Disposal Management System Development for Nigeria using expensive hypertext markup language, cascading style and asynchronous javascript with XML using mysql as database. This system can enable local authorities in Nigeria to manage solid waste and contain the spread of an outbreak to ensure everyone's safety by locating all waste collection tanks that are monitored, managed and maintained in the area using the Waste Collection Management system would "Adebayo, 2014". A Web-based Solid Waste Management System for Sierra Leone is a prototype developed using C# as a programming language and is a web-based ASP.NET application. The main goal of this application was to develop a web-based solid waste management system that can collect and display municipal solid waste data.
Aid for business creation by groups of young people. The first edition is intended to be used by a single solid waste company. Second, it doesn't take into account the operation of the community, which we observed during our research, most communities work with many private companies to help them with waste collection, and each company has a specific area that is involved in this type of waste collection situation is active.

3. METHODOLOGY

This section provides presented different methods used during our research study. The chapter describes the research design, the research approaches, the information required for the modeling, design, development, testing and validation, and the various tools that helped us to carry out our research study. The data for this research was collected directly from secondary data and direct observation.

4.IMPLEMENTATION

Systems implementation is the manner of: defining how the archives computing gadget have to be built (i.e., bodily computing device design), making sure that the data laptop computer is operational and used, making sure that the files device meets super regular (i.e., exquisite assurance). Systems shape Conceptual shape – what the computing system wish to do Logical plan – what the computing device select to exhibit up to be to the persona Physical shape – how the laptop ought to be built

4.1 Screenshots

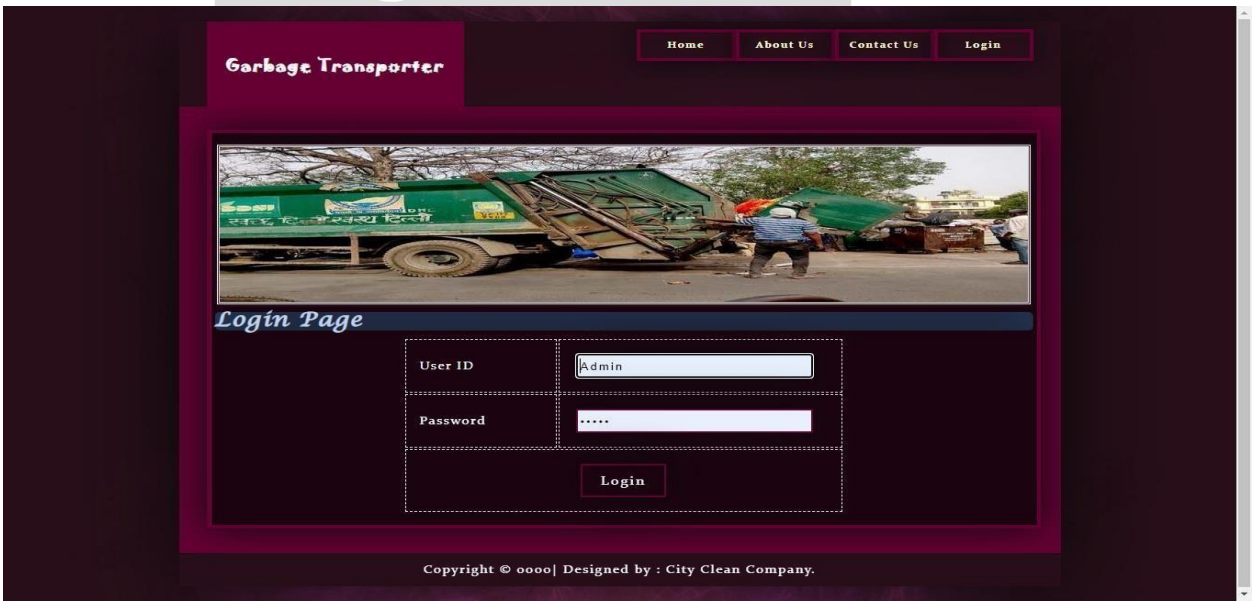

Fig 4.1.1 Admin Login Page

- The 6.1.1 Figure Shows The Login page of the admin for this project, Here admin login to the Application. Here we use UserID and particular Password for Admin Login.

Here all the field are validated proper validation.

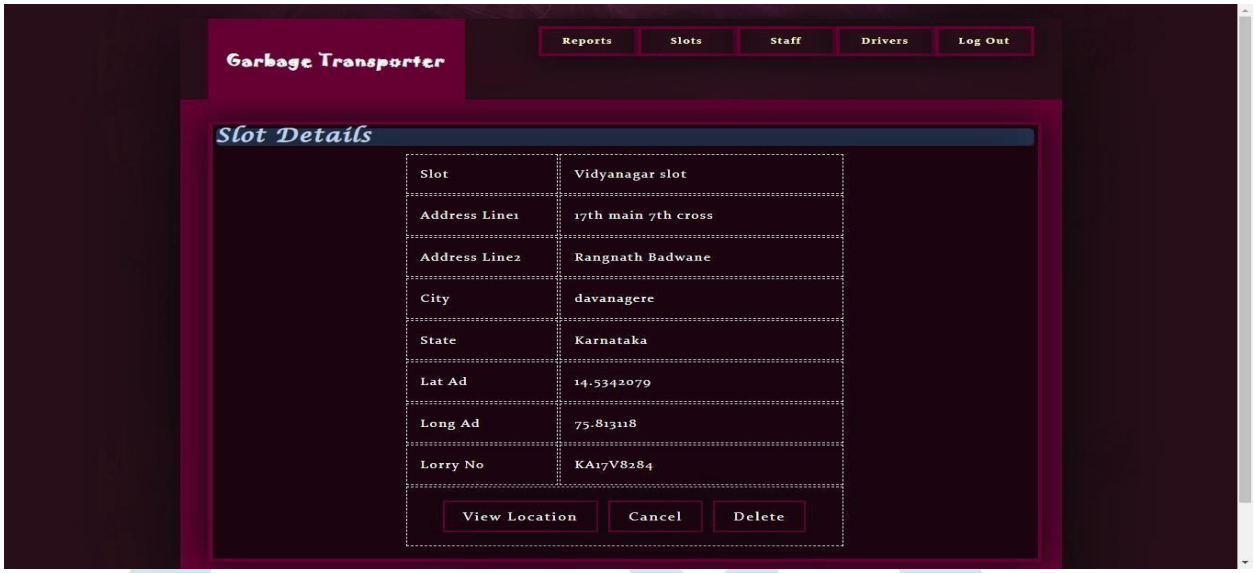

Fig 6.1.2 Employee Slot Details page

In 6.1.2 slide we have to collect the details and location of the employees, here admin can manipulate all the details of the employees data.

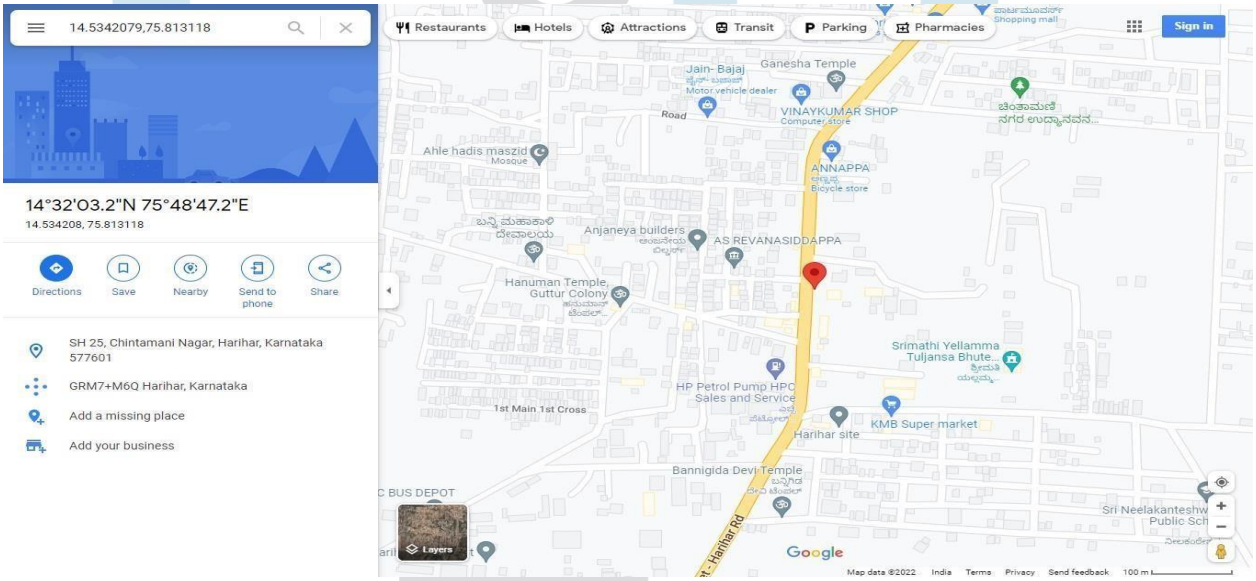

Fig 4.1.3 Location Details Page

It's the Location page , 6.1.3 page presents the location of member or person who will send the transport message and admin is also track the location Admin can provides the location for the drivers.

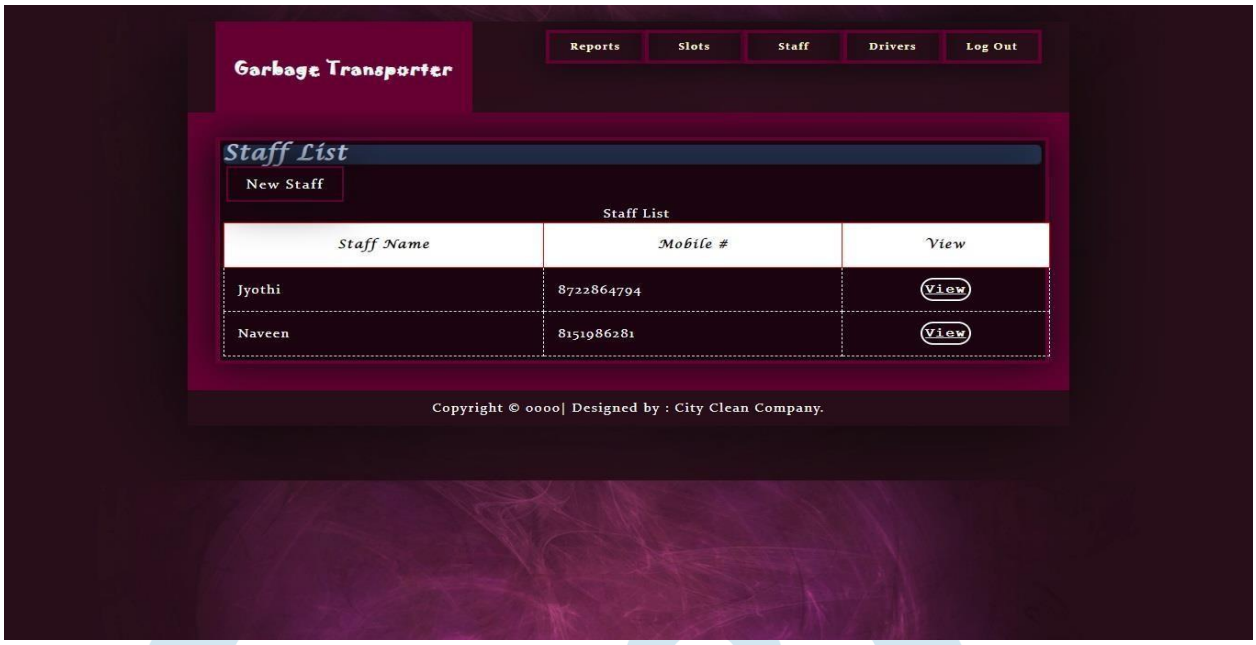

Fig 4.1.4 Employee staff list

- The 6.1.4 Figure gives the details about staff who have been worked for this portal
- Admin can add, delete manipulate the staff.

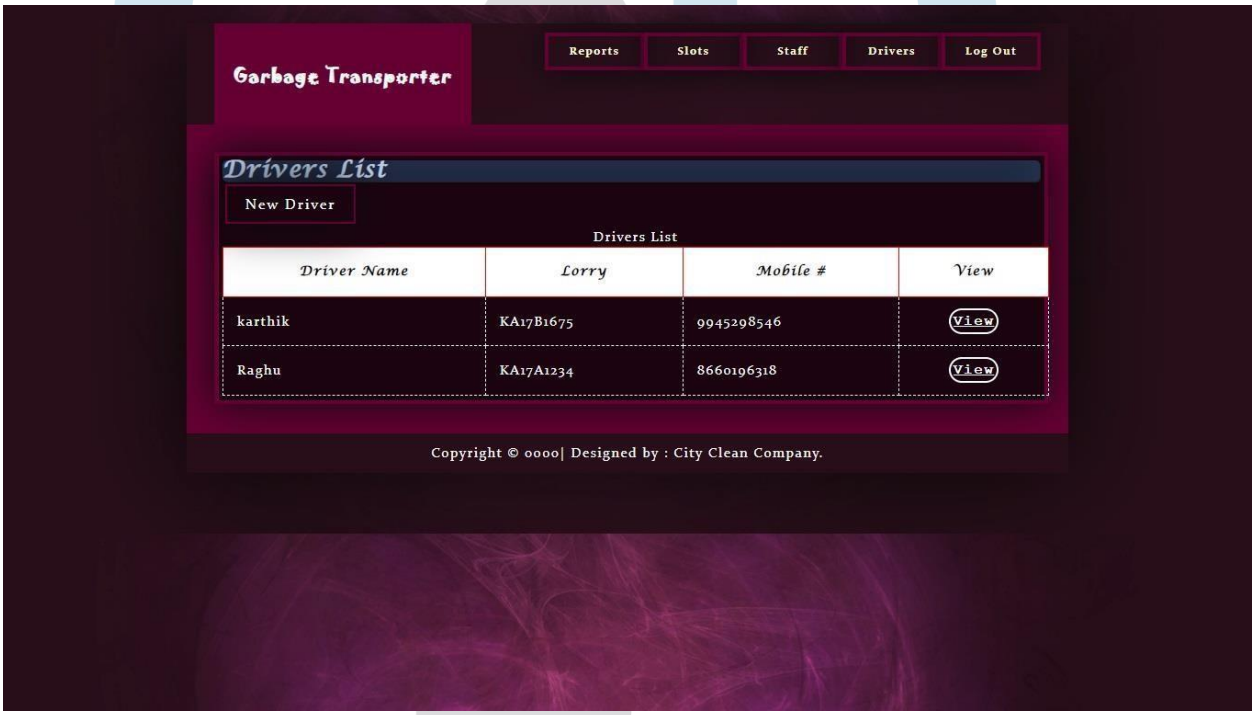

Fig46.1.5 Drivers List

- The 6.1.5 Figure shows the details about Drivers who have been worked for this Application and facilities.
- Admin can handle all the drivers list in this application.

4. Conclusion

By developing it to the point where it can be used in cities, the suggested system is designed to address the issues that people now have with garbage management. This will allow for the control of significant urban problems. Through this app employees of the municipal can allot the work to lorry drivers through the android app. The proposed model based on mobile technology will help to improve the solid waste collection process by providing a powerful model that includes solid waste collection OnDemand and route optimization. Through this app employees can allot dustbins to drivers and they can track the working truck drivers. Finally, I hope that work done by us best.

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