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SMART RECYCLE DUSTBIN DETECTOR FOR CLEANERS IN UITM TAPAH CAMPUS

Fatina Aisya Shuhaimi[1], Zalikha Zulkifli[1] and Faridah Zulkipli[1]

[1]Faculty of Computer and Mathematical Sciences
Universiti Teknologi MARA, Perak Branch, Tapah Campus,
Tapah Road, 35400 Perak, MALAYSIA.
Author Correspondence, e-mail: fatinaaisya@gmail.com

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ABSTRACT

Commonly, when ask about cleaner's profession they always relate in maintaining quality environment. Overflowed of garbage in recycled bin always been an issue in the institution and the hazardous scenario in the institution leaving bad impression to the outsider such as parents and visitors. In order to overcome such overflowed of garbage in recycled bin issue and improving the cleaner efficiency in collecting the recycle materials from the recycle dustbin, Smart Recycle Dustbin Detector for Cleaners is propose for this project. These smart recycle bin are in design phase and the bin are interfaced with "Exponent Client" application using react native on mobile application which the system working under the same Wi-Fi module. Hence, the status of full dustbins was sent to the cleaner's Apple iOS application using Wi-Fi module. The main objective of this project is to reduce human resources and efforts in collecting recycle materials along with the improvement of an institution's environment with technology applied in the institution vision.

Keywords: Smart Recycle Dustbin; Cleaners; Exponent Client Application; React native.

1. INTRODUCTION

Mobile application is a computer program which designed to run on a smart device such as mobile phone, tablet or even a watch. Nowadays, in the era of Fourth Industrial Revolution, which is building on the third revolution, demonstrating new ways in which technology becomes embedded within societies. As the result it connected billions of people through mobile devices with infinite knowledge access, storage capacity and unpredicted processing power.

In Malaysia, the technology is well advanced. Most of the labor's job had been replaced by high technology due to insufficient result produce by labor. While, automation able to increase the effectiveness in managing the resource and producing optimum solution in daily life compared to manually labor. As technology evolving rapidly, human always seeking for an alternative to provide things much easier and simpler such as using a mobile application in monitoring the garbage collection at different locations.

In UiTM campus Tapah, Perak, the process of collecting the recycle waste is not properly conducted because to the uncertainties in time collection and cleaner absenteeism.

A survey on Smart Recycle Dustbin Detector using mobile application had been conducted to collect data regarding these issues and it is open to cleaner and student. The other issue occurs when one of the cleaner is absent and other cleaner had to take over the task as a replacement. Sometimes, the cleaner failed to accomplish the task hence the waste will overflow and can cause all sorts of health and environmental issues. The objectives from Smart Recycle Dustbin Detector using Mobile Application are:

i. To design a model of prototype smart recycle dustbin detection.
ii. To notify the exact location for cleaner through an "Expo Client" mobile application.

2.0 LITERATURE REVIEW

Throughout of the years, there a few related topics that associated with the project Smart Recycle Dustbin Detection for Cleaners. Cleaning is part of a facility maintenance activity that aims at rise and maintaining the overall life cycle of the institution and at the same time provides a human support for an effective working environment to the facility's occupiers [1]. Literally, there are thousands of articles or information available on the internet related to such topic but this intelligent technology is not yet implemented in UiTM Perak Branch, Tapah Campus. The current method waste gathering required a lot of labors and it is time consuming [2]. According to existing routine of the cleaners, the cleaners had checked each recycle dustbin every end of the month. If the recycle dustbin is full or more than half of the waste, the cleaner will gather the recycle waste and throw together with other garbage. In the following, Table 1 explained the summarization of the literature review section of the system.

Table 1. The summarization of the literature review

EXISTING SYSTEM	TYPE OF MOBILE APPLICATION	EXPO CLIENT
In the following, a general features of some existing system which similar objective to Smart Recycle Dustbin Detector for cleaners using mobile application is provided. The E-Cube Lab has offered IoT-based solution that improving the efficiency of waste collection using a sensor and others intelligent device [3]. E-Cube Lab is an innovative green technology company to provide eco-friendly waste management solution for smart city. Currently, all major regions including North, South America, Europe, and the Middle East had their branch. On the other hand, "Where is the Dustbin is an application which have similar with the porposed system such as displayed the nearest dustbin and to allow user to update the new details of the dustbin via online [4]. "E-cube Lab" website and "Where is The Dustbin" application has a lot advantages as well as disadvantages. From the disadvantages of the existing application, this system built to close the gap between the disadvantages. Both of the company has the same objective which is improve the efficiency of waste management and collection. Table 2 shows the comparison between existing system with the proposed system.	Mobile Application had three different types, such as native apps, hybrid apps and web apps. Each of the types has different features. Table 3 shows different purpose for three types of mobile application. **Table 3.** The different purpose for three types of mobile application **Type** / **Purpose** Native Apps — Develop to specific platform such as windows, Apple iOS and Android Hybrid Apps — Develop to target multiple platform Web Apps — Interface like a web page a) Native application The flexibility of native app development is the platforms have ability to develop mobile application such as Apple iOS and Android. The	Expo client application is an open source and free platform, which use React Native and JavaScript as primary programming language. This expo client application is support to develop and test on real device such as Apple iOS and Google Android. This free version of Expo client apps is available in Google Play

Table 0. The comparison between existing system with the proposed system using "Expo client" Application.

Bil	Features	E-cube Lab	"Where is The Dustbin" application	Proposed System
1	Availability for mobile application	No	Yes	Yes
2	Installation availability (Free)	No	Yes	Yes
3	Garbage's level detection	Yes	No	Yes
4	Availability in Malaysia	No (South Korea)	No (India)	Yes (Malaysia)

mobile application developments based on native apps have capability to be developed differently platform such as Apple iOS and Android. Every application that built from either iOS or Android it cannot freely used apps in other platform other than their own platform for example you cannot use apps downloaded in android to be used in Apple iOS [5].

b) Hybrid application
Mobile application which developed in category of Hybrid apps are able to function well in platform such as Xamarin, React Native, Ionic, Angular Mobile Sencha Touch and etc. The apps are able built in combination of web instruction such as HTML5, CSS and Java script. In simpler words, hybrid apps is a combination of website application and native

and App Store. The main function of the Expo client apps is the developer able to run instantly their own code like in a real device and the device must be connected to the same wireless network as the computer developer. It is a digital dashboard that allowed people to develop a graphic interface by easily install package and implementat

	apps [6]. c) Web Application Web applications are known as their responsive website that able to function well in any mobile device. This apps use a browser to run. Web apps will redirect a user to specific URL and installations are offered as an option by simply the creating a bookmark to their page.	ion technique through built-in function [7].

3.0 METHODOLOGY

The Waterfall model has been used for the project entitled "Smart Recycle Dustbin Detector for cleaner using mobile application". Waterfall model is also known as linear sequential life cycle model which each division of phase represent different stage of software development and each of phases must be completed first before proceed to another phase to execute desired mobile application. The Waterfall model, each of the phases is run by a different team of expertise to handle with full responsibility on a particular phase. There are 6 phases throughout the project, which are planning, analysis, design, implementation, testing and evaluation [8].

3.1 Planning

Planning is the first phase in developing Smart Recycle Dustbin Detector Using Mobile Application. More participant and extra effort are needed in order to develop a good project. However, research had approved that project performance is significantly shown the excellent result by conducting planning before start a project [9]. In this area of system study, there are involving collections of data such as data to identify what kind of the system, the problem statement, objective, scope, significance, and limitations in order to develop a quality system. The Figure 1 shows the details of planning phase.

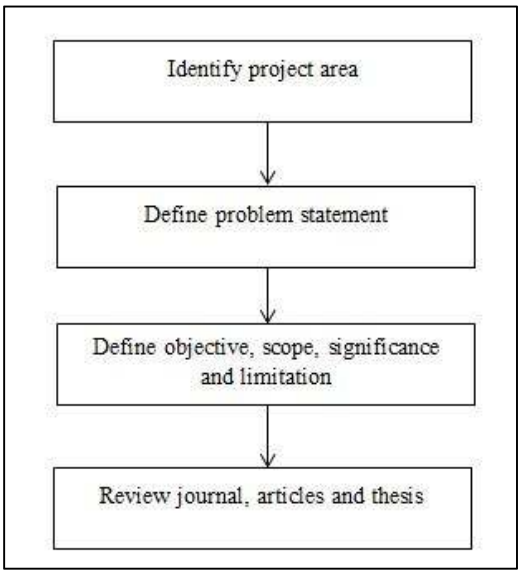

Fig. 1. Planning activities

3.2 Analysis

In this phase, the project consists of three sections, which are reviewed literature, analyze the current collection recycle waste system and analyze the result of the pre survey filled by the cleaners. In reviewed literature, the information of the existing system is based on research paper, thesis and journal. While in analysis phase will provide more details information regarding how the objectives of the project will be achieved. The current collection waste system is analyzed to identify the limitation to be overcome by the Smart Recycle Waste Dustbin Detector using "Expo Client" application. Early in October, 2018 pre survey had been conducted and collected 17 cleaner responded. Based on the collected data, 82.35% agree that the responded had seen overflowed of waste in recycle bin and 92.12% strongly agreed that overflowed garbage produce un-condusive environment. These are the factor for the proposed system to be developed and eventually increase the efficiency of cleaner work.

3.3 Design

In the design phases of development of the proposed system, there are the details design of the flowchart and system architecture. Figure 2 illustrates the flowchart of this proposed system consist several interface process that involved in designing smart recycle dustbin detector apps. The flowchart explains the function of the smart recycle waste dustbin detector for the cleaner which once the cleaner is success login the system, the cleaner's smartphone is connected to internet and a pop-up message will appeared to notify the exact location of full recycle waste dustbin.

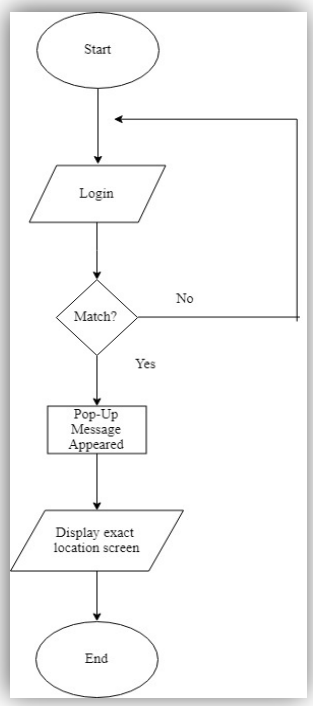

Fig. 2. The Flowchart Cleaner Interface of Smart Recycle Waste Dustbin Detector using mobile application

Figure 3 illustrates the system architecture which user able to access the mobile application using Internet connection. The smartphone with the Internet connection is needed to access successfully the application and will receive a pop-up message which give information about the full recycle dustbin. The signal is sent by the WeMos sensor and ultrasonic sensor via Arduino platform when the garbage in the recycle dustbin exceeds the highest level.

Fig. 3. The Flowchart Cleaner Interface of Smart Recycle Waste Dustbin Detector using mobile application

3.4 Implementation

The implementation phase is a process, which is involved the specification of hardware and software needed to develop the proposed system. The specification of hardware and software always demanding for latest and higher as technology frequently change for better system's performance. Table 4 and Table 5 shows the identified specification for hardware and software used in this system.

Table 4. The identified specification for hardware used in this system

Hardware List	Activities
Laptop	Samsung R440
Processor	Intel(R) Core(TM) i3-370 M CPU
RAM	2.40 GB

Table 5. The identified specification for software used in this system

Software List	Activities
Operating System	Windows 7 Ultimate, 32 bit
Programming Language	HTML, JavaScript, SQL, PHP,Wemos sensor network
Database	phpMyAdmin
Server Platform	Arduino IDE, Android Studio
Internet Browser	Google Chrome, Mozilla Firefox

For software specification, online software or open source tool such as Android studio and Arduino IDE is used to develop the mobile application. In implementation phase, there is process to design the initial of the mobile apps interface.

3.5 Testing

Every complete application must be tested to ensure the functionality is correct before review to the client. Smart recycle waste dustbin detector using mobile application applied a few testing such as functionality testing to check whether the application works and function correctly. Functionality testing is a process to examine the movement of the system. Functionality testing is a software testing. Besides that, functionality testing is to ensure that the proposed system achieve the objective as stated. This functionality test will be conducted after complete project development. The testing also can be describes as preliminary steps on how smart recycle dustbin detection mobile application operate for cleaner's management and

cleaner.

4. CONCLUSION AND FUTURE

This paper describes the overview of planning, design, and development of "Smart Recycle Dustbin Detector for Cleaners" through mobile application. It was an effort to improve the efficiency for cleaners to collect the recycle waste without consuming so much time. So far, this paper is focused mostly on the design and collecting data for proposed system.

In the future work, we are urged to focus on the development of mobile application for location full recycle dustbin detection. The next phase, we will conduct a post survey on the cleaner and practically test functionality towards the cleaners in UiTM campus Tapah, Perak to ensure the objective of project is achieved.

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