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PROPOSAL PAPER:

**SECURED LOCATION BASED GARBAGE
MANAGEMENT ANDROID APPLICATION**

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ABSTRACT

In this paper, we are proposing a system

One of the major environmental problems has been solid waste management, which sometimes goes uncollected from bins without notice, resulting in overflowing garbage cans and fouling the area around the trash cans. This has a negative impact on society's health since it is a primary factor in the growth of germs, insects, and vermin. This raises the likelihood of humans contracting salmonella, which causes typhoid fever, food poisoning, enteric fever, gastroenteritis, and other serious disorders. Rwanda is a vast country that is expanding with amazing ideas, applying smart concepts and technology, developing a smart lifestyle, and constructing smart cities. As a result, we must also address waste management in a strategic manner.

Smart cities incorporate a variety of mobile or online technology to create a comfortable human habitat. One of these answers is to establish a trash management system that is ecologically friendly, efficient, and effective. The existing garbage collection system involves regular garbage trucks making daily or weekly rounds, which not only do not cover every zone of the city but are also a waste of government resources. The suggested system, in which the administrator manages the trash app for complete online monitoring and analysis of the system. This paper suggests a cost-effective mobile and web-based system for the government to use existing resources to efficiently handle the massive volumes of rubbish collected each day, while also providing a better answer for individuals' difficulty with garbage disposal. This is done by a driver, and the app will give predicted and guided routes for trash trucks. Data will be gathered once the driver updates the status of the job done. For the workforce and citizens, an android or web app is built that essentially allows the user to generate complaints available smart bin. Project for a Waste Management System

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LIST OF ABBREVIATIONS

AES:	Advanced Encryption System
IDE:	Integrated Development Environment
JDK:	Java Development Kit
MD5:	Message-Digest algorithm 5
OS:	Operation System
OTP:	One Time Password
NPC:	National Police College
SDK:	Software Development Kit
SQL:	Structured Query Language
2FA:	Two Factor Authentication

CHAP I: GENERAL INTRODUCTION

1.1 Introduction

We all know that the "Smart City" concept is being given priority nowadays, therefore we are proposing a system which would enhance it. All smart cities combine a variety of portable or web-based solutions to create a pleasant and comfortable human dwelling. One of these plans is to provide an environmentally sound, competent, and appealing waste administration system. Now, the existing situation for garbage/wastage is incompatible if we examine, the current trash collection system integrates routine dump trucks conducting adjustments day by day or week by week, which does not cover every zone of the city and is a completely useless utilization of government assets.

This concept is ideal for saving time and changing the traditional method of trash disposal; thus, this system will provide a cost-effective way with an android application and a web-based system for the government to use available resources to efficiently manage the overall amounts of garbage collected on a regular basis, while also providing a better solution for garbage disposal for many cities. Our Location-Based Garbage Management System for Smart Cities app combines the finest approaches for checking and analyzing data obtained in order to deliver the best and easiest routes produced through maps for garbage trucks/vehicles. For the inhabitants, an android application will be created, which effectively makes trash/waste disposal easier.

1.2 Problem Statement

With the current system, there is not clear communication between garbage collectors' agencies and people who have trashes and bins which they want to throw. As a bad result, the rubbishes start to overflow the containers which leads to bad smell and less cleanness of the cites. Also in some cases, people start throwing rubbishes in the unappropriated locations or in the environment which pollute the cities and cause environment pollutions. On the other hand, the garbage collectors' companies make less profits because of not having real-time information of whether to go to collects trashes, this might reduce their operating hours hence the profit is decreased.

1.3 Objective of the Project

The objectives of the project are divided into two categories, general and specific objectives.

1.3.1 General objectives

The general objectives are to:

- ✓ Develop a system which will help to achieve smart cities with an effective trash collection system
- ✓ Easily connect people, buildings, places with garbage to collect with concerned cleaning agencies

1.3.2 Specific objectives

The project's specific objectives are to:

- ✓ Provide a technique will prevent rubbish from overflowing the containers
- ✓ Improve environmental quality with bad odors and cleanness cities
- ✓ Develop a mobile application which facilitate the payment of trash collection in a secured way
- ✓ Develop a system which help drivers who collect trash to easily know where to go for garbage collection

1.4 Scope and Limitations

During our research, we shall focus more on improving the existing garbage management system based in our country Rwanda and focusing mainly on most populated regions.

The mobile application to be developed also is only an android based, to mean that our research development will be achieved by the help of android operating system.

The last defined boundary is that during the development of our proposed project, we shall implement mobile money as the type of payment in our system as it is the commonly used way and accessible by everyone to make payments.

1.5 Security of Project

To make our system secured, we have enforced different measures for both users and administrator.

- Before saving admins and users' passwords during the registration process, the system will encrypt them by using MD5 hashing as it cannot be decrypted.
- Only registered users can access and using the mobile application to be allowed to submit their reports related to garbage to be collected.
- For the users to proceed with payments, you have to verify and pass the authentication by using fingerprint or password verification.
- For the admins to login into the website dashboard, you they have to complete 2FA (Two Factor Authentication)
- The drivers has access to view only the locations where trashes are available and to confirm the completed locations.

1.6 Organization of the report

This document is composed of 5 chapters classified as follows:

Chapter 1, this chapter provides an overview of the entire project where it contains the general introduction, background, statement of the problem, choice and motivation of the study, general objective, specific objectives, scope of the study.

Chapter 2, this chapter focuses on describing the current system environment mentioning the and analyzing how it works and the problems related to it.

Chapter 3, this chapter describes the methodology used by the researcher to achieve the stated objectives and techniques used to collect data. They will help the research by proving real data from documents and people's experience which will provide guidance to the system solution.

Chapter 4, this chapter presents proposed implementation of the system by explaining how it works, expected results and different diagrams.

Chapter 5, this chapter provide conclusion basing on the conducted research and the outcomes and recommendations to different parties that could be interested in or get advantages from the system.

1.7 Gantt chart

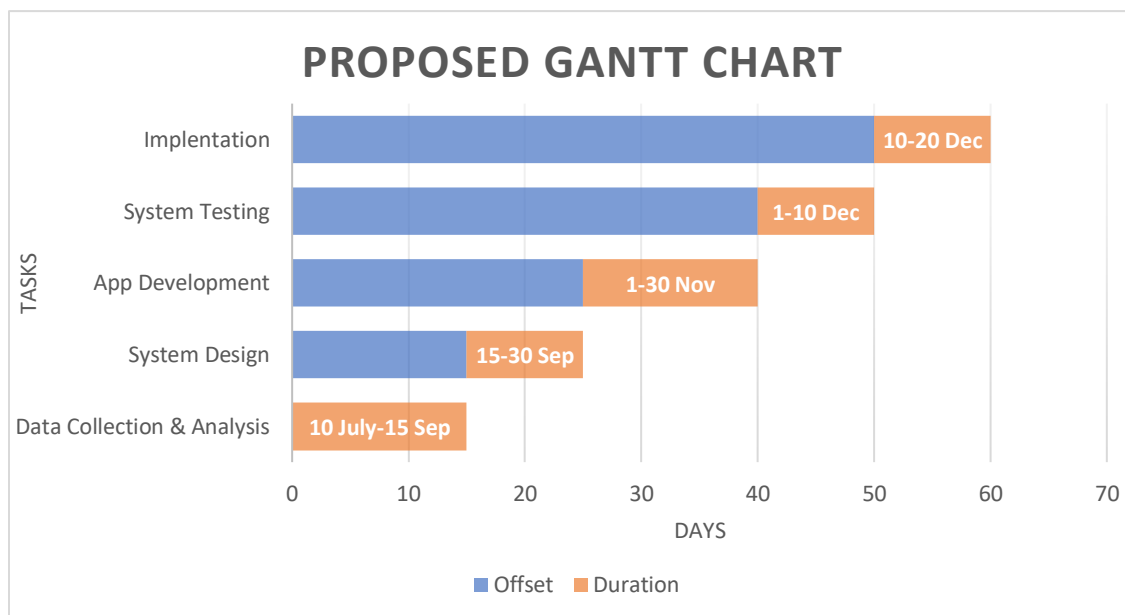


Figure 1: Gantt chart

CHAP II: LITERATURE REVIEW

2.1 Definition of Terminologies

2.1.1 Garbage:

Garbage is human-generated garbage that is thrown owing to a perceived lack of utility. In general, the word excludes bodily waste products, primarily liquid or gaseous wastes, and poisonous waste materials. Garbage is routinely sorted and divided into different types of material that are appropriate for different types of disposals. [1]

2.2 Existing System

Every morning, employees arrive at their desks. There are just not enough garbage cans to go around for all of those people. Hundreds of individuals pass the same place on the streets of cities every minute. The apparent solution is for cleaning employees to stay near garbage cans every day until they full up in order to clean them. This is not a viable option. When the garbage cans are continuously full, there are several noticeable negative consequences. One of the most noticeable symptoms is that the surrounding environment begins to smell and become highly unpleasant.

When the garbage cans are full, individuals place their rubbish on the edges of the cans. The garbage collection procedure is crucial for service providers. The conventional method of physically monitoring rubbish in waste bins is a complex, time-consuming procedure that requires more human work, time, and money and is incompatible with modern technology. Irregular waste management, particularly of home, industrial, and environmental garbage, is a root cause of many human issues such as pollution and sickness, and has a negative impact on living creatures' hygiene. [2]

2.2.1 Disadvantages

- Trucks go and empty containers whether they are full or not, which is time intensive and inefficient.
- Unsanitary environment and appearance of the city
- A bad odor spreads and can cause disease in humans.
- The current approach necessitates a large number of people and is expensive.

2.3 Proposed System

The proposed system is Secured Location Based Garbage Management Android Application.

The data related to the number of available trashes of rubbishes will be submitted by users and collected by the application and stored in a database. This data will be processed and displayed on the dashboard that the administrator may analyze using data analytics, reports will be created for admins so that they can decide when to go to collect the trashed in the appropriate time.

Based on the acquired data, garbage vehicles may be provided routes developed by different algorithms and Google Maps API to effectively navigate through all essential waste bins and eventually reach the disposal location.

For the users to submit the reports about their trashes to be collected, they have to fill the form and provide the type and quantity of available garbage, then the application will calculate and prompt to them the amount to pay. And the vehicle will come to pick the trashes after the users have paid and the garbage are full or enough to be collected. Once the trashes are collected, the drivers will update the finished location and the information will be saved in the database.

2.3.1 Advantages

- This technique will prevent rubbish from overflowing the containers.
- The suggested system will minimize the amount of time required for operations.
- Intelligent garbage management in the smart city.
- Garbage collection vehicles are deployed depending on real needs.
- Cost cutting and resource optimization
- Improves environmental quality
 - Less odors
 - Cleaner cities
- Effective use of garbage vehicles.

CHAP III: RESEARCH METHODOLOGY

3.1 Methodological Approach

It is a specialized data collection and analysis approaches for uncovering new information A research technique is an approach that allows a researcher to map out a systemic procedure to comprehend a phenomenon. Different methodologies must be employed to comprehend an issue or phenomena based on the data available and how relevant the given data is.

In our study we are expecting to use the following data collection methods:

1. Observation
2. Interviews and Focus Groups

3.2.1 Observation method

Observation is a method of acquiring data that involves witnessing behavior, events, or noting physical traits in their natural environment. Observations can be overt. [3]

3.1.2 Interviews and Focus Group method

Interviews and focus groups include chatting face-to-face with subjects about a certain topic or issue. Interviews are usually one-on-one, whereas focus groups are usually made up of multiple people. We will be able to utilize both to collect qualitative and quantitative data.

We will collect input on the current system from people in our target demographic through interviews and focus groups. [4]

3.2 System Requirements

3.2.1 Technologies & Programming languages

- ❖ GPS location
- ❖ Mobile Money
- ❖ Java, XML
- ❖ JavaScript

- ❖ HTML, CSS
- ❖ PHP
- ❖ SQL

3.2.2 Hardware requirements

The system hardware required are:

- ❖ Computers such as laptops, desktop, android phones
- ❖ RAM with 4GB minimum
- ❖ Processor: Intel core or i3 of 2.9HZ minimum
- ❖ Hard Disk with 500GB minimum

3.2.3 software requirements and development tools

The software required are:

- ❖ System type 32 bit or 64bit
- ❖ Android studio
- ❖ WampServer or XAMPP, MySQL
- ❖ VSCode Text editor
- ❖ Android SDK
- ❖ Java - JDK
- ❖ Operating System (OS): Windows 8,8.1,10, or windows 11

CHAP IV: ANALYSIS, DESIGN, AND IMPLEMENTATION

4.1 System Analysis

Problem analysis serves as the foundation for the design and development phases of software development. The problem is examined in order to offer enough information to develop a new system. Large issues are subdivided into smaller ones to make them more intelligible and easier to solve. Similarly, in this project, all tasks are subdivided and categorized

4.2 Working Principle of the Proposed System

The working principle of the proposed system is that the system is divided in two parts, Android based application for user and website dashboard for admins.

4.2.1 System Modules:

4.2.1.1 Administrator

For the system administrator, an admin will be using a web-based application. To login in the system, the admin must have credentials with administration privileges to be able to enter into the dashboard.

Within the dashboard, an admin can perform several operations explained below:

- Login
- View registered users
- Add allowed locations
- Set the supported type of garbage
- Create Garbage bin
- Update/Delete garbage bin
- Set the pricing per garbage type and location pricing
- Set date for sending vehicles to collect the garbage in case they are enough to be collected
- View list of reported garbage to be collected
- View Garbage Report

- View list of payments

4.2.1.2 General Users

For the users, they will have the mobile application installed in their smartphones and each user must be registered to start using the application. For the registration you have to provide your personal information like name and phone number, your current location and a strong password to secure your account.

After completing the registration, users will be redirected to the home page where they can see a list of supported types of garbage and allowed locations.

For users to report that they have garbage in their home or working places, you choose the type of garbage you have and enter the weight and your location. In that case a charging amount will be calculated basing on the entered weight and your current location.

Then user will be redirected to a payment page where you will use your mobile money in order to pay. To confirm the payment, you have to be authenticated and verified using fingerprint scanning.

4.2.1.3 Drivers

Drivers have a mobile application with limited access to view the locations where trashes ready to collected are located and they can be able to go there with their vehicles to pick the trashes. And after, the drivers will have to confirm completed locations through the mobile application and it will be updated in the database so that there will be no conflicts in sending multiple drivers at same locations.

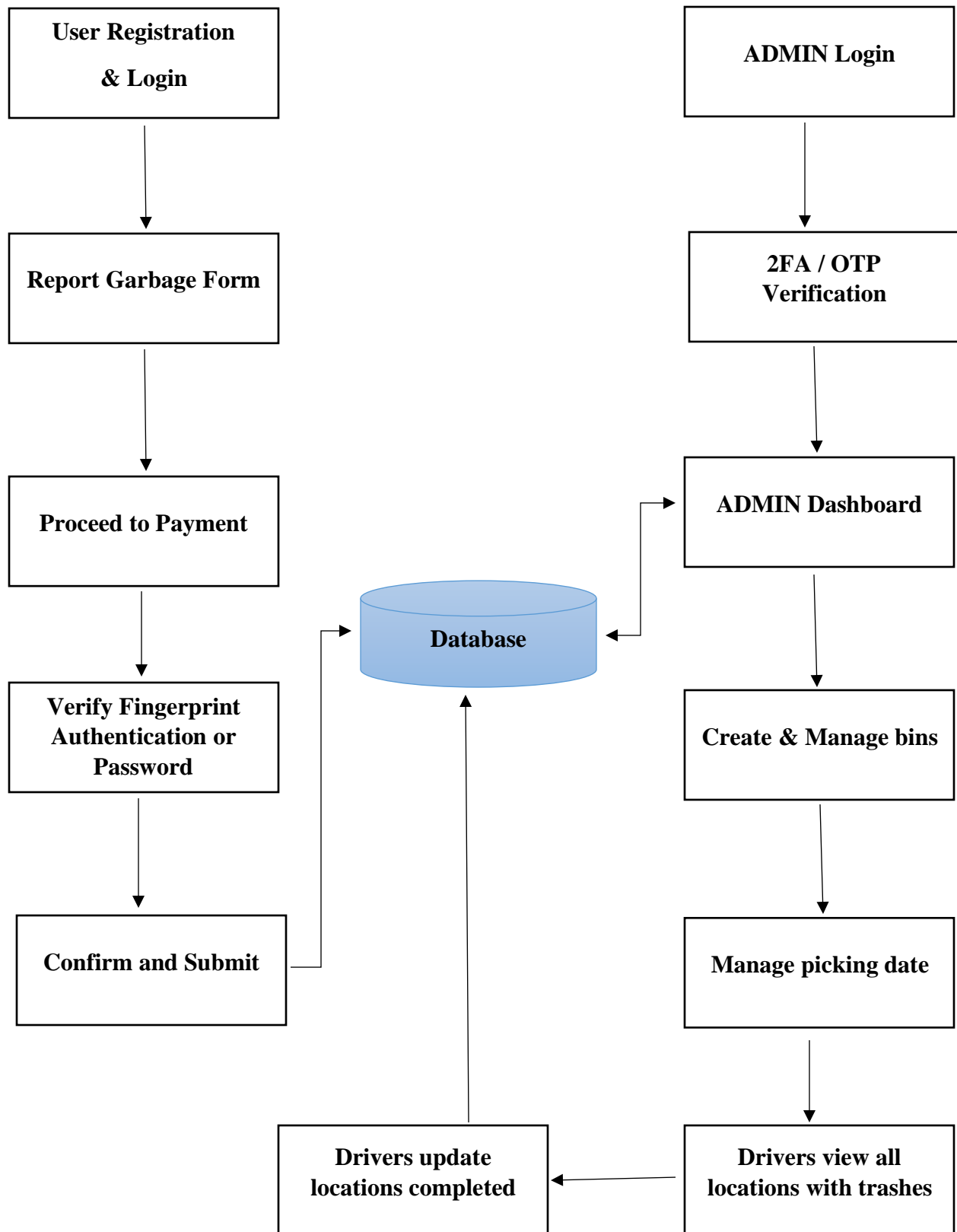


Figure 2: Proposed system diagram

CHAP V: CONCLUSION & RECOMMENDATION

With the proposed system, we shall be able to solve the problems related to garbage management. In light of environmental pollution, we suggest a new generation waste management system and system characteristics in this research to suit the needs. Using this system, the user will be able to notify the appropriate department about the available garbage or bin to collect. More crucially, the department does not need to receive the call; the user only needs to utilize the mobile application and indicate the amount of available rubbish to be collected. Using the Android operating system, the suggested next generation trash management system may adapt to the user's mobility by modifying the place where the system can function. For further researches, we recommend that there can be an integration of sensors in the trashes so that the sensors might detect the level of garbage in the trashes and send an alert to the control system automatically.

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