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SURVEY ON LOCATION-BASED WASTE MANAGEMENT SYSTEM APPLICATION USING FLUTTER

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ABSTRACT

This project introduces a dynamic Flutter mobile application aimed at revolutionizing waste management in urban environments. The application leverages location-based services to provide users with real-time alerts regarding the arrival of garbage collectors, ensuring timely and efficient waste disposal. Additionally, it offers a feature to locate the nearest disposal facilities, catering to users who may be unfamiliar with proper waste management practices. The application's user-friendly interface and intuitive design aim to bridge the gap between residents and waste management authorities, ultimately fostering a more sustainable and organized waste management ecosystem in urban communities. This innovative solution exemplifies the potential of technology in addressing critical environmental challenges. Location-based waste management systems use GPS and other technologies to track waste collection and disposal activities. Location-based waste management systems can also help to educate the public about waste disposal practices and encourage recycling and composting.

Keywords: GPS Tracking, Garbage Disposal, Smart City, Waste Management, Flutter, Mobile Application.

I. INTRODUCTION

Nowadays, Waste management is a global issue. All countries need to set up robust regulatory waste management. India has a national waste management policy, but still, smaller cities struggle with waste management. Traditional waste management systems are often inefficient and ineffective, leading to environmental pollution and public health problems. The rapid urbanization and population growth in contemporary cities have led to an unprecedented surge in waste generation, posing significant challenges for effective waste management systems. In response to this pressing issue, this project introduces a cutting-edge Flutter mobile application designed to revolutionize waste management practices. This innovative application capitalizes on location-based technology to provide users with real-time notifications regarding the arrival of garbage collectors, ensuring timely and efficient waste disposal. Moreover, it offers a crucial feature allowing users to identify the nearest disposal facilities, catering specifically to those who may lack familiarity with proper waste management protocols. This introduction will delve into the critical need for such a solution, outlining the prevailing issues in waste management, and emphasizing the potential impact of this mobile application in streamlining the process and promoting sustainable waste practices in urban communities. This project endeavors to contribute to a cleaner, more sustainable urban environment by addressing the challenges posed by ineffective waste management.

1.1 Android Applications: An Android application is software specifically created to operate on an Android device or emulator. It is developed to function on the Android platform, which is tailored for mobile devices. Typically, Android applications are designed for smartphones or tablets running on the Android OS. They are primarily programmed using languages like Java, Kotlin, or Dart Flutter within the official development environment, Android Studio. Upon completion of the programming process, the application is compiled into an Android package (.apk) using the Android Asset Packaging Tool (AAPT). Any Android application installed on a mobile phone has its file extension in .apk format.

1.2 Flutter software platform: Flutter encompasses a suite of application programming and development tools, offering a comprehensive framework in the Dart Flutter language. This framework is specifically designed for creating high-quality user interfaces while equipping developers with efficient tools to expedite the process of building complete applications. The core component of Flutter is its mobile SDK. It's worth noting that Flutter was conceived from the ground up and written in both Dart and C++. Google introduced it in early 2017,

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and since then, it has garnered substantial acclaim and success. Flutter is deeply rooted in the Dart language, a programming language initiated by Google in 2011 [11][12][14][16].

II. RELATED WORK

2.1 Dr. T. M. N. Vamsi, Mr.G.Kalyan Chakravarthi, Mrs. Pratibha Lanka, Mr.B.Divakar

This paper introduces a significant application named the Smart Garbage Monitoring and Disposal Support System (SGMDSS), leveraging Internet of Things (IoT) principles to enhance daily living. Properly handle points like ESP8266 Wi-Fi modem, Ultrasonic Sensor, Arduino board, and a GSM module, which is a cost-efficient and economic smart garbage collection system. With the widespread availability of mobile communication and internet access, there is a growing opportunity to remotely control devices. The proposed SGMDSS integrates IoT with traditional waste management, simplifying garbage bin monitoring. This system offers an innovative approach, automating waste monitoring and disposal support. It notifies cleaning personnel via an Android application about the garbage levels in bins and provides the shortest route to bins nearing capacity. The system utilizes components like an ESP8266 Wi-Fi modem, an Ultrasonic Sensor, an Arduino board, and a GSM module, ensuring cost-effectiveness.

2.2 Harini P K S1, Ramya S1, Yamini R2

The paper discusses the need for efficient garbage management systems in smart cities, emphasizing the inefficiency of the current weekly garbage collection by routine trucks. It proposes a mobile and web-based system that uses smart bins and cloud-based technology to optimize garbage collection routes. This system also includes mobile apps for government personnel and citizens. The smart bins are equipped with sensors and Raspberry Pi technology to monitor their fill levels, and the data is analyzed on a server. The system features client and admin dashboards, a workforce application for cleaning staff, and a client application for citizens to locate nearby bins. Overall, the paper presents a comprehensive solution to improve waste management in smart cities, addressing issues like littering and unpleasant odors.

2.3 P. Deepa, Kavitha Subramani, M. Shaanvanthi

The paper discusses the importance of efficient waste management systems in smart cities, noting that existing waste collection methods are often inefficient and fail to cover every area of the city. It proposes a cost-effective mobile or web-based solution for governments to manage daily garbage collection while improving convenience for citizens. The proposed system is described as a "Location-Based Garbage Management System for Smart Cities." It involves the development of an Android or web application for government personnel and citizens, offering features such as optimized waste collection routes, finding nearby bins, and promoting waste segregation. The paper also outlines the historical evolution of waste collection methods.

In summary, the paper highlights the waste management challenges in smart cities and proposes a solution that combines technology, incentives, and efficient waste collection to address these issues.

2.4 Abdalbasit Mohammed Qadir, Peter Cooper

The paper discusses the development of a cross-platform cargo tracking system using Google Flutter technology for mobile applications compatible with Android and iOS. The system utilizes GPS for accurate cargo location tracking and integrates Google Map API to display this information to clients. A web-based application is also created for client access. The paper emphasizes the importance of cargo tracking in the transportation industry and the benefits of cross-platform development for cost and time savings. The client-server architecture is explained, with mobile apps, GPS tracking, a server, and the web-based application as key components. The system enhances transparency and client confidence. Future work may involve additional security features and real-time notifications.

2.5 Carlos Mayorga, Cristina Gomez, Rafael Kobayashi, Jorge Brieva, Hiram Ponce, Ernesto Moya-Albor

The paper addresses the growing issue of increasing garbage levels in cities, leading to worldwide pollution and health problems. It introduces a solution in the form of a mechatronic garbage collector that can autonomously detect and pick up garbage in a specific area using a camera and sensors. The objective is to reduce the health risks for both garbage collectors and citizens and mitigate the impact of pollution. The paper highlights the unique aspects of this project, including its affordability and functionality, which go beyond existing cleaning robots that only handle small particles. The robot's design combines a mobile base with obstacle avoidance

capabilities and a manipulator for picking up garbage. The paper outlines the problem, explains the robot's design, and discusses the results of experimentation. It concludes by emphasizing the importance of addressing the garbage issue and proposes future work in this area.

2.6 Muhammad Ghazali, Murizah Kassim, Norsuzila Yaacob, Azlina Idris, Shuria Saaidin

The paper discusses the development of a mobile application that tracks and alerts both the community and local authorities about garbage collector truck schedules using Google Maps. The motivation for this project stems from issues with poorly managed or delayed garbage collection, resulting in unpleasant odors and uncollected waste in residential areas. The mobile app is designed to provide real-time information on garbage collection schedules and track the location of garbage collector trucks. The paper also presents a prototype mobile application for garbage collection, with an analysis of location data and truck punctuality. This system offers consistent mapping services, interactive map displays, and real-time tracking of the trucks. It can serve as a monitoring platform for local authorities, improving the quality of service and addressing residents' concerns regarding garbage collection delays, as specified by the city council.

2.7 Shashika Lokuliyana, Anuradha Jayakody, G.S.B. Dabarera, R.K.R. Ranaweera, M.Perera, Panangala

The paper highlights the significance of proper waste management in urban environments, particularly in the context of crowded cities like Colombo. It emphasizes the shortage of garbage bins compared to the high population of people who generate waste daily. This results in overflowing bins and littered surroundings. The paper argues that simply increasing the number of cleaning staff is impractical and costly. The negative effects of overflowing garbage bins are discussed, including bad odors, unsanitary conditions, and the spread of diseases. The paper proposes the use of IoT (Internet of Things) solutions to create a smart waste management system for municipalities, involving citizens, workers, and administrators. Key features of the proposed system include adapting to growing populations by increasing the number of bins, route optimization to prevent overflowing, monitoring the use of harmful materials, applying waste reduction techniques, and establishing recycling stations to generate profits. The ultimate goal is to create a cleaner city, provide citizens with a convenient waste disposal method, and enable the government to save resources and potentially profit from recycling efforts in the long term.

2.8 Shinjini Ray, Sayan Tapadar, Suhrid Chatterjee, Robin Karlose, Sudipta Saha, Dr. Himadri Nath Saha

The paper indicates the application of the Internet of Things (IoT) in waste management, specifically in monitoring and optimizing the status of dustbins. It introduces the concept of "smart" dustbins that can detect when they are full and request timely cleanup, aiming to solve the problem of overflowing garbage and improve hygiene. This smart waste management system uses IoT sensors to measure dustbin fill levels, sending data to the cloud for storage and analysis. Web APIs are utilized to configure and track dustbins, reporting when they are full and when they have been cleaned. The potential for data analysis and machine learning to optimize routine cleanup schedules. It discusses using K-means clustering to determine optimal cleanup times and recommends new dustbin installations in problematic areas. Ongoing research aims to enhance the system's effectiveness, cost-efficiency, and integration with larger urban environments.

2.9 Aaditya Jain, Ranu Bagherwal

The paper indicates the utilization of IoT technology in waste management represents a significant step toward addressing the complex challenges faced in urban areas. One of the central aims of this system is to optimize waste collection while reducing costs. IoT sensors play a vital role in determining the most efficient time to empty waste bins, ultimately cutting down on the number of vehicles and containers required. The introduction of smart waste management, through a user-friendly application, empowers the public to actively participate in keeping their city clean. It provides real-time information about the locations and status of nearby dustbins, making it convenient for residents to make informed decisions about waste disposal. The future enhancements of this system are equally promising. It includes plans to segregate waste into categories, such as dry and wet waste, thereby encouraging responsible disposal and recycling practices. Additionally, regular collection of wet waste, even if bins are not full, is set to tackle issues related to odor and pests. The implementation of IoT sensors in this context offers an efficient, data-driven solution to waste management, ensuring a cleaner and healthier urban environment for all.

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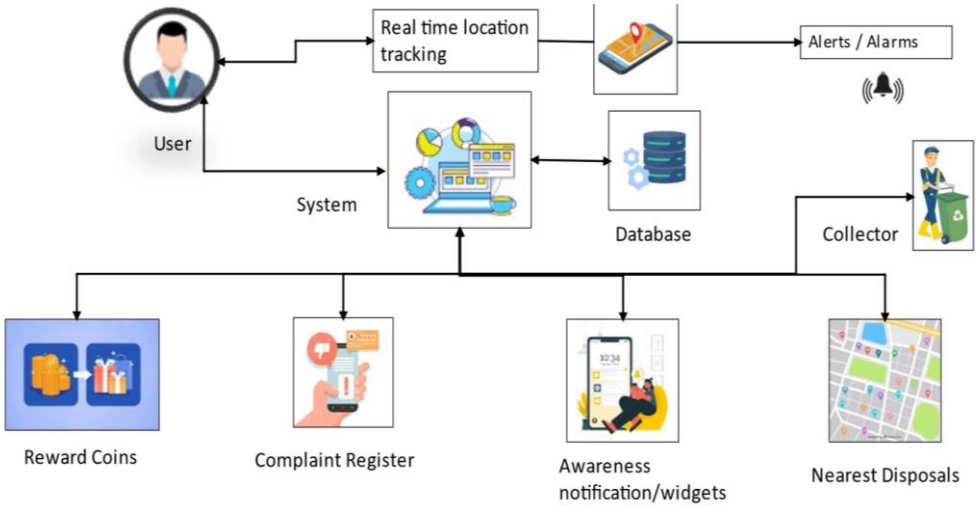
2.10 Luís C. M. Varandas, Binod Vaidya, Joel J. P. C. Rodrigues

This research paper discusses the utilization of advanced mobile communication devices, particularly those equipped with GPS technology. The paper outlines how mTracker enables users to set specific points of interest and establish safety radius zones, allowing them to monitor the location of individuals or devices. In the context of potential emergencies, the application allows users to send distress calls with GPS coordinates via SMS. It can also detect unauthorized SIM card changes, further enhancing security. Furthermore, the paper mentions the development of a PC application, "mTrackerMap," which displays the monitored positions on Google Maps. This feature allows users to track and review device locations over time. The research paper is structured with a comprehensive review of related work in mobile and ubiquitous computing, location-based services, and similar approaches. It details the application's development, requirements, architecture, and employed technologies. The paper provides an evaluation of the application's functionality, user interface, and experimental validation.

III. PROPOSED ALGORITHM

The algorithm introduces a dynamic Flutter mobile app for urban waste management. It utilizes location-based services to notify users about garbage collector arrivals in real time, ensuring prompt disposal. Additionally, it helps users find the nearest disposal facilities, aiding those unfamiliar with proper waste management. The app's user-friendly interface bridges the gap between residents and authorities, enhancing urban waste management. This innovative solution showcases technology's potential in tackling environmental challenges, utilizing GPS and other technologies for tracking waste activities and promoting recycling and composting education.

IV. SYSTEM ARCHITECTURE



V. EXISTING SYSTEM/OPEN ISSUES

Currently, the prevailing waste management systems often lack real-time technology integration and location-based services, leading to several critical challenges. Firstly, residents and businesses are frequently unaware of the closest disposal stations, resulting in inefficient waste disposal practices. This contributes to environmental degradation and poses health risks to communities. Secondly, the absence of real-time alerts for garbage collector arrivals hinders timely waste collection. As a consequence, garbage accumulates, leading to unsightly and unsanitary conditions. Moreover, a significant proportion of the population remains uninformed about proper waste management protocols, perpetuating suboptimal practices. This knowledge gap exacerbates the existing waste management issues. In light of these limitations, there is an urgent need for an integrated, location-based waste management system to alleviate these pressing concerns and revolutionize waste management practices.

VI. CONCLUSION

In this paper, by providing users with real-time alerts for garbage collector arrivals and facilitating the identification of the nearest disposal stations, we have sought to bridge the gap between individuals and

efficient waste management solutions. This innovative system addresses the immediate need for timely waste collection and tackles the larger issue of public awareness and education regarding proper waste management practices. Through the seamless integration of technology and practical waste management techniques, our solution stands poised to enhance the overall cleanliness and sustainability of urban environments. As we look ahead, further refinements and expansions, including the incorporation of emerging technologies, promise to elevate the effectiveness and reach of our waste management system, contributing to a cleaner, healthier future for our communities.

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