A SMART APPLICATION FOR MUNICIPAL SOLID WASTE RECYCLING

ODETOLA, AZEEZ OPEYEMI
(21PCG02290)
B.Sc. Computer science, Tai Solarin University of Education, Ogun state

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A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE (M.SC) DEGREE IN COMPUTER SCIENCE IN THE DEPARTMENT OF COMPUTER AND INFORMATION SCIENCES, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY, OTA, OGUN STATE, NIGERIA.

AUGUST, 2023

ACCEPTANCE

This is to attest that this dissertation is accepted in partial fulfilment of the requirements for the award of the degree of Master of Science in Computer Science in the Department of Computer and Information Sciences, College of Science and Technology, Covenant University, Ota, Nigeria.

Miss Adefunke F. Oyinloye
(Secretary, School of Postgraduate Studies) **Signature and Date**

Prof. Akan B. Williams
(Dean, School of Postgraduate Studies) **Signature and Date**

DECLARATION

I**, ODETOLA, AZEEZ OPEYEMI (21PCG02290),** declare that this research was carried out by me under the supervision of Dr. Olamma U. Iheanetu of the Department of Computer and Information Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria. I attest that the dissertation has not been presented either wholly or partially for the award of any degree elsewhere. All sources of data and scholarly information used in this dissertation are duly acknowledged.

ODETOLA, AZEEZ OPEYEMI

Signature and Date

CERTIFICATION

We certify that this dissertation titled "**A SMART APPLICATION FOR MUNICIPAL SOLID WASTE RECYCLING**" is an original research work carried out by **ODETOLA, AZEEZ OPEYEMI (21PCG02290)** in the Department of Computer and Information Sciences, College of Science and Technology, Covenant University, Ota, Ogun State, Nigeria under the supervision of Dr. Iheanetu O.U. We have examined and found this work acceptable as part of the requirements for the award of Master of Science (M.Sc.) in Computer Science.

Dr. Olamma U. Iheanetu
(Supervisor) **Signature and Date**

Prof. Olufunke O. Oladipupo
(Head of Department) **Signature and Date**

Prof. Adebukola S. Onoshoga
(External Examiner) **Signature and Date**

Prof. Akan B. Williams
(Dean, School of Postgraduate Studies) **Signature and Date**

DEDICATION

I dedicate this work to the Almighty God, for His infinite grace over my life.

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First and foremost, I want express my gratitude to the Divine Creator for bestowing upon me the mercy and resilience that facilitated the successful and efficient completion of this research endeavor. I extend heartfelt appreciation to my parents and siblings for their unwavering affection and assistance.

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ABSTRACT

Sustainable municipal solid waste (MSW) management is a critical challenge faced by rapidly urbanizing regions, such as Lagos, Nigeria. The negative impacts of unchecked waste generation and poor waste disposal practices have become increasingly evident, necessitating innovative solutions to harmonize economic growth with environmental sustainability. This thesis proposes an IoT-based system to optimize MSW management in Lagos, Nigeria, by leveraging smart bins and the Analytic Hierarchy Process (AHP) for waste ranking. To address these challenges, the proposed IoT-based system incorporates smart bins equipped with weight sensor, microprocessor, and IoT connectivity. The system empowers households to create pickup requests and enables recyclers to set preferences for waste collection, optimizing resource allocation and efficiency. Additionally, the system uses AHP to systematically rank available recyclable waste, guiding recyclers' decision-making process. The system represents a transformative approach to municipal solid waste management in Lagos, Nigeria. Successful implementation of the system will require collaboration with local stakeholders (recyclers and households) and continuous improvement based on stakeholders' feedback. This research lays the groundwork for future advancements in end-user sorting as a waste management practice and serves as a model for other urban areas facing similar challenges.

Keywords: Municipal solid waste, Recycling, Analytical hierarchy process Machine learning, Forecasting, Smart cities.