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FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

TITLE: AN AUTOMATIC TOXIC GAS DETECTION AND ALERTING SYSTEM IN PUBLIC GARBAGE BINS

FINAL YEAR PROJECT REPORT

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A final year project report submitted to the Department of Computer Engineering in partial fulfilment for the award of a Bachelor of Science in Computer Engineering

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DECLARATION

I Masika Jackline BU/UG/2018/4127 declare that this final year project report is original and has not been published or submitted before to any university or higher institution of learning.

Sign …….

Date ……

APPROVAL

This is to certify that the final year project report titled “AN AUTOMATIC TOXIC GAS DETECTION AND ALERTING SYSTEM IN PUBLIC GARBAGE BINS” has been under my guidance and supervision and is submitted to the board of examiners with my approval.

Signature ……...

Date …….

PROF. TWAIBU SEMWOGERERE

Department of computer engineering.

DEDICATION

I dedicate this report to my beloved parents in appreciation for their unconditional love and care, for supporting me since childhood, and for the spirit of hard work, courage, and determination they taught me which have enabled me to finish my computer engineering program through the many ups and downs.

I also dedicate it to my beloved friends Nantale Tracy Cynthia, Mwarisi Brian Arthur, Namuganga Joyce, Namulindwa Linda Evelyn, BCT class 2022, among others for the motivation and courage they have always given me to focus on my education.

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May the Almighty God reward you abundantly.

ABSTRACT.

Uganda is facing rapid urbanization of 5.1% per annum, leading to overcrowding and the development of slums and informal settlements with poor waste management practices. The growing number of people living in urban areas has led to increased waste generation capacities. The competence of the city managers to regularly monitor the waste bin is low.

Mismanagement of waste in public garbage bins exposes the area to diseases such as coughing, shortness of breath, and eye irritation due to the high concentration of toxic gases produced by the decaying garbage in the garbage bin which pollutes the air.

To minimize people's health implications caused by air pollution due to toxic gases produced by decaying garbage and to improve the cleanness of society, an automatic toxic gas detection and alerting system in public garbage bins is designed, which detects the level of toxic gases produced by the decaying garbage by the use of gas sensors, MQ-136, MQ-137, TGS-2611 for hydrogen sulfide, ammonia, and methane respectively, detects the level of the garbage with the help of ultrasonic sensor and sent to the authorized agency for garbage collection through GSM system when the toxic gas levels and garbage levels exceed the threshold with the GPS location of the public garbage bin. An ultrasonic sensor is used to detect the presence of the garbage and a servo motor automatically opened and closed the bin. LCD for displaying the values. The GSM, GPS, LCD, Servo motor, and the peripheral sensors used are interfaced through the Arduino microcontroller.

This minimizes peoples' health implications due to air pollution from the decaying garbage, makes the environment smart, clean, and safe, and keeps the garbage collection team updated about the status of the public garbage bin.

LIST OF ACRONYMS

GSM	Global System for Mobile Communication
GPS	Global Positioning System
NH_3	Ammonia
H_2S	Hydrogen Sulfide
SMS	Short Message Service
FDMA	Frequency Division Multiple Access
TDMA	Time Division Multiple Access
LCD	Liquid Crystal Display
LC	Liquid Crystal
CRT	Cathode Ray Tube
RFID	Radio Frequency Identification
RF	Radio Frequency

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CHAPTER ONE.

1.0 INTRODUCTION.

1.1 Background.

Waste management is a local issue with global implications. As the world's population continues to grow, so does the amount of waste produced. In 2015, the world generated 2 billion metric tons of solid waste. This number is expected to grow to 3.4 billion metric tons by 2050. In low-income countries, the amount of waste is expected to increase by more than three times by 2050.[1]

Uganda is facing rapid urbanization of 5.1% per annum, leading to overcrowding and the development of slums and informal settlements with poor waste management practices.[2]

Kampala Capital City Authority (KCCA) acknowledges that the amount of Solid waste generated overwhelms its capacity to collect and dispose given its enormous collection costs. Out of 1,200– 1,500 tonnes of garbage generated per day, only 400-500 tonnes are collected giving a collection efficiency of only 40%. This implies that 60% of Solid waste generated daily is not properly collected and disposed which has resulted in indiscriminate disposal by the public.[2]

The growing number of people living in urban areas has led to increased waste generation capacities. The competence of the city managers to regularly monitor the waste bin is low. Mismanagement of waste like leaving the bin open in an area exposes the area to natural disasters like the outbreak of diseases such as coughing, shortness of breath, eye irritation and headache since the bad smell from the open garbage bin pollutes the air.

We frequently observe garbage bins being filled over and additional waste materials being disposed and accumulated around the bin in different cities of Uganda. That improperly disposed garbage will be the dwelling for the various number of dangerous micro-organisms, insects, and mosquitoes to breed on. Because of this, severe and contagious disease is stimulated and also bad smell comes out of it and may cause illness to human beings. [3]

Sometimes people throw already decaying garbage and others decay while in the garbage bin, this decaying garbage produces toxic gases like hydrogen sulfide, methane, and ammonia. High concentration of methane and a bad/foul smell from hydrogen and ammonia results in adverse

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