

Application Design of Toll Payment using QR Code a Case Study of PT. JasaMarga

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Abstract- Technological developments, especially smartphones, tablet, iPad and others, became very popular today. Starting from user needs is almost complete with a small object with millions benefit. Smartphone, tablet and iPad has been widely used by all users. With this trend, many people use their smartphone to do electronic transactions. One of the electronic transactions is electronic transaction of toll road payment. Electronic transaction aims to improve the time efficiency at the toll gates using Android and QR code platform as the automatic media access so that the transaction does not need to be served manually. This study is motivated by the need to reduce the queues that often occur at the toll gate. The model proposed in this study can be considered by company we researched to reduce the queues at toll gate.

Keywords: Toll Payment, Smartphone, Android, QR Code, Queues.

I. INTRODUCTION

Along with the increasing number of vehicles in major cities, Toll Road is an option for smooth transportation to avoid congestion. The increasing use of toll roads will be followed by the increase in highway infrastructure to support optimum service to users [1].

Android which Google released as an open-source mobile phone operating system is a Linux-based platform; it consists of the operating system, middleware, and user interface and application software [2]. The success and development of the current android capable of occupying the highest position gadgets and computer market, it is certainly due to the sophistication of technology systems and applications that are on it are currently a trend among mobile phone users because it can help all areas of work so that it becomes easier [3]. The advantages of android is the open source license so it is possible for anyone with an android programming ability to create or develop applications to run on Android based gadgets [4].

Mobile Toll Application (Molapp) is an automated electronic application whose function is to improve the efficiency of the transaction time at the toll gate, thus reducing queues of vehicles by utilizing the Android OS and the QR Code as media access

automatically, so no need to use manual service at toll gates. As for the so-called QR Code is a type of matrix codes or two-dimensional barcode whose functions is to identify an object. Implementation QR Code later designated as the automation of the toll gate so as to speed up service for prospective users of the toll gate.

Molapp that are designed in this paper is limited in application design and testing of application design. Tests conducted to determine the success of the transaction process and get the data - data that supports the success of the transaction. This paper proposes an application which is built based on android platform and implement a two-dimensional barcode for smartphones. The main representations of this technology is e-ticketing and e-Receipt [5].

General Introduction To The Subject Area

PT JasaMarga (Persero) Tbk is an Indonesia-based company primarily engaged in the operation and management of highways in Indonesia. Its business activities also include the planning, development and maintenance of the highway and also the provision of various services along the highway operated such as rest areas, gas stations and advertising space.

Transaction system that exist on the PT JasaMarga are closed system and opened system. Closed system is toll payment occurred when the road users take a ticket at the toll gate entrance and do payment at the toll gate exit. Opened system is toll payment occurred when the road toll users do the toll payment only at the toll gate entrance. But there is still remaining a toll gate transaction method which is an electronic payment conducted by attaching a smart card in the GTO reader machine.

II. RELATED WORK

With the development of smartphone many traditional PC applications are being deployed to phone as clients [6]. Android and smart phone, mobile Molapp system implements communication between client and server to provide users' query and request. This article designs the system architecture and functional module describes how to implement communication between server and client and lists algorithms of key modules [7].

Nym. [1] designed an electronic toll payment that provides a faster transaction processing time and more effective system than the manual toll system. He said that his research aims to design a subsystem that can support the interconnection between RFID device and the data processing application subsystem that can enable the electronic payment of toll gates transaction processing faster. Nym, designed electronic toll road paymentsystem by referring to other electronic payment such as e-Toll and OBU.

E-Toll card is a smart prepaid card and contactless smartcard whose function is as a substitution for toll cash payment transaction. E-Toll balance is refillable. There are still weaknesses in e-Toll practice that make users worried such as the card read two times by the reader, the payment fraud on the toll gate staff, and the unreadable card. However, the time required for e-Toll use is only about 4 sec which is efficient enough[8].

OBU (On Board Unit) is a device stored in the middle of the car dashboard whose function is to emit an electronic signal which is read by the receiver on the *GarduTolOtomatis* (GTO), and it will directly open the barrier, so the users do not have to open the car window while doing payment. However, this device still need to be supported by the e-Toll card that make the users have to work 2 times to use this tool. The fantastic price of this device does not make user interested enough in this tool even if the time required for the payment process in toll gate is only about 2,3 sec [9].

The program which has the most similar design with my application is e-Toll card, but the application that I made is to utilize smartphones to do the toll transactions which is there is still no similar applications that provide this service.

III. PROPOSE APPLICATION

The purpose of this paper is to develop and implement a payment of toll roads system based on Android application development. Several parameters are used for payment the toll roads is QR Code and Reader. Utilization of QR Code is payment function in real time without any delay, while the Reader sensor used to capture the QR Code on android smartphone which is then processed in a database.

Application Architecture

Molapp application utilizing the internet connection. Figure 1 illustrates that the application

architecture consists of several components, user, android to generate qr code, toll booths, and database systems. All components have the same reference, the internet.



Fig. 1 : Application Architecture

Offline / Online Situation

Online situation is a situation when users are connected to internet. In online situation, users can do the transaction process in toll gate which there are QR Code in Molapp, reader machine in the toll gate as the media processing and database server as the storage media. The reader machine used to read the QR code in Molapp in the toll gate is the same machine used for e-Toll card, but after the transaction processed, the transaction data will be directly recorded to the history storage of the application. Besides having a function to do transaction, the online situation can be used by users for finding out rest areas and gas station located in the highway using Molapp.

Offline situation is a situation when users are disconnected to internet. This situation allows users to see the saved data in history located in menu static which has opened when the device is still connected to internet. The saved data is the transaction data occurred in the toll gate. Besides data history, menu static is a call center menu whose function is to call the toll staff in any emergency situation.

Workflow of Application

Molapp has procedures menu for users' using. Similar to another application, after users open the

application, they will be asked to login to their account. If they do not have any, Molapp will guide users to a registration form in order to do an account registration. After success the registration, users will be guided to a login display.

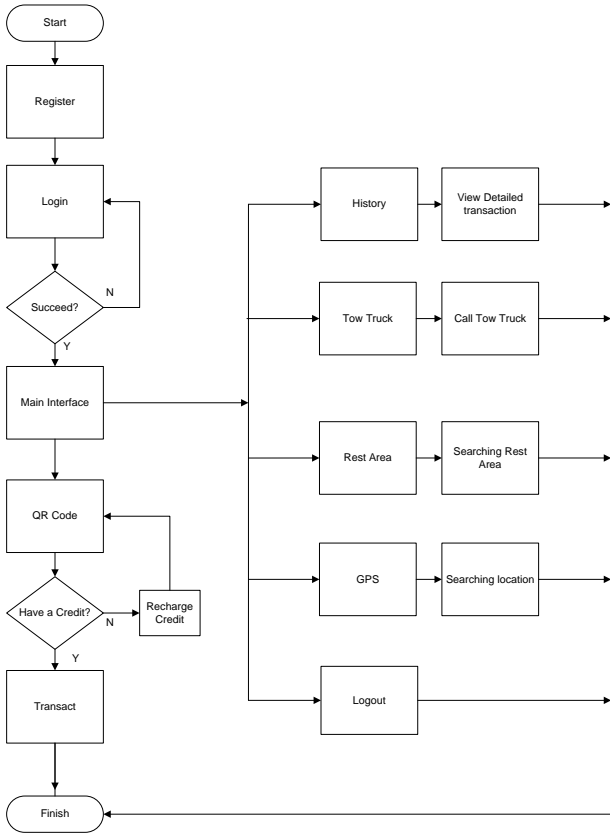


Fig. 2 Flowchart Application

IV. DEMONSTRATION

This study demonstrates the validity and reliability. The test application is the main process in the Android platform. The author will test the application to make transactions on the QR Code interface and the results that come out will be recorded into the history menu automatically or not. In the QR Code interface, the author will fill the user data such as user ID, username, and the credit balance amount. However, the data to be entered into the history interface is user data after the transaction occurred such as user ID, location of toll gates, the amount to be paid and the date and time of the transaction.

TABLE I

ID	YK1908
Name	YudhiKristanto
Credit	Rp. 50.000

Testing Data



Fig 4.(a) Transaction QR Code (b) Menu History

Transaction

After scanning the QR Code to the scan reader machine, the data that has been encrypted will automatically be entered into the history, where the existing data in the QR Code has been successfully scanned and entered into the database. History interface will display contents such as user ID, location of toll gates, the amount already paid and the date and time of transaction.

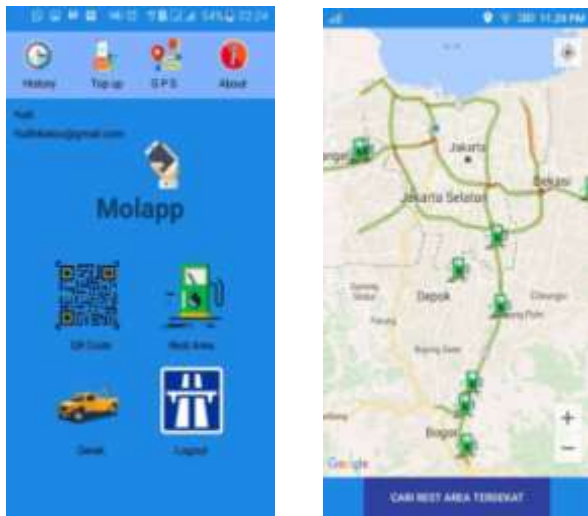
Based on the figure 4, (a) we can see that the balance of the id code “YK1908” has made a transaction and (b) the existing balance on the account has been cut by Rp5500,- to do the toll payment at toll gate Karang Tengah on 29/07/2016 at 18.37 WIB. The toll gate location is determined based scanner that has been set previously.

Home Interface

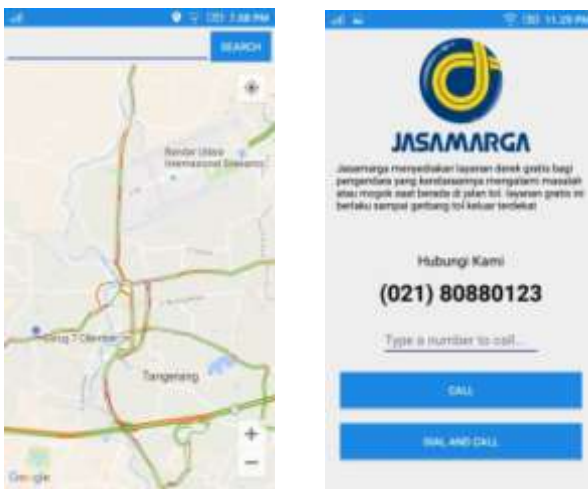
In this application there are other features in addition to the transaction, there are four interfaces that support them is Tow Truck, Rest Area, GPS. Figure 5 (c) shows the main view of the application. (d) Toll road users who feel tired or just want to refuel, can use this menu whose function is to look for a place to rest and refuel.

Figure 6 shows the features that support services (e) GPS. Toll road users who had difficulty finding the location he is and want to find the desired location, can use this navigation. The last, (F) Tow Truck is a menu function to call the toll officers in case of

unwanted things like cars broken or accidents, officers will come to tow the vehicle if it happens.



(c) Home Interface (d) Rest Area



(e) GPS (f) Tow Truck

V. CONCLUSIONS

Utilizing smartphone as the media to catch the people interest that can substitute the toll payment method is one of the best option currently thinking of the smartphone using that quite boomed in Indonesia. Using this application can reduce the number of traffic jam in the toll road. Somebody said that nothing is better than giving the best services to the customers

In general, the authors believe that the smartphone, android and a QR code has great potential as an instrument to make transactions. Some possibilities has been discussed in this paper, and there are many creative ideas waiting for us to explore. Also, this paper can be served as a first step the reader

to investigate topics of interest about the mobile application. My future project is to develop the more effective credit recharge method and expand Molapp to the toll road.

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