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PARKING MANAGEMENT INFORMATION SYSTEM BASED ON ANDROID (STUDY CASE : HIGHER EDUCATION IN INDONESIA)

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Abstract
Nowadays the number of private vehicles use in Indonesia are increasing rapidly. People prefer to use private vehicles for travel rather than public transportation. parking management problems in every agency often arise due to ineffective and efficient parking arrangements, in addition to the rampant theft of vehicles can often cause harm to vehicle owners. This study aims to provide a dynamic solution by introducing the Android Application design for Parking Management and Security Systems that regulates the parking lot of vehicles with the help of Pin code. This system is basically designed for college parking which can then be extended as needed. The results of this study indicate that using android applications can (1) identify owners who have multiple vehicles with one Pin code (2) vehicle in and out report in real-time (3) vehicle quota settings (4) can photograph the vehicle out of the parking area, (5) the average execution time for the Pin code process is 2.4 seconds. (6) reduce the queue on the parking door.

Introduction
The number of vehicles in Indonesia is the highest in ASEAN, based on data from the Indonesian National Police noted that the number of vehicles that are still operating throughout Indonesia in 2013 reached 104.211 million units, with an average rise of 11 percent annually (ha Deoghare, 2015). With an average rise of 11 percentage it could be possible currently there are approximately 125 million vehicles. That number sure has an impact on parking in Indonesia, Parking is a problem for almost everyone today so there has to be a solution, there is a dire need for a secure, intelligent, efficient and reliable system which can be used for searching the unoccupied parking facility, guidance towards the parking facility, along with the proper management of the parking facility (Bonde, Shende, Kedari, Gaikwad, & Bhokre, 2014)

Currently, there are many organizations especially college which apply the manual parking system in Indonesia. By distributing parking card at the entrance, and at the exit gate returns the card while showing genuine Vehicle Registration Certificate (STNK) to match with the plate number of the vehicle, to avoid long queues when distributing parking card, it would require a lot of manpower. Other than that, some college are already implementing a modern system with a desktop computer with installed parking applications, and thermal printer to print out a parking ticket (Iyer, 2014), it requires a lot of thermal paper as a cost and more spaces for desktop computer such as lcd monitor and printer. Iyer, (2014)and (Smita, Komal, Rashmila, Avanti, & Ankoshe, 2015) in her research is already using a smartphone based on Android to apply the parking system technology, but not maximizing existing facilities on smartphones such as camera as part of a security system.

In this study, the application is basically designed for a college parking which can further be extended as required, this system enhances the component of existing parking system available in the colleges. Parking information system android based client server operating system with a smartphone camera to scan QR codes can exist in student and employee cards this system can also record the time of each vehicle entry and exit, and then be able to analyze and provide various reports required by the management. in addition, this application has the advantage to know the capacity of parking in the parking area and for safety reasons to use a smartphone camera to take pictures of vehicles. The research is expected to contribute in the field of smartphone application for parking system, which will be developed and applied to a parking system and automatically to help solve parking problems and parking security in Indonesia.

Economic behavior is often a problem for capital market investors (Hirshleifer & Welch, 2002). Good behavior tends to make the market stable or lead to growth. because investors are investors in the capital market, this behavior is unavoidable in making investment decisions (Brunnermeier, 2000). The decision-making process by investors in the market involves various thoughts and factors in decision making. these factors are sometimes unexpected and we are forced to assume that investors are rational in making investment decisions. Various research on investor behavior began to develop in the 1990s, which tried to map the aspects of behavior in the decision-making process in investment to the consequences of these behaviors. Every employee working in the organization has its own norms and values and different belief towards organization where he / she works (Ilham, 2018)

QR (quick response) codes are two dimensional images that when scanned by a smart phone's camera, prompt the smart phone to open a web-page or display an image, video, numeric or text (Chang, 2014).Pin code scanner application is able to decode information encryption in Pin code (Coleman, 2011). Pin code works like a physical hypertext that can store addresses and URLs, phone numbers, text and message that can be used on magazines, diaries, advertisements, on bus signs, business cards or other media. The presence of this code allows the audience to interact with the media they have posted through the phone effectively and efficiently. Users can also generate and print their own Pin code for others by visiting one of several Pin code encyclopedias. Pin code has a high capacity in encoding data, which is capable of storing all kinds of data, such as numerical data, alphabetic data, kanji, kana, hiragana, symbols and binary codes. Specifically, Pin code is capable of storing numerical data types up to 7,089 characters, alphanumeric data up to 4,296 characters, binary code up to 2,844 bytes, and kanji characters up to 1817 characters. Additional Pin code has a smaller view than the barcode. This is because Pin code is able to accommodate data horizontally and vertically, therefore automatically the size of the image of the Pin code image can be only one tenth of the size of a Barcode. Not only that Pin code is also resistant to damage, because Pin code is able to fix errors up to 30%. Therefore, although some of the Pin code symbols are dirty or damaged, the data can still be stored and read. Three square shapes at three corners have a function to make symbols readable with the same result from any angle 360 degrees. The advantages of Pin code are high capacity encoding of data, small printout size, dirt and damage resistant durability, readable from any direction in 360 degrees, structured appending features (Narayanan, 2012). Pin code used to encode the student ID number and identification number of employees that can be scanned with a smartphone camera.

Android is a mobile device in the operating system for mobile phones based on Linux (Bonde et al., 2014). Android is open source platform which everyone can developed. Android has four characteristics as follows: (1) Open Source, android is an open source platform so that an app can call one of the core functions of the phone such as making calls, sending text messages, using the camera and others. Android is a virtual machine designed specifically to optimize the memory and hardware resources contained within the device. Android can be freely expanded to incorporate new, more advanced technologies as they emerge. Any programmer can build and develop this platform will make it more innovative mobile applications. (2) All apps are created equal, android creates the same permissions on every major application app from third-party applications and telephones. All applications are built to have equal access to the advantages of a phone in providing a broad range of services and applications to users. (3) Solve obstacles in the application, android can build applications that are applicative and innovative. For example, a developer can bring together information obtained from the web with information on a person's smartphone such as a phone book, calendar and geographic location. (4) Application development is fast and easy, Android provides users with extensive access to better use of applications. There is a set of tools on Android that can be used to help developers to increase productivity when creating applications. Based on these four characteristics, this application is made with android platform.

This parking app was created using App Inventor. APP Inventor is an application builder for creating applications running on the Android operating system provided by googlelabs, and is currently managed by the Massachusetts Institute of Technology (MIT). Therefor we must have a google account to get into the home app inventor. App Inventor is slightly different from other app builder because based on visual block programming, so developer can make application without coding. AppInventor was developed using a visual programming block based on

the Kawa Languange Framework. Application of parking information system to be installed on smartphone using Android based operating system with minimum requirement 1GB RAM, 5.5 inch LCD, Android OS 4.4.2 Kitkat version with 1Gb memory.

In generally, the way the system works is to scan the card Pin code students and employees with a smartphone camera, and then encoded using the parking information system applications and matched as existing in the database. In Figure 1 explain about flowchart display parking information system, there are two flowcharts are connected to a single database server. First - all users are coming to the parking gate entrance to scan Pin code for verification, if the ID card is not listed in the database, meaning users are not a Pin code that will be created exclusively for guests. after the verification process Pin code then the vehicle can enter the parking area. At the park entrance, if the number of vehicles already meet the specified capacity then the system will refuse, so that the vehicles coming in cannot enter the parking area. Second, process at the exit gate is Pin code scan the user's ID card member, then performed the verification with the database and performed taking photos of vehicles that will come out of the parking area, at the same time the capacity counter decrease.

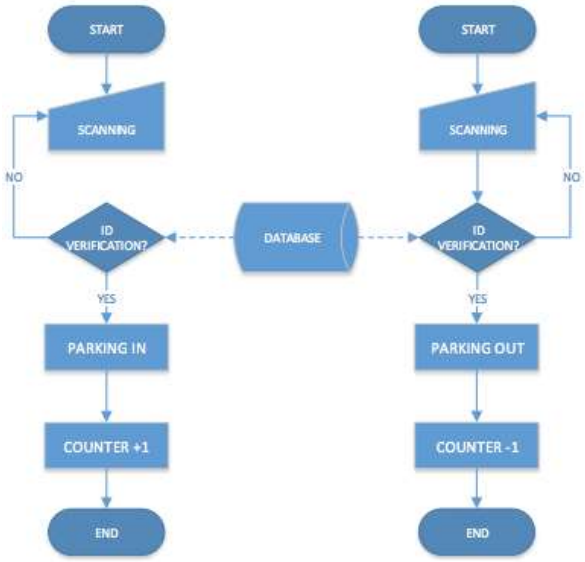
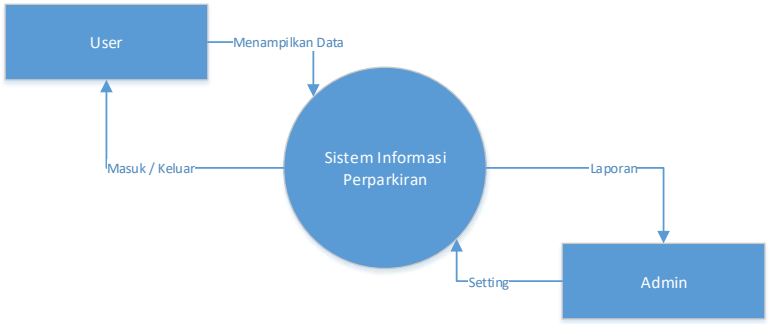
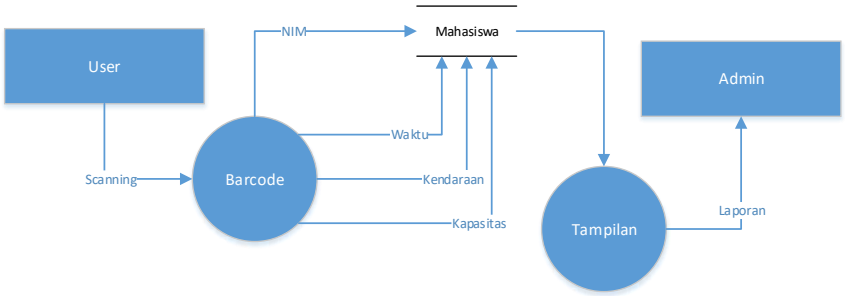


Fig. 1: Flowchart of parking information system

The process of input and output data in the parking system application is done by the user and admin, as the user inputs the display ID then the system will provide feedback to be able to enter and exit the parking, while admin here to input application settings, from the vehicle capacity adjustment, user permissions and outgoing or incoming access, which then gets output in the form of reports. In figure 2 is a data flow diagram (DFD) parking information system



(a)



(b)

Fig. 2: (a) DFD lvl 0 ; (b) DFD lvl 1

Parking information system applications are based on client-server architecture. There are client-server system that performs both functions of client and server so as to promote the sharing of information between them. This allows many users to have access to the same database at the same time, and the database will store a lot of information (Kurniawan & Puspita, 2010). Every smartphone that will be used at parking entrance and exit gates will be installed applications Banks Association Parking Information System (PPIS), this application will have two access rights, first as administrator and the second as a client. Data processing is performed by the server using PHP and MySQL, the client did request member data to the server, then the server responds to data synchronization (Kurniawan & Puspita, 2010; Patil & Sakore, 2014).

Data storage centered on a server, the client can be accessed via smartphone anywhere. To speed up the application work it would be nice to put a server locally (Ramadiani, Azainil, Haryaka, Agus, & Kridalaksana, 2017). The right of access clients are provided with interactive user interface for the car park entrance and exit parking, while the administrator permissions are used for monitoring, setting and setting permissions on a client's position parking gate entrance or parking exit gates.

The advantages of client server relationship model are: (1) centralized (resources and data security controlled via server), (2) scalability (3) flexible, (4) New technologies are easily integrated into the system. (5) the whole component (client / network / server) can work together. client server model in this parking system application is in figure 3, all the data centered on the server

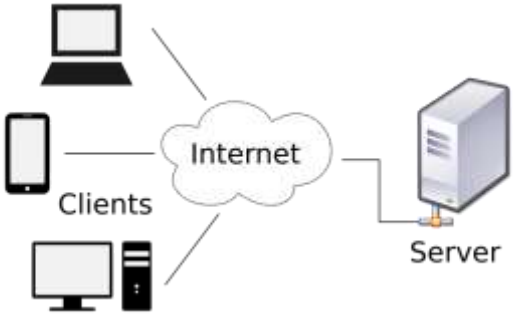


Fig. 3: Client Server Architecture

To keep corporate information resources it will require a security management system to maintain the confidentiality, availability and integrity. There are several types of controls used in these applications, technical

controls, restrictions on permissions, database encryption and physical control (Oluwatosin, 2014). Technical control systems in the manufacture of these applications are closed loop systems, feedback Pin code of ID card members will automatically identify the vehicle entered by counting the number capacity of the vehicle in the parking area and identify the suitability plate number at the gate of the parking exit. Restriction of access rights is done through user privileges on a database that can be accessed by the administrator and the client, for the administrator has the authority to set the client at the entrance of the parking lot or at the exit of the parking lot, but it is also the administrator can see the data of vehicles that enter and exit online, setting vehicles capacity. As a client can only scan Pin code, enter the license plate number, and took a photo of the vehicle. Encryption is done on a database that resides on a server, so if there are people who managed to get into the database, cannot read the data. While the physical controls carried out on smartphones with dual locks, locking on smartphones and applications.

The database is not just a collection of files. Moreover, the database is a central source of data that is used by many users for various applications. The core of the database is the database management system (DBMS), which allows the creation, modification, and updating of the database; retrieve data; and generate reports (Prashanth, Sathyanathan, Makam, & Nagarathna, 2016). This application uses the My SQL database which is one of the multi thread, multi-user RDBMS types, which is distributed for free under the GPL (General Public License) license. Any user can freely use MySQL, but with restrictions should not be made commercial derivative products. My SQL is a commercial database server that is three to four times larger than currently available, supported by multiple languages, capable of creating large, open source and distributed tables for free.

Waterfall Model is a software development method that is sequential. This method was introduced by Royce in 1970 and is currently referred to as the classical cycle and is now better known as linear sequential. In addition, this model is the model most widely used by the developers of the device soft. The core of the waterfall method is the workmanship of the system performed in sequence or in a linear manner. The steps in working on the waterfall method are (1) requirement analysis, this step is analysis conducted data collection on a study, such as interviews or study literature. System analyst will dig as much information from the user so that will create a system that can do the desired task. At this stage will produce the document user requirement or can be said as data related to what the user wants in making the system. This document will be a reference system analyst to translate into the programming language (2) system design, the design of the process will translate the need to a predictable software design prior to the creation of a programming language (coding). In this process focuses on data structures, software architectures, interface representations, and procedural (algorithmic) details. At this stage will produce software requirement. This document will be used by the programmer to perform system-making activities (3) Coding, Coding is a translation design system in a language that can be recognized by the device. The programmer will measure the process requested by the user. At this stage the programmer starts to perform the system in accordance with the design system that has been designed before it (4) Testing and Implementation, this stage can be said final in the making of a system. After doing the analysis, design and coding then the system has been used by the user (Bonde et al., 2014; ha Deoghare, 2015).

Methods

This research was applied to five schools in East Java, Indonesia, the type of data in this study is primary data using field research (field research), this research conducted by way of direct visit to the object of research. In this case perform data collection by (1) observation, (2) interview, (3) interview and (4) literature study. The minimum requirements for this application can run are (1) Hardware used to build this application are a smartphone with a minimum requirement 500Mb RAM, processor dual core, built in 8 Megapixel camera and need disk space 4 gigabytes. (2) Software requirement are android gingerbread platform and spreadsheet application as Microsoft excel (3) educated user.

Results and analysis

First - all, users must install the application "Perbanas Parking Information System - (PPIS)" on the smartphone device based on Android. After installation, the application icon will be displayed on the Home Screen, then select and it will appear "PPIS" welcome screen as in figure 3. In this view there is a background process data network

connection to the server which takes about 3 seconds depending on the network connection data. After the loading process is complete then click on the screen to go to the next display is the login form.

Fig. 3: Welcome Screen

There are two types of users, the administrator and the client. In order to get into the application of differentiated user name and password entered via the login form in figure 4a. Here's Administrator user has the responsibility of the user to enable clients to be at the gate of the parking lot or parking exit gates as shown in figure 4c. In addition the user administrator is also responsible for determining the capacity of parking in the parking area, by entering the number of vehicles in the textbox provided, and press the simpan button. through the administrator form, the administrator can also see how many vehicles are already in the parking area, and there are facilities to view data for historical displays of vehicles that enter and exit the parking area as in figure 4b.

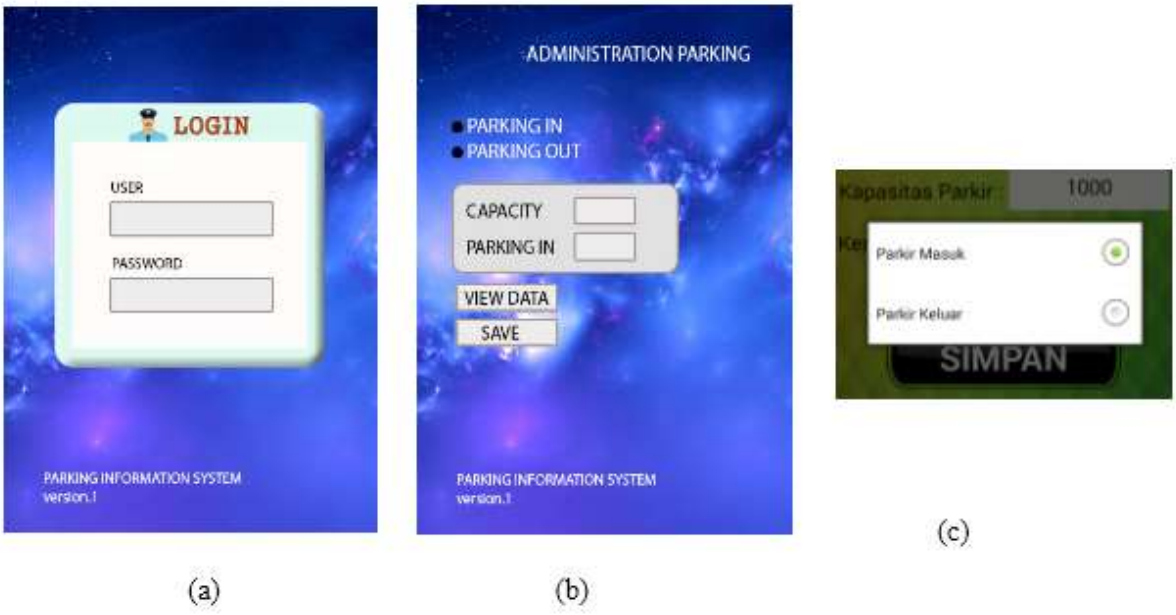
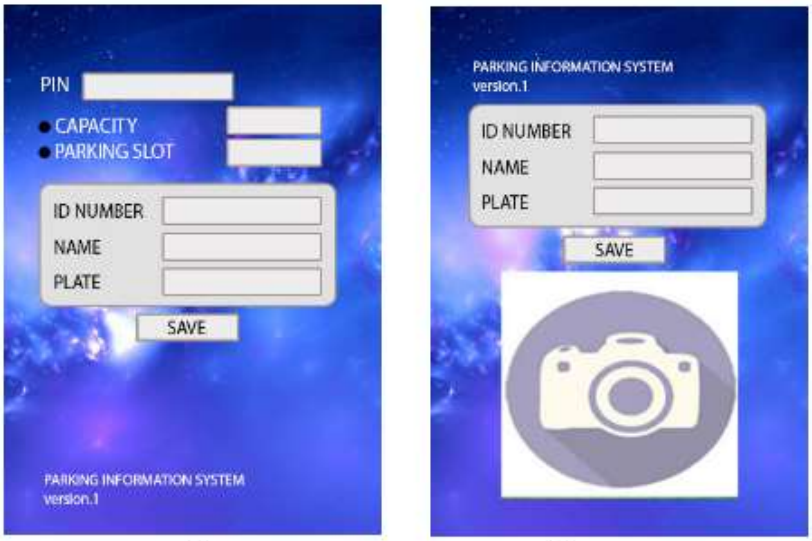


Fig. 4: Login (a) Login Form, (b) Admin Form, (c) Combo Button

How to use the form of parking, the form of parking sign in Figure 5a first thing to do is to scan the QR code that exist on ID card, the name and id number will appear automatically and then the officer can just enter the license plate number of vehicles, in this form also the officer can see the capacity the parking area and the rest of the parking area, so the vehicle into the parking area definitely get a parking spot, often the problems that exist in the parking area is a lot of its vehicles entering the parking area, but parking space in the parking area is full, so a lot of vehicles that have been enter the parking area eventually had to come out again. The next process is the form of parking out in Figure 5b, the first thing to do is to scan the QR code that exist on ID card, hence the name, id card and license plate numbers of vehicles will automatically pop up, the advantages of a form of parking out of these facilities is double plate numbers, the facility enhancements made based on the problems that often occur in the parking area, a problem that often happens is one person the user can enter with more than one vehicle, it is very useful if there is a user that his vehicle was broken so had to get out of the parking area and return to take another vehicle and went back into the parking area. In addition to improving the security of the facility there is a camera that can take pictures rider thus reducing crimes that often occur in the parking area.



(a) (b)

Fig.5: Parking, (a) Entrance Form, (b) Exit Form

3.4 Report to Manajemen

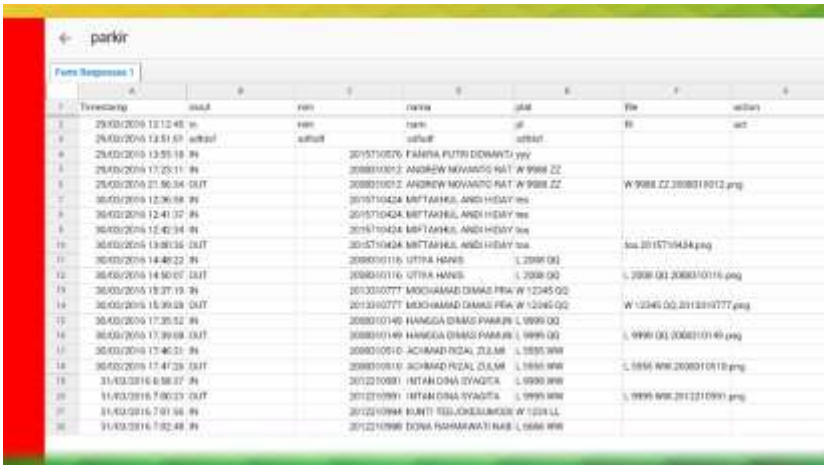


Fig. 9: Form Report

The button "view of data" on the form are useful admin reports to display the outgoing and incoming vehicles online for the management. From this report management can view date, time in, time out, ID and Name user and plate license number.

Conclusion

Application of the parking system is able to change the manual processes to automated, making it easy to manage, search for the required vehicle data, and provides the recording to reporting the vehicle entrance and exit to management. The implementation of this parking system takes an average of 2.4 seconds to process the entry of vehicles, from the scanning process Pin code to enter license plate numbers (Hermawati & Koesdijarto, 2010). While in the process of manually distributing parking card, the time it takes an average of 1.5 seconds making it faster, but keep in mind that the manual process can be done more quickly just in terms of the distribution of the cards, while in terms of user security is still far from secure parking, and the convenience of staff and managerial very far because of the absence of the reporting process and good service to managerial (Watene, Musiega, & Ndegwa, 2013). The system can further be enhanced by providing various options. By addition reservation online, GPS for empty space parking area by maps, payment of bill by various modes such as credit card etc, and it can be installed in another operating system.

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