

## Mobile Application for Locating Nearby Garbage Collection Sites

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### ABSTRACT

Human actions produce waste. The placement of garbage cans is an issue in the Special Region of Yogyakarta. The public is often unaware of the location of garbage cans. The Nearest Garbage Sites Search System (SIPTeST) solves an existing problem. The objective of developing SIPTeST is to enable the public to determine the location of the nearest garbage can based on their current location. SIPTeST is based on both mobile and web platforms. The SIPTeST website is constructed with PHP and MySQL. Android Studio is used to build SIPTeST mobile. In addition to using the user's location, the system uses the user's location to add garbage bin locations. SIPTeST implements location-based services (LBS). This system's output is that it assists users in locating the closest garbage cans and viewing photos of their locations. The user can also observe the location history of previously viewed trash cans. Then, users who encounter problems can also submit reports.

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## 1. INTRODUCTION

Technology is a tool that humans use to make their daily activities simpler [1]. Using information technology, every individual has access to real-time information. One discipline that can utilize information technology to facilitate public access to information is public service. A trash can is one of the public utilities that the public is unaware of. In Indonesia, public garbage cans are difficult to locate. Human irresponsibility regarding refuse can result in environmental problems and damage, such as littering [2]. Garbage is a frequent problem in cities with concentrated populations. Garbage is a consequence resulting from human activity [3]. By the definition of the term, it can be deduced that every human activity will inevitably generate refuse. According to a report from the Ministry of the Environment, the amount of refuse generated each year will continue to rise with human activity and consumption expansion. According to the Ministry of Environment's report, each Indonesian resident's average amount of refuse generated is 2.5 liters [4].

The placement of garbage cans in the Special Region of Yogyakarta is a problem associated with their existence. The location of garbage cans is frequently unknown to the public. It is evident from the waste piles frequently deposited in areas that are not landfills or legal landfills. The proliferation of illegal temporary landfills is proportional to community ignorance regarding the location of integrated legal refuse bins. In addition to the difficulty of locating legal landfills, waste classification is a significant issue in Indonesia's major cities. As processed human waste, garbage has been shown to be harmful to surrounding life; therefore, waste management must be meticulously and seriously considered. The decomposable waste should be sent to

a landfill where it can be reprocessed or buried. Waste that cannot decompose can be reprocessed into other completed products or destroyed in accordance with environmental regulations [5]. Due to the complexity and significance of waste management, improper waste management by the community's residents will significantly threaten the community's environment and social life.

This application's waste categories are separated into three (3) sections: organic waste, inorganic waste, and hazardous and toxic (B3). Organic waste that can decompose and be accepted by nature without being processed is refused. This waste must be processed before it can be destroyed or reprocessed into derivatives of other human-processed finished goods, for instance, plastic waste, which can be processed into plastic materials. other. Household waste materials harmful to the environment or other people, such as shattered glass, used oil, and batteries, can be considered materials for hazardous and toxic products (B3) [6]. As an application whose purpose is to assist the community in locating integrated trash cans that can separate refuse by specific categories. The waste classification can be utilized by individuals who independently process waste. Users can view the location of inorganic refuse so that it can be collected by collectors and recycled into other finished products.

By developing a mobile application for the nearest garbage can, information regarding the location of the nearest trash can be compiled. These applications can be developed with minimal memory and processor resource requirements and high reliability [7]. The author's solution to the problems is to develop the Nearest Garbage Sites Search System, which allows users to locate the nearest waste can base on their location. Those who have registered and logged in can also add locations for garbage cans not currently included in this application. The user who will add the location of the garbage cannot simply add any trash can. The added garbage must be in a public trash can, such as one provided by the local government/related agency. This application is anticipated to assist the community in reducing and eliminating littering.

Research on a new garbage can location search application is available in Jambi City. This study describes the LBS (Location-Based Service) system's applicability to applications for the city of Jambi [8]. The LBS function makes it simple for the application to provide the user with a navigation map to the nearest garbage can. Researchers observe that the application lacks a trash can categorization function based on trash class. Research pertaining to location search applications utilizing LBS is typically utilized by Companies, Agencies, and Public Facilities to make it easier to locate the location of their respective offices. As an example of using an application that uses LBS, namely the Android-based Hospital Search Application in Solo City [9], the Development of a Location-Based Service Application for Information and Search for Tourism Locations in Cimahi City Based on Android [10], the Android Application for Searching Places of Worship in the Bekasi Region [11], Utilization of Geofence to Find the Location of the Nearest Tire Repair Shop based on Android [12], Application System for Searching the Nearest Parking Location Using Location Based Service Based on Android [13], Location Based Service Application for Searching Places in Manado City Based on Android [14], Location Based Service (LBS) Application for Taman Mini Indonesia Indah (TMII) Based on Android [15], Application for Searching for Places to Eat Using Location Based Service on Android [16], Application for Mapping Landfill Locations of Madiun City Based on Android with the Assistance of Geographic Information Systems (GIS) [17], Location-Based Service Applications for Android-Based Public Facilities [18], Mobile-Based Digital Map Location Marking Applications for Geographic Information Systems (GIS) on Android Smartphones [19]. Examples of extant applications illustrate how application systems that utilize LBS can assist users in locating the nearest location, allowing users to locate the desired location point quickly and precisely within their application.

In addition to the above-mentioned place search applications, the nearest trash can search application utilizes a data input system developed based on previous research, namely Android and Web Service Based Community Complaint Service Application Prototypes [20], Mobile Application Prototype Monitoring Garbage Complaint Reports [21], and Analysis and Android-Based Waste Management System Design Through Community Participation in Rappocini District [22]. The application explains that there is user participation in resolving various problems via the application and attaching relevant documents such as photographs. The closest trash can search application uses previous research to input trash cans from the user so that the user can enter the location of a new trash can along with an image of a trash can not yet available in the nearest trash can search application.

The researcher read Firmansyah Aldi's research titled Application of Android-Based Plastic Refuse Recycling Guide [23] to classify the refuse that can be entered into the application. The application explains which categories of waste can be recycled, allowing you to recycle anything that can be thrown away or become trash. The Android-based plastic waste recycling guide application contains general information about the varieties of plastic waste, which is one of the categories of trash that can be displayed to users to locate the nearest trash can.

The researcher will develop an LBS-based application that can assist users in navigating to the location of the nearest refuse can from the user's current location, based on several studies that served as the author's

reference in developing the application. The map displayed on Google Maps provides the user with instructions for the location of waste bins in the form of a red marker that, when pressed, displays a photo along with information on the classification of trash cans. When the user approaches the location of the garbage can, a blue circle will be displayed that follows the route on the map. This system aims to assist users in locating trash cans in the Special Region of Yogyakarta to create a cleaner urban environment and provide services to make the public more conscious of proper refuse disposal.

## 2. METHOD

To conduct this research successfully, there are two primary stages: (1) The first stage is a literature review, which is a search for written sources relevant to the author's research. The Literature Study examines books, archives, articles, and journals in which the discussed topics are relevant to the author's research topics. This mobile application's design and implementation can be aided by the information obtained from the Literature Study. (2) The second stage is software development, which consists of (a) identifying the functional software through analysis. (b) the design is executed to design use cases, system interfaces, and databases and prepare product functions for the system being constructed. (c) software development in which the author creates a MySQL database and programs using PHP and Android Studio. (d) Testing is conducted in which the author tests system functionality to determine system dependability, and system users test the system interface.

## 3. RESULTS AND DISCUSSION

### 3.1. Design Application

SIPTeST is a mobile application that assists users in not littering or not doing so in the correct location by supplying information about the location of the nearest trash cans. This application can make it simpler for users to locate the nearest trash can to maintain a clean environment. The images below illustrate the features of the SIPTeST mobile application.

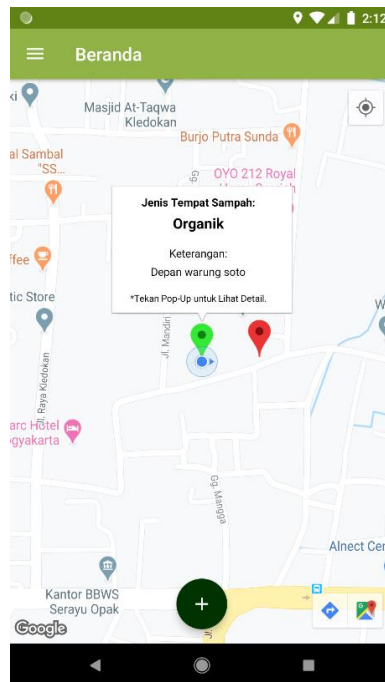


Figure 1. Home page

The SIPTeST mobile application's Homepage is displayed in Figure 1. This page displays the SIPTeST system's map, user location, and garbage bin locations. There is a round button and garbage bin location on the homepage. Then, if the location point is selected, a small window will appear with information about the selected waste can location point.

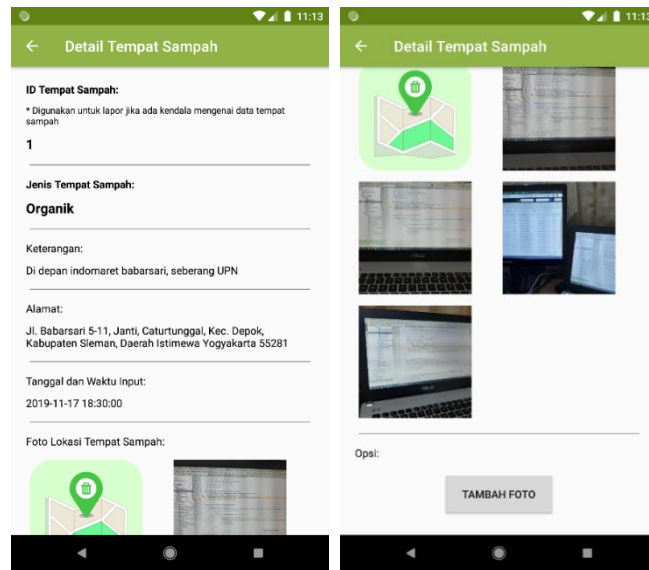


Figure 2. Detail Page for Garbage Sites

The page depicted in Figure 2 is the Trash Sites Details page. This page provides information about the specified trash bin location. The displayed waste information includes the ID, category, description, address, date and time of addition and a photo of the trash can's location. Here, users can also upload images from their photo gallery or camera.



Figure 3. Add a Photo Page for Trash

The page depicted in Figure 3 is the Add Photo Trash page. This page displays a sampling of the photo that was selected. The Select Image icon displays options for selecting a photo from a gallery or the camera. The Upload icon will upload the image you've selected. If the user has not yet chosen a photo and selects the Upload button, a prompt will appear requesting that they do so.



Figure 4. Specific Photographs of Garbage Cans

The page depicted in Figure 4 is the Photo Details page for the Trash Can. This page exhibits photographs of the selected locations of trash cans. Users can enlarge the displayed photographs on the Trash Details page to view each photo.

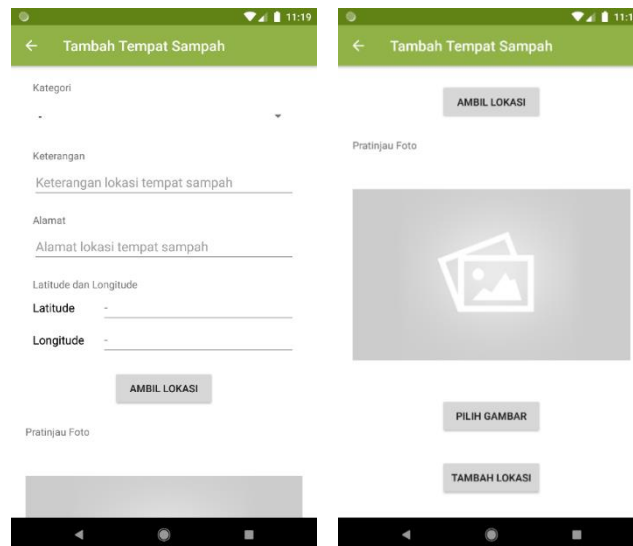


Figure 5. Insert Garbage Sites

Figure 5 depicts the Add Garbage Can Location page, which users use to add locations for waste bins. The user must input the trash can's category, description, address, latitude and longitude, and a photo on this page. The Latitude and Longitude will be entered into the Latitude and Longitude fields upon clicking the Fetch Location icon. The Select Image icon displays the option to select an image from the gallery or camera and a preview of the selected image. The Add Location button adds photos of the waste can locations to the SIPTeST database.

### 3.2. User Testing

Thirty students from the Atma Jaya University in Yogyakarta participated in the trial of the system on users. "Is the SIPTeST mobile display easy to use and understand?" 66.7% of respondents indicated Strongly Agree, while 33.3% indicated Agree. For query number 2, we asked, "Is the SIPTeST mobile application useful for locating trash cans?" Strongly Agree: 73.3% of respondents; Agree: 26.7%. Regarding question 3: "Do users easily understand the overall function?" Respondents responded with Strongly Agree 56.7%, Agree 40%, and Enough 3.3%.

Fourth question: "Do you agree that there are no errors or annoying bugs when using SIPTeST mobile?" On the basis of the user's responses, it was determined that 50% of respondents responded with Strongly Agree, 46.7% with Agree, and 3.3% with Enough. Regarding query number 5, "Is the SIPTeST mobile interface easy

to use?" Strongly Agree: 83.3% of respondents; Agree: 16.7%. Question 6: "How satisfied are you with using SIPTeST mobile?" Based on the responses obtained, 70% of respondents indicated Strongly Agree, while 30% indicated Agree.

#### 4. CONCLUSION

The authors can conclude, based on the analysis and implementation of the Nearest Garbage Sites Search System (SIPTeST) mobile application, that they have successfully designed and implemented a mobile application that can provide users in the Special Region of Yogyakarta with information on the location of the nearest trash can. The SIPTeST mobile application has been demonstrated to assist users in locating garbage cans. According to the survey results, 73.3% of respondents strongly agreed and 26.7% agreed. The questionnaire's results show users are also generally pleased with SIPTeST mobile. Seventy percent of respondents firmly agreed, and thirty percent agreed.

SIPTeST is an application that requires continuous maintenance and development, so the authors conclude with recommendations for developing the SIPTeST application, including adding a trash can location verification feature to the mobile application so administrators can verify data anywhere. Then, adding a message feature to the Report function facilitates the investigation of user issues.

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