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BUSITEMA UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING AND INFORMATICS

FINAL YEAR PROJECT REPORT

TITLE: DESIGN AND IMPLEMETATION OF A GSM BASED WASTE MANAGEMENT SYSTEM

BY

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A final year project proposal report submitted to the Department of Computer Engineering in Partial Fulfilment of the Requirements for the Award of a Bachelor's Degree in Computer Engineering of Busitema University.

JUNE, 2024.

DECLARATION

I, Munyangazi Noah, affirm with sincere conviction that this proposal is a product of my original effort and has not been previously presented to any academic institution.

MUNYANGAZI NOAH

Sign.....Date ....1st July, 2024..

APPROVAL

This is to confirm that the project proposal titled "Design and implementation of a GSM based Waste Management " has been conducted under my supervision and is now prepared for assessment.

Signature: .....

Date: 25th June, 2024

DR. GODFREY MIRONDO KIBALYA

Department of Computer Engineering

DEDICATION

I dedicate this proposal report to all waste management professionals striving to improve operational efficiency and sustainability in waste management practices.

ABSTRACT

This report introduces a novel Waste Management System designed to revolutionize waste collection and management practices. The system integrates advanced sensor technology, including the MQ-135 gas sensor, ultrasonic sensor, GSM module, LED display, and LCD screen, all controlled by the Arduino Uno microcontroller.

The Waste Management System employs the MQ-135 gas sensor to detect harmful gases not beyond 0.5 ppm emitted from waste materials, ensuring timely interventions to mitigate environmental pollution risks. Additionally, the ultrasonic sensor accurately measures waste fill levels in trash bins not beyond 22. 5 cm, enabling optimized collection routes and resource allocation.

Wireless communication facilitated by the GSM module allows real-time data transmission to a central management platform, empowering waste management authorities to monitor and control waste collection operations remotely. The LED display and LCD screen provide intuitive visual feedback, enhancing user interaction and system usability.

By leveraging the capabilities of these components, the Waste Management System offers numerous benefits, including improved environmental sustainability, enhanced operational efficiency, and reduced costs associated with waste management. Furthermore, the system's modular design allows for scalability and adaptability to diverse waste management scenarios.

Looking ahead, integrating GIS into the system can optimize waste collection routes, leading to more efficient resource allocation and reduced fuel consumption. Additionally, incorporating sensors for specific waste types, like recyclables, can help identify optimal locations for recycling centers. This holistic approach promises more sustainable waste management systems, supporting environmental protection and resource conservation.

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LIST OF ABBREVIATIONS

CSS: Cascading Style Sheets

GSM: Global System for Mobile Communications

H2S: Hydrogen Sulphide

HTML: Hypertext Markup Language

IMSI: International Mobile Subscriber Identity

IoT: Internet of Things

KCCA: Kampala Capital City Authority

MQ: Gas Sensor Module

NO.: Number

SIM: Subscriber Identity Module

SIMCARD: Subscriber Identity Module Card

URL: Uniform Resource Locator

CHAPTER ONE: INTRODUCTION

1.0 INTRODUCTION

This chapter introduces a groundbreaking initiative, the GSM-based Waste Management System, devised to tackle the prevalent issue of overflowing trash bins and waste decomposition in Kampala. By focusing on monitoring waste decomposition, the system aims to proactively identify and address potential health hazards and environmental concerns before they escalate. Through the amalgamation of sensor technology and data analytics, the system offers real-time monitoring of waste levels and decomposition, enabling timely

intervention to optimize waste collection processes and mitigate environmental pollution. Ultimately, the system strives to elevate public health and sanitation standards in Kampala.

1.1 BACKGROUND OF THE STUDY

Waste management is a critical concern in urban environments worldwide, exacerbated by the rapid growth of cities and population expansion. In Africa, particularly in cities like Kampala, Uganda, effective waste management practices are imperative amidst ongoing urban development [1]. Traditional waste management approaches in Kampala suffer from inefficiencies, inadequate infrastructure, and resource limitations, leading to environmental and health hazards [2].

The consequences of ineffective waste management are multifaceted, ranging from overflowing trash bins to unsanitary conditions and environmental degradation. Decomposing organic waste emits foul odors and attracts pests, posing significant health risks to residents [3]. Moreover, the release of hazardous gases such as hydrogen sulphide (H2S) and ammonia exacerbate air pollution, impacting both public health and environmental quality [4].

In Kampala, current waste management practices struggle with timely waste collection and odor control, resulting in unsanitary conditions and environmental pollution [5]. Conventional methods lack real-time monitoring capabilities, leading to overflowing trash bins and the release of foul odors from decomposing waste [6]. Consequently, residents are exposed to health risks, and the city's cleanliness and hygiene standards are compromised [7].

The completion of the GSM-based Waste Management System project represents a significant milestone in addressing the challenges of waste management in urban environments. By focusing on real-time monitoring and proactive intervention, the system empowers authorities with valuable data for effective waste management strategies. With the project now developed,

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APPENDICES