ClassiWaste: A Mobile Application for Accurate Waste Segregation Using Image Recognition Technology

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1 Overview

As the Philippines continues to modernize and urbanize, waste management has emerged as a critical environmental issue, affecting both rural and urban communities. According to Statista.com, the country produced over 59.24 thousand tons of waste per day in 2022. The combination daily waste production, rapid population growth, and lack of awareness regarding waste segregation has significantly contributes to environmental degradation.

This thesis proposes using technology to address waste management challenges, particularly waste segregation. By utilizing the widespread use of smartphones among Filipinos, this study aims to enhance public awareness and improve waste management practices. The proposed solution is the development of an app that enables users to accurately identify and categorize waste items, thereby facilitating proper waste segregation.

The app employs advanced image recognition technology to scan waste items and determine their classification, such as biodegradable, non-biodegradable, recyclable, hazardous, or non-trash. It provides real-time feedback on the appropriate waste bin for each item, simplifying the segregation process and educating users on proper waste management.

This thesis will explore the development, deployment, and potential impact of the waste management app, focusing on its technological framework, user interface design, machine learning models for image recognition, and overall effectiveness in promoting sustainable waste disposal habits.

2 Rationale

In today's world, waste generation is gradually increasing and it has become a significant environmental problem globally. Improper waste management leads to many environmental and health issues including pollution, spread of diseases, depletion of natural resources, and habitat destruction. It also contributes to climate change by increasing greenhouse gas emissions from decomposing of waste in landfills. Despite the implementation of numerous plans and technologies to address this issue, there remains a considerable lack of public awareness regarding proper waste segregation. Many individuals lack knowledge or tools to correctly correctly identifies whether an item is recyclable, non-biodegradable, or biodegradable, leading to improper disposal practices. Our research revealed that existing apps often provide general information or require manual input, which can be time consuming and error-prone.

To address this issue, we propose an innovative solution to enhance public awareness and engagement in proper waste segregation by simply taking a simple photo, this solution will empower individuals to make the decision about waste disposal. Thus leading to improved cycling rates, reduced environmental and health impact and a more sustainable future.

The rationale behind this study is to create an accessible, user-friendly tool that closes the lack of knowledge in waste management, enabling people to easily dispose their waste properly.

3 Significance

The programmed system holds significant potential as it seeks to address real-world environmental challenges through technological innovation. The development of a system capable to categorizing waste as biodegradable, non-biodegradable and recyclable will be instrumental in enhancing of sorting practices, thereby contributing to effective waste segregation. The following outlines the benefits of the system to various groups.

- **For students**: The system will enrich students' learning experiences in waste management, aiding their understanding of waste segregation and fostering greater environmental awareness.
- **For educators**: This tool will serve as a valuable resource for teachers, particularly those instructing in environmental science or related subjects. It can be integrated into teaching strategies to enhance engagement and effectively promote proper waste segregation practices.
- **For individuals**: The system will increase individual awareness regarding waste segregation, encouraging healthy environmental practices beginning at home, which can have a positive ripple effect on communities.
- **For environmentalists**: This system will support environmental advocates in promoting initiatives related to proper waste management, providing a practical tool for awareness campaigns.
- **For waste management professionals**: The system will aid in the sorting and collection of waste, improving recycling processes in facilities, and ensuring the proper handling of waste disposal.
- **For government authorities**: The system will be valuable for government efforts to promote waste sorting, enhancing waste management and recycling programs within communities.
- **For future researchers**: This system may inspire future researchers to build upon this work, developing new technological solutions that contribute to environmental sustainability.

4 Scope and Delimitation

The research aims to develop and evaluate a mobile application designed to assist users in waste segregation by recognizing and categorizing waste as recyclable, biodegradable, or non-biodegradable. The app will utilize image recognition technology alongside a comprehensive database of waste items to ensure accurate classification. Additionally, the study will assess the effectiveness of the user interface in guiding users, enhancing environmental awareness through educational content.

The scope of this study is limited to the Philippines or to other aspects of waste segregation. The research will not address other facets of environmental sustainability outside of waste management. Limitations of the study include the potential for misclassification due to the inherent challenges of image recognition technology. Furthermore, the app's effectiveness may be constrained by the initial comprehensiveness of its database, which may not cover all waste items users might encounter.