ANDROID APPLICATION SMART INDOOR NAVIGATION IN SHOPPING MALL FOR ROUTE INSTRUCTIONS & PROMOTIONAL INFORMATION USING WIFI TRI-LATERATION & TWITTER API

Shulhan Mulia Rahmawan[1], Rangga Gelar Guntara[2]

Universitas Komputer Indonesia
Jalan Dipatiukur No. 112-116, Coblong, Lebakgede, Bandung, Jawa Barat 40132
E-mail : shulhanmulia@gmail.com[1], ranggagelar@gmail.com[2]

ABSTRAK

Istana Plaza is one of the biggest mall in the city of Bandung which lies in a strategic location Pasarkaliki Street became one of the attraction for visitors to visit, to locate a route in the Palace Plaza to the location of the intended shops often becomes a problem when the visitors were inside the Palace Plaza, especially for a new visitor first visited Istana Plaza, especially in the crowded mall was visited by many visitors. Increasingly more crowded or a building, it is likely to get lost in it becomes bigger. As an effort to minimize the chances of visitors get lost in Palace Plaza, the Plaza Palace management has prepared a directory which contains a picture of the floor plan of the entire building or just directions heading to a location, but visitors do not know the location of the store is in the Palace Plaza. So visitors prefer asked officers who are the vigils to know the location of the shop that is being sought, but the visitors did not immediately find a store that is being sought so visitors prefer looking for its own stores that you want to visit. The visitor is also difficult to determine the route inside the building to find a store that is being sought, so that visitors feel the spin – play in building because of not knowing the fastest route to find while visiting a store that wants to land on, and also visitors do not know which stores information that is currently running a promotion. Therefore, an application was made to facilitate the Viewer to determine the location of the visitor, looking for stores that will be visited by the shortest route and get ongoing promotion information by using WiFi technology Tri-Lateration for position, Dijkstra shortest route to earn, and the Twitter API to get Promotional information.

***Kata kunci**: WiFi Tri-Lateration, methode dijkstra, Twitter API, Android Application*

1. INTRODUCTION

1.1 Problem Identification

The Palace Plaza is one of the biggest mall in the city of Bandung which lies in a strategic location Pasarkaliki Street became one of the attraction for visitors to visit, to locate a route in the Palace Plaza to the location of the intended shops often becomes a problem when the visitors were inside the Palace Plaza, especially for a new visitor first visited the Palace Plaza, especially in the crowded mall was visited by many visitors. Increasingly more crowded or a building, it is likely to get lost didalamny became bigger.

As an effort to minimize the chances of visitors get lost in Palace Plaza, the Plaza Palace management has prepared a directory which contains a picture of the floor plan of the entire building or just directions heading to a location. From the results of the questionnaire amounted to 30 respondents that have been spread out more than 80% of visitors do not know the location of the store is in the Palace at the Plaza. So more than 55% of visitors prefer to ask the officer who is being beraga to know the location of the shop that is being sought, but more than 50% of visitors do not directly find a store that is being sought so visitors prefer looking for its own stores that you want to visit. The visitor is also difficult to determine the route inside the building to find a store that is being sought, so that visitors feel the spin – play in building because of not knowing the fastest route to find while visiting a store that wants to land on, and also visitors do not know which stores information that is currently running a promotion.

To determine the location of a visitor uses a WIFI tri-lateration. WIFI tri-lateration technique uses the parameters of the WIFI network parameters used from the WIFI signal frequency is a netwok WIFI, the WIFI signal strength, and the access point (AP). The signal strength of the WIFI device is received by a mobile device can be used to calculate the estimated distance between the access point (AP) with a mobile device. Using this method requires at least three or more access points (AP) located within the building. The strength of the signal received by the mobile peranggkat can decline depending on the distance between the transmitter signal WIFI with mobile peranggkat and also other factors.

1.2 Goal and Purpose

Based on the issue that has been mentioned above in the background then the purpose of this research was to build an Android application Smart Indoor Navigation For Shopping in the building Instructions and Route Information Promo using Wifi Tri-lateration and the Twitter API.

While the goals to be achieved in this research is:

1. *Make it easy for visitors to find a store in the building and demonstrating the visitors position.*
2. *Provide clues the fastest route to get to a shop in the building that is being sought after by visitors.*
3. *Make it easy for visitors to get promotional information that is being maintained its position in the various shops located in the Palace at the Plaza.*

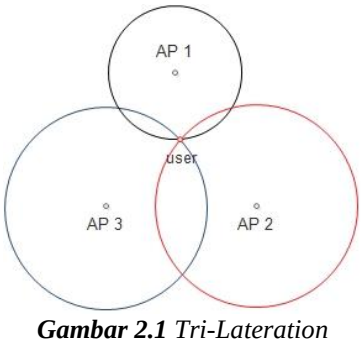
2. THE CONTENET OF RESEARCH

2.1 Android

Android is an operating system for linux-based mobile devices that includes an operating system, middleware and applications. Android provides an open operating system for developers to create applications. Android is launched to the public in 2008. Android is very rapidly growing in the industry because the two main asopek i.e. are opensource and architectural models. As a project that is opensource, android allows for fully understood and analyzed regarding features, settlement on the bugs of the program to the hardware [3].

2.2 WiFi Tri-Lateration

WiFi Trilateration is the technique of positioning of 3 AP location as a reference. Trilateration using the distance between the location of the AP to determine the position of a device that receives signals AP. In this technique, the distance between the location of the AP with positions that would like to be known as analogous to the radius of the circle with Center a circle by some was the location of the AP. The position of wanting to know is the intersection of the circle of radius 3 like in the picture 2.1.

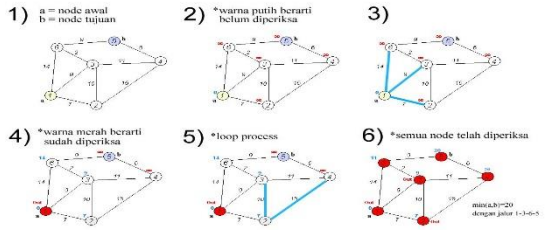


***Gambar 2.1** Tri-Lateration*

2.3 DJIKSTRA'S ALGORITHM

There are a variety of algorithms to determine the shortest route. One of the most popular algorithm is the algorithm that Djikstra is widely used in routing data packets on the network computer can also be used to determine the fastest route. One of the hallmarks of this algorithm is its spatial and time requirements are relatively small so that it can be implemented on a device that has a hardware specification that is not too high.

Machining process Djikstra's algorithm to determine shortest routes are the following pictures 2.2[1]



***Gambar 2.2** Djikstra's Algorithm*

2.3 Discussion

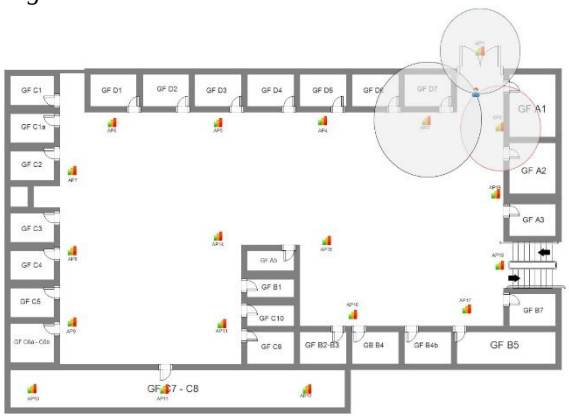
Android application smart indoor navigation for shopping in the building instructions and route information promo using WIFI Tri-Lateration & twitter API is the elaboration of the problem what existed before the founding of the application and intend to help visitors who visited the Palace Plaza Mall in determining the location and route of the stores that will be visited. Analysis of the existing problems include such things as follows:

1. *Visitors have trouble finding the location of stores in the Mall the Palace Plaza and visitors are also sometimes not knowing his position inside the Palace Mall Plaza because not all visitors visiting every heart and remember the position of the shop is located.*
2. *Visitors don't know the fastest route to the store that will be targeted because visitors do not know where the position of the shops are so visitors to the difficulties which must be traversed route.*
3. *Visitors are not aware of the ongoing promotion information in a Palace Plaza Mall due to the promotion of the information only exists in many stores and visitors too exhausted if it should go to the store one by one were having a promotion.*

2.4 Positioning Using WIFI Tri- Lateration

This positioning is in charge to get the position of the user. This positioning is divided into four phases i.e. RSSI data retrieval, Preprocessing, Indoor Propagation Model, and WiFi Tri-lateration.

Positioning system for modeling can be seen in Figure 2.3.



***Gambar 2.3** Modeling system WIFI Tri-Lateration*

1. *The process of retrieving the required data i.e. RSSI Trilateration technique. RSSIadalah WiFi signal power received by the user of the device expressed in dBm. The data obtained are sorted based on their great value. RSSI data so that the 3 methods of Trilateration can be used.*
2. *Indoor Propagation Model function to convert the value – RSSI value into units of distance. Free Space Path Loss model is used to get the value of the distance from the RSSI data. By using the equation [2] :*

$$d = 10^{\frac{(FSPL_{dB} - 20log_{10}(f) + 27.55)}{20}}$$

3. *the process of Trilateration. This process generates the coordinates of the position of the user using the coordinates and distance from AP 3. After getting the range of each AP, using the equation [2] :*

$$x = \frac{AY_{32} + BY_{13} + CY_{21}}{2(x_1Y_{32} + x_2Y_{13} + x_3Y_{21})}$$

$$y = \frac{AX_{32} + BX_{13} + CX_{21}}{2(y_1X_{32} + y_2X_{13} + y_3X_{21})}$$

Where

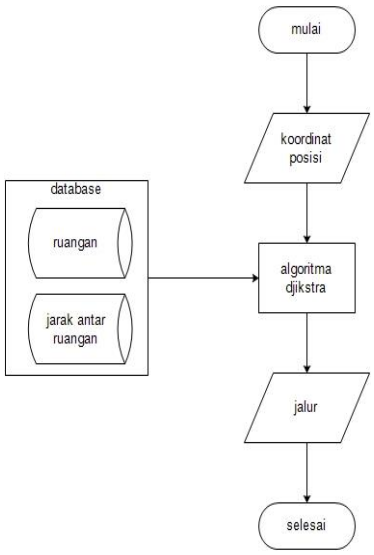
$$\left.\begin{aligned} A &= x_1^{\,2} + y_1^{\,2} - d_1^{\,2} \quad (a) \\ B &= x_2^{\,2} + y_2^{\,2} - d_2^{\,2} \quad (b) \\ C &= x_3^{\,2} + y_3^{\,2} - d_3^{\,2} \quad (c) \end{aligned}\right\}$$

And

$$\left.\begin{aligned} X_{32} &= (x_3 - x_2) \quad (a) \\ X_{13} &= (x_1 - x_3) \quad (b) \\ X_{21} &= (x_2 - x_1) \quad (c) \\ Y_{32} &= (y_3 - y_2) \quad (d) \\ Y_{13} &= (y_1 - y_3) \quad (e) \\ Y_{21} &= (y_2 - y_1) \quad (f) \end{aligned}\right\}$$

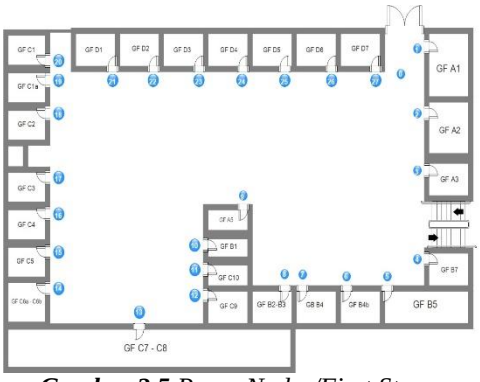
2.4 Djikstra's algorithm use the route instructions

At the stage directions of the route using the initial coordinate Needed Djikstra's algorithm, the final coordinates and map to use this algorithm. The initial coordinates are the position of the user's time, the final goal is to coordinate and map used is the floor plan as the floor plan of the path – a path that can be used. The result of this algorithm is a line with direction that guides users to get to its destination. Flow diagram of the navigation system is described as a picture 2.4.



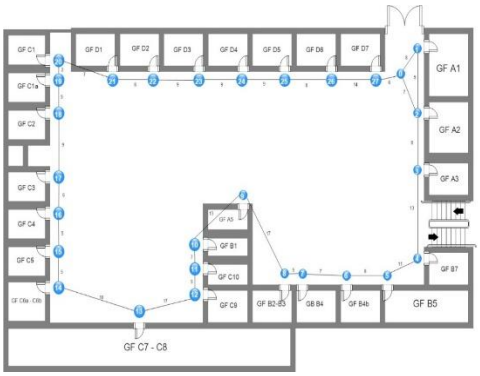
***Gambar 2.4** Flowchart Guidance Route*

1. *The first stage of work for data input the coordinates of the position of the start and end position. Database nodes-shaped room with their respective coordinates from the room and the value of the distance between nodes. Node in each room were incorporated into the map as in the picture 2.5.*



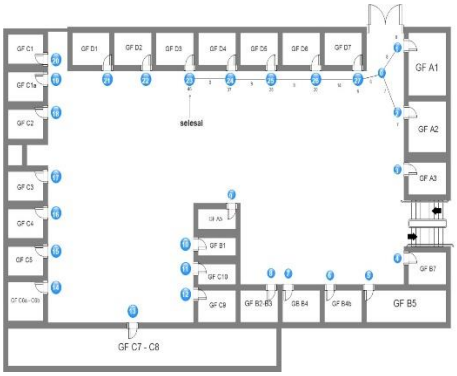
Gambar 2.5 *Room Nodes/First Stage*

2. *The second stage, to node 0 as the departure and destination node is the node value 23, every edge that is connected between nodes already have value as in the picture 2.6.*



Gamabar 2.6 *Second Stage*

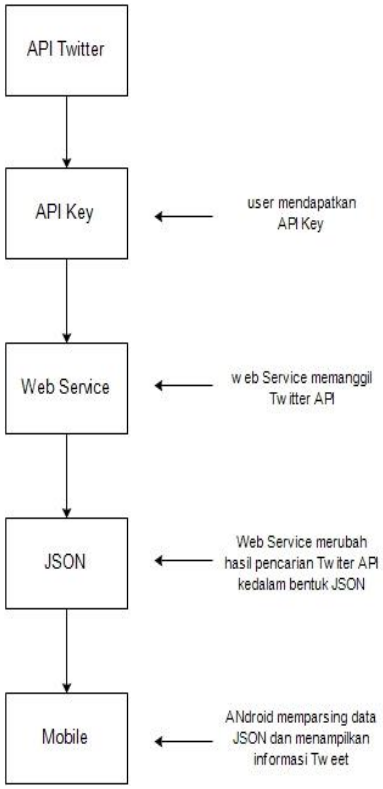
3. *The third stage, the Dijkstra calculation towards neighboring node performs directly connected with the departure node (node 0), and the results obtained are as shown in the picture 2.7.*



Gambar 2.7 *Third Stage*

2.5 The process of Retrieving data from Twitter

This application uses the technique of grab tweet using Twitter API. First, Twitter API gives API Key as verification. Then Web Service calling the Twitter API and changed search results in the form of JSON. After that the Android memparsing the JSON data and display information tweet. The process of data capture the Twitter API can be seen in Figure 2.8.



Gambar 2.8 *Groove Twitter Data Retrieval*

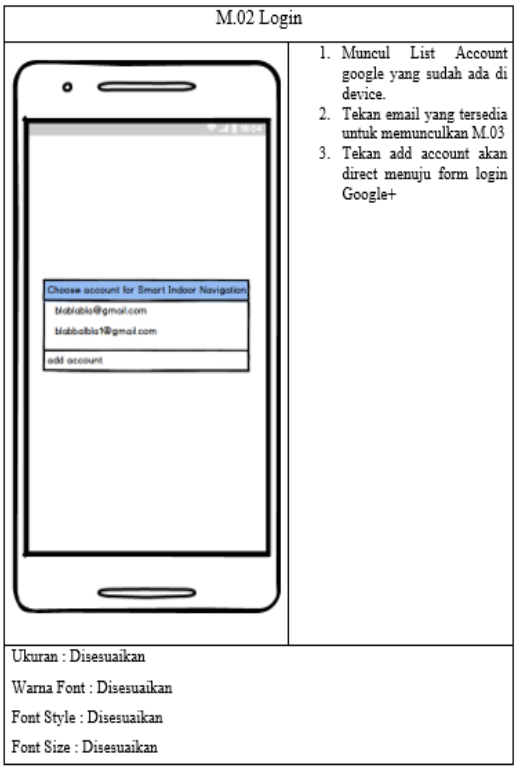
2.6 Design Interfaces

1. Login Interfaces

The design of the interface of the login page when the user is accessing the login page.

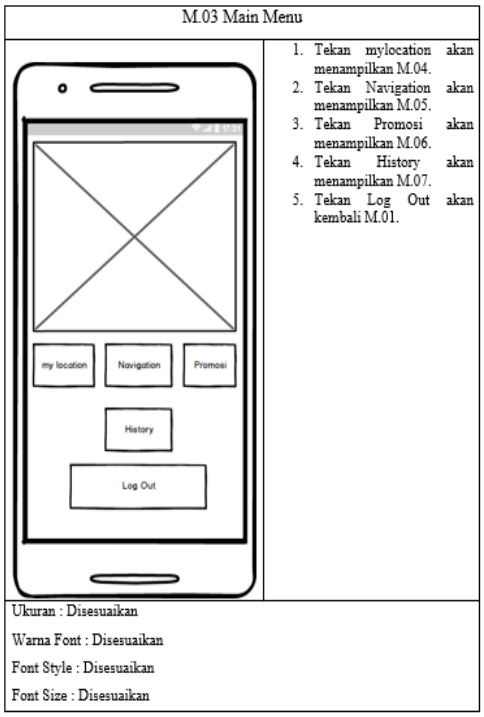


Gambar 2.9 *Form Login 1*



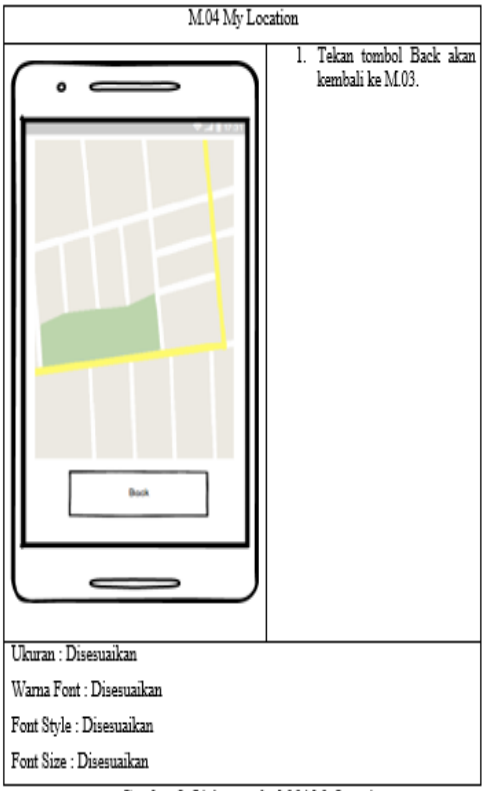
Gambar 2.10 *Form Login 2*

2. *The design of the interface is the main menu of the page when the user has login will go to the page main menu.*



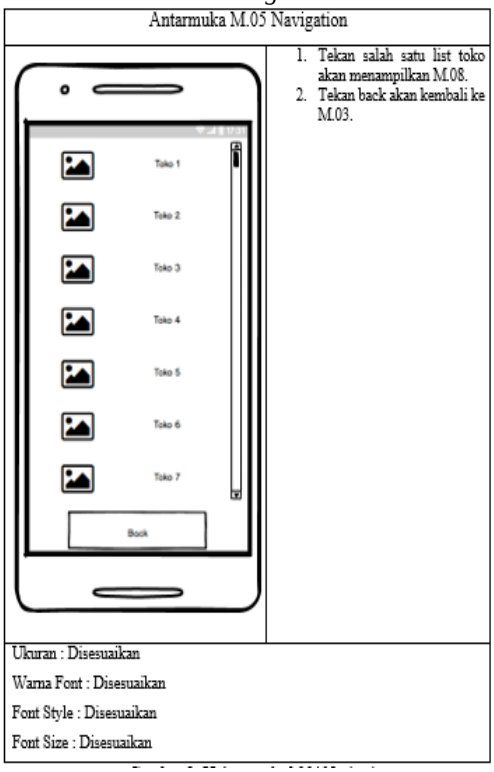
Gambar 2.11 *Form Main Menu*

3. *The design of interface MyLocation is page to see the user location is inside the shopping building.*

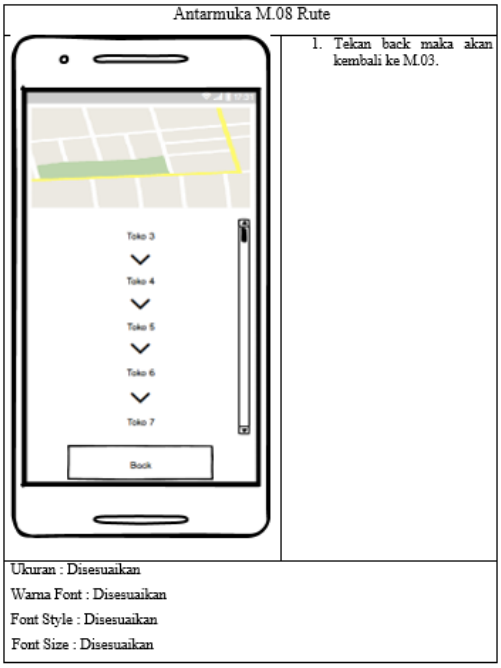


Gambar 2.12 Form MyLocation

4. *The design of the interface of Navigation is the page for instructions on the fastest route to the user want to go.*



Gambar 2.13 *Form Navigation 1*



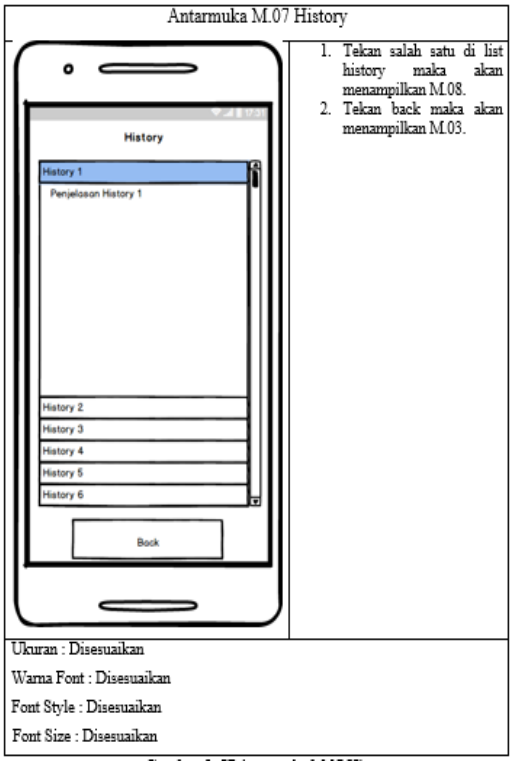
Gambar 2.14 *Form Navigation 2*

5. *The design of the interface for user pages is the promotion view promotions that are running.*



Gambar 2.15 *Form Promotion*

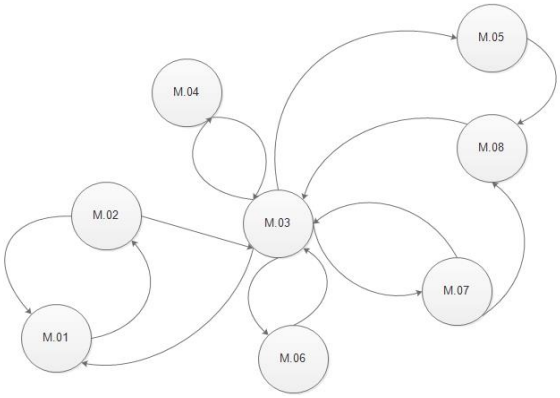
6. *The design of the interface for user page History is viewed History.*



Gambar 2.16 *Form Promotion*

2.7 The Design Of The Semantic Network

Semantic network is the description of the graphic that shows knowledge of the relationships between objects (circle) and lines that describe the objects between different formations. As for the semantic network to devices that are built can be seen in Figure 2.17 and for the table code can be seen in Table 2.1.



***Gambar 2.17** Semantic Network*

***Tabel 2.1** Table Code View*

Kode Tampilan	*Deskripsi*
M.01	*Form Login 1*
M.02	*Form Login 2*
M.03	*Form Main Menu*
M.04	*Form My Location*
M.05	*Form Navigation*
M.06	*Form Promosi*
M.07	*Form History*
M.08	*Form Rute*

2.8 In Conclusion Alpha Testing

Based on the results of software testing that is done then it can be inferred that the software NavMall on the android platform that is built has been running as expected either in terms of validation or process error handling.

2.9 The Conclusion Of The Beta Test

Based on the results of beta testing, it can be concluded that::

1. *Visitors strongly agree NavMall Applications can help make it easy to find shops in the Palace Plaza.*
2. *Visitors agree NavMall Application can determine the position of a visitor inside the Palace Plaza mall.*
3. *Visitors strongly agree NavMall Applications can help make it easier to determine the fastest route to the store who wanted to land on visitors in Palace Plaza mall.*
4. *Visitors strongly agree NavMall Applications can help get ongoing promotion information on the Palace Plaza.*
5. *Visitors are strongly agree that App NavMall easy to use.*

3 CLOSING

3.0 Conclusion

Based on the results of testing the application NavMall to use WiFi technology to determine the position in the building and methods of dijkstra to indicate the fastest route on the android platform so conclusions are obtained as follows:

1. *The application is built makes it easy for users in determining position in the building.*
2. *The application is built makes it easy for users to find tenant/shops in the building.*
3. *The application is built makes it easy for users in determining the fastest route to get to the tenant/store destination.*
4. *The application is built makes it easy for users to get an ongoing promotion information in a Palace Plaza mall.*

3.1 Advice

Advice that can be given to development of the system that has been created for further system development, namely:

1. *Add the number of floors.*
2. *Add photos, so that users who've been friends can know the position of the other user in the mall.*
3. *The admin backend to add a feature to change the position of the store if moved and also does not cover possible admin increased the number of mall.*
4. *Application for users can only run on one platform, namely android. We recommend that applications can also be developed in other platforms in order to expand the users in using the software.*

DAFTAR PUSTAKA

[1] K, Raman Kumar, 2006. "*Improving the Accuracy of Wireless LAN based Location Determination Systems using Kalman Filter and Multiple Observers*". Mumbai, India: Indian Institute of Technology Bombay.

[2] Pu, Chuan-Chin., Pu, Chuan-Hsian., & Lee, Hoon-Jae. 2011. "*Indoor Location Tracking using Received Signal Strength Indicator*". Rijeka: InTech.

[2] Chan, Eddie C. L. & Baciu, George. 2012. "*Introduction to Wireless Localization with iPhone SDK Examples*". Singapore: John Wiley & Sons Singapore Pte. Ltd.

[3] Le, Manh Hung V., Saragas, Dimitris., & Webb, Nathan. 2009. "*Indoor Navigation System for Handheld Devices*". Worcester, Massachusetts:Worcester Polytechnic Institute.

[4] Saputra, Arranda Mahayekti. 2013. "*Implementasi WiFi Fingerprinting dan Algoritma Dijkstra Dalam Perancangan Prototype A Mobile Indoor Directory Berbasis Android*". Bandung: Telkom University.

[5] Safaat H, Nazruddin. *Pemrograman Aplikasi MobileSmartphone dan Tablet PC Berbasis Android.* 2011 : Informatika Bandung.