VEHICLE TRACKING APPLICATIONS POSITION USING GPS AND GSM BASED ON ANDROID

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ABSTRACT

The development of mobile technology is very rapid, especially the term of Android that we often hear, read, and see. In general, the term of Android is associated with gadgets such as mobile phone, smartphone and tablet. GPS Tracker/GPS Tracking is a device for detecting vehicle position, which is functionalized for control device and send the vehicle position data to the owner gadget by sending sms command code to GSM number that is registered to GPS Tracker. Along with the development of mobile technology, the sms command can be included to Android application that will directly send the sms to GPS Tracker without the need of re-writing the sms command. In addition, it can accept coordinate data that can be directly seen in form of territory map so it can be used for solution of vehicle monitoring.

PRELIMINARY

1.1 Background Issues

At the present time, communication devices (smartphones and android) is preferred by many people, because this communication tool has a variety of features, tools and applications that really support the mobility of users. Besides easy to operate with a smartphone can also be used for monitoring, search locations, and others.

Shandy Rent is a rental service or rental car in Singapore at affordable prices while still prioritizing services and quality. Shandy Rent meet the transportation needs of car rental in and out of town. Shandy Rent provides various fleet is always in prime condition and ready to use, and supported by a friendly and experienced drivers. Vehicle leasing process that occurs can take up to several days, in which time period the vehicle is not under the supervision of the owner of the vehicle such things happen very vulnerable to loss of vehicle is carried away by the tenant. In addition Shandy rental that has a lot of vehicles are prone to be targeted vehicle theft. Therefore we need a system that can track the position of the vehicle. When the vehicle is lost, then the vehicle has been untraceable position and presence and direct action chase.

The system will be built is the position of the vehicle tracking application using GPS and GSM technology based on Android. This application is based Geographic Information Systems, which this application can monitor a vehicle traveling in operation, can show the direction of travel to destinations in the form of maps, and can turn off the engine through the application, so it can provide a sense of security in the company vehicle operations. This system will show a map to know the whereabouts of the vehicle and provide a sense of direction shown on the map by using the Google Map API.

The vehicle tracking system utilizing GPS and GSM based technologies integrated with applying oprasi android application. This tool uses a module arduino. The system works starts from vehicle owners to request the position of the vehicle then the module will accept the request and give responds in the form of coordinates of the vehicle position then responds is sent back to the owner of the vehicle, from the owner's side there is an android application that processes responds from the module in order to get those coordinates can appear on the digital map Google maps.

GPS is a satellite navigation system with the aid of which serves to determine the position, speed and time. While the GPS tracker is a system that determines the position of the vehicle fleet, as well as personal in realtime. This GPS tracker utilizes GSM and GPS technology to determine the point coordinates and translates it to a map like google maps or other. [1]

Of the problems that have been described, the system is created as a tool to track the vehicle's location by using GPS (Global Positioning System) and features SMS (Short Message Service). Received via SMS feature as a command can be used to check the GPS output on android phones. So that each vehicle can be monitored existence, the results of the analysis of the making of this application is that users can know the location of the vehicle from android phones already installed the application by determining the latitude and longitude coordinates received via SMS service bedasarkan from GPS output.

The system uses an Arduino Mega 2560 as a data processing center. On the Arduino Mega 2560 is connected to the GSM module and GPS module. All these devices are stored in a hidden place in the

vehicle so that its existence can not be known by others.

Based on the description of the problem that has been described, the app's meal will be built vehicles POSITION TRACKING APPLICATIONS USING GPS TECHNOLOGY BASED ON ANDROID. With the construction of this application, is expected to make it easier to track and secure the position of the vehicle via GPS found on android smartphone.

1.3 Purpose and objectives

1.3.1 Intent

The purpose of this study is to establish the position of the vehicle tracking application using GPS and GSM technology based on Android.

1.3.2 Aim

The purpose of this study is as follows:

1. This android app designed to facilitate viewing the entire location of the vehicle is in use or in the rental.
2. Android app is designed to prevent vehicle theft.
3. Prevent the vehicle taken away by the tenant.

In this final task required boundary problem. Here is a boundary problem of this thesis:

1. This system serves to track the position of the vehicle based on the GPS coordinates via Android based smartphone.
2. The information provided in the form of latitude and longitude coordinates of the GPS module.
3. Communication between the owner and teknoligi module using SMS (Short Message Service).
4. The system is designed to address vehicle theft and helping vehicle owners find or track his vehicle.

1. Research Contents

2.1 Microcontroller

A microcontroller is a functional computer system on a chip. It contains a processor core, memory (a small amount of RAM, program memory, or both), and input and output equipment. In other words, the microcontroller is a digital electronic device that has inputs and outputs as well as control with a program that can be written and erased in a special way, how the actual microcontroller to read and write data. Microcontroller is a chip inside the computer that is used to control electronic devices, which emphasize efficiency and cost effectiveness. Is literally can be called "little control" where an electronic system which previously was often require supporting components such as TTL and CMOS IC can be reduced / minimized and ultimately centralized and controlled by the microcontroller.

Mikrokonktroler used in products and equipment are controlled automatically, such as engine control systems, remote controls, office machines, household appliances, heavy equipment, and toys. By reducing the size, cost, and power consumption compared to designs using a microprocessor memory, and input devices separate output, microcontroller presence make electrical controls for different process more economical.

2.2 Arduino

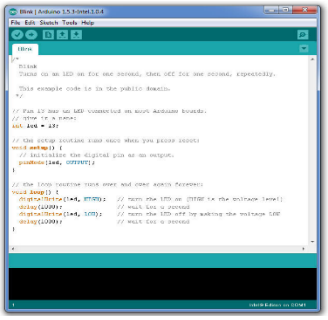
Arduino is an open source platform (open source) used to make electronics projects. Arduino is composed of two main parts: a physical circuit board (often called microcontroller) and a software or IDE (Integrated Development Environment) that runs on the computer. This software is often called the Arduino IDE used to write and upload the code of the computer board to physical (hardware) Arduino. Arduino is composed of two parts: hardware and software. [2]

ATmega328 microcontroller is the "brain" arduino board. This component is an IC (Integrated Circuit), which is coupled to header socket making it possible to be released.

Picture 2.2 Arduino Mega 2560

2.2.1 Arduino IDE

Arduino IDE is a software that is provided on site arduino.cc intended as a device that is used as a sketch development program in the Arduino board. IDE (Integrated Development Environtment) is a form of an integrated program development tools so that various uses are provided and expressed in the form of a menu-driven antarmukan. By using the Arduino IDE function to write a sketch, checking there is a mistake or not in the sketch, and also upload a sketch that has been compiled to the arduino board.



Picture 2.1 Arduino IDE

2.3 GPS

GPS stands for Global Positioning System which is a system for determining position and navigation globally by using satellites and triangulation methods. The system is a system that was first developed by the Department of Defense that was originally intended for Satellite Timing and Ranging Global Posotioning System) is the original name of the GPS system, which has three segments, namely: satellite (Space Segment), controller (Contorol Segment), and receiver / user (user Segment). GPS satellites orbiting the earth totaling 24 pieces, 21 pieces of fruit remaining active 3 is backup. Segment controller on duty to control the satellite, orbit determination and prediction, so that the satellite time synchronization, and transmit data to the satellite. While the receiver segment duty to receive and process data from satellites to determine the position, direction, distance, and time required by the user. In this design, use commercial GPS with a level of positioning accuracy of + 0 meter that serves to determine the position of the tool is to be displayed on Google Maps.

Picture 2.3 GPS

GPS module is part of a navigation tool that serves to receive and perform calculations coordinates and transmits the result as a serial UART in which this data will be processed again by the PC / laptop or microcontroller.

Picture 2.4 GPS Modul

2.5 GSM (Global System for Mobile Communications)

GSM module is designed so that the equipment can be used for communications applications from machine to machine or from humans to machines. GSM module is the equipment used as the engine in an application. In applications that are made there should be a microcontroller which will send commands to the GSM module in the form of AT commands via RS232 as connecting components (communication links). GSM module is part of the control center that serves as a transceiver. GSM module has the same function as a cellular phone that is capable of performing the function of sending and receiving SMS. Given a GSM module then designed applications can be controlled remotely using the GSM network as an access medium.

GSM module - SIM900A

SIM modules used in this study using a GSM module - SIM900A. Module SIM900 GSM / GPRS is a section that serves to communicate between the main monitors to mobile phones. ATCommand is a command that can be given modem GSM / CDMA as to send and receive data based on GSM / GPRS, or send and receive SMS. SIM900 GSM / GPRS is controlled via AT commands (GSM 07:07, 07:05, and SIMCOM). AT + Command is a set of commands that are combined with other characters after the characters 'AT' is usually used in serial communication. ATcommand used to regulate or give a command module GSM / CDMA. ATCommand command starts with the characters "AT" or "at" and ends with a code (0x0d).

Picture 2.5 GSM MODUL

2.8 HANDPHONE

Cell phone or mobile (phone) or mobile (HP) is a telecommunications device electronics have basic capabilities similar to conventional phone line fixed, but can be taken anywhere (portable, mobile) and does not need to be connected to the telephone network using a cable (wireless; wireless). Currently, Indonesia has two wireless telephone network is the GSM system (Global System for Mobile Telecommunications) system and CDMA (Code Division Multiple Access). Besides functioning sending and receiving short messages (short message service, SMS), mobile phones are generally also has the function to receive and make phone calls ,. There is also a provider of mobile phone services in some countries that provide third-generation services (3G) by adding videophone services, as a means of payment, as well as for online television on their mobile phones. Now, mobile phones become multifunctional gadgets. Following the development of digital technology, now the phone also comes with a wide selection of

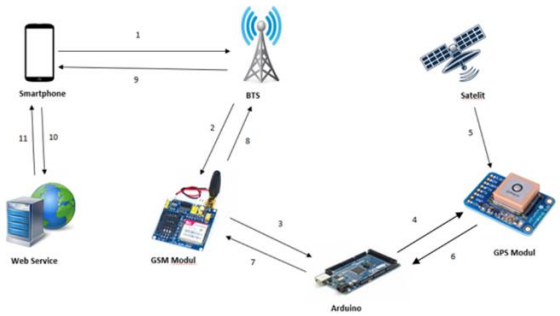
features, like being able to catch the broadcast radio and television, software audio player (MP3) and video, digital cameras, games, and internet services (WAP, GPRS, 3G). In addition to these features, the phone is now embedded computer features. So in these phones, people can change the function of these phones into mini computers. In the business world, this feature is very helpful for the businessmen to do all the work in one place and makes the job completed in a short time. In mobile phones, there is a loudspeaker, microphone, keyboard, display screen, and powerful circuit board with microprocessors that make every phone like a mini computer. When associated with a wireless network, a set of technologies that allows users to make calls or exchange data with another phone or computer.

Picture 2.6 HANDPHONE

2.6 ANDROID

Android is an operating system for mobile devices that covers Linux-based operating system, middleware and applications. Android provides an open platform for developers to create their applications. Initially, Google Inc. bought Android Inc. which is a newcomer that makes software for mobile phone / smartphone. Then to develop Android, formed the Open Handset Alliance, a consortium of 34 companies hardware, software, and telecommunications, including Google, HTC, Intel, Motorola, Qualcomm, T-Mobile, and Nvidia.

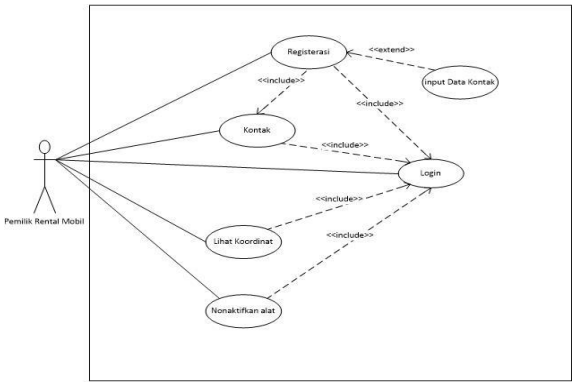
2.1 Sub Bab



Picture 3.1 Analysis of system design architecture

3.4.1 Use Case Diagram

Use case diagram is a model that is functional in a system which uses actors and use cases. While understanding of the use-case itself is a service or function is available on the system for its users.



Gambar 3.2 Use Case Diagram

Scenario Use Case View coordinates

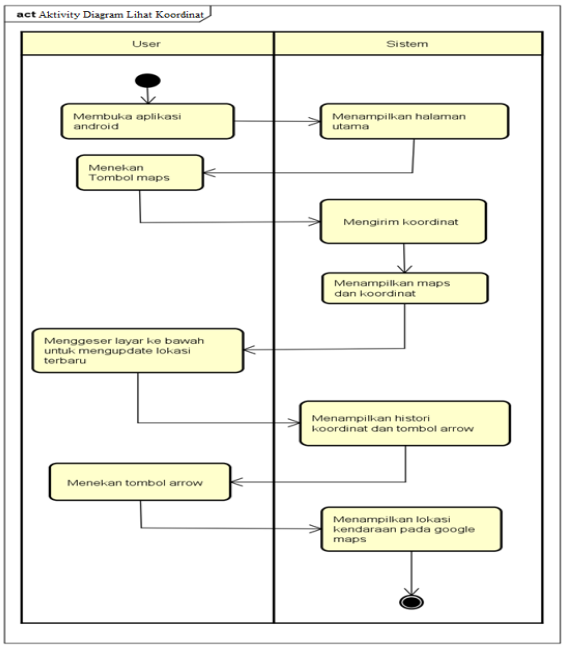
Tabel **Error! No text of specified style in document.**.1 Scenario Use Case View coordinates

Identifikasi	
Number	4
Name	See coordinates
Aim	Knowing the position of the vehicle passing on the maps gps tracker app
Description	The system displays the maps on your smartphone to provide vehicle position
Actor	Rental Owners
Main scenario	
Initial conditions	History Koordinat

Action actor	Rection system
1. Membuka aplikasi android	
	2. Menampilkan halaman utama
3. Menekana Tombol *Maps*	
	4. Mengirim Koordinat
	5. Menampilkan *maps* dan koordinat
6. Menggeser layar ke bawah untuk meng*update* lokasi terbaru	
	7. Menampilkan histori

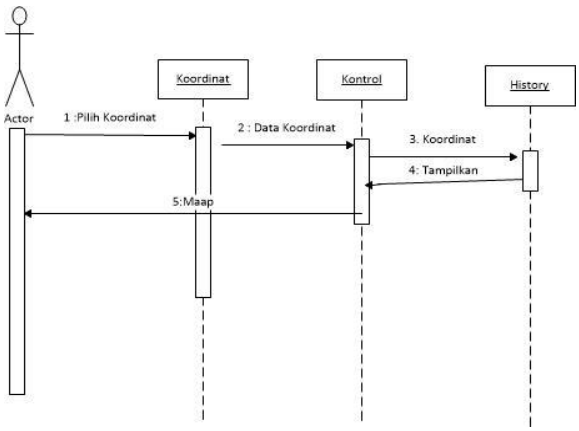
	koordinat dan tombol *arrow*
8. Menekan tombol *arrow*	
	9. Menampilkan lokasi kendaraaan pada google maps
Kondisi Akhir	Menampilkan lokasi kendaraan pada google maps

Aktivity Diagram Lihat Koordinat



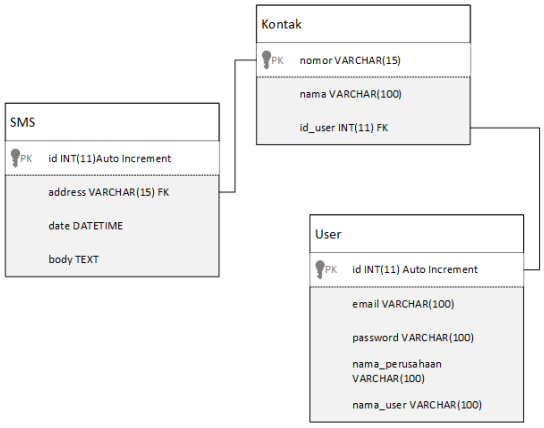
Gambar **Error! No text of specified style in document.**.1 Aktivity Diagram Lihat Koordinat

Sequence Diagram Tampilkan Koordinat



Gambar **Error! No text of specified style in document.**.2 Sequence Diagram Tampilkan Koordinat

3.5 Skema Relasi



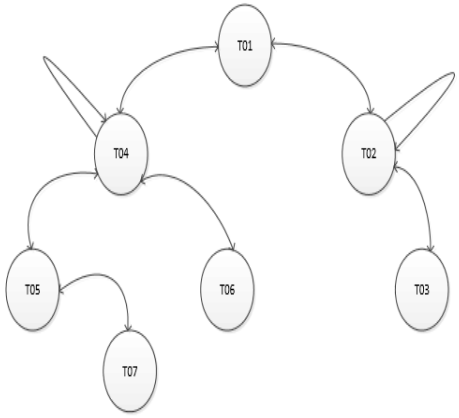
Picture **Error! No text of specified style in document.**.3 Skema Relasi

1.1.1 Interface Design Coordinates History

Interface design History page before the user must press the icon folder that is on the main page before entering on the form history, after which the user can view the history of the coordinates of the vehicle and if you want to see the status of the coordinates of the most reasonably shift the screen to the bottom, after which the system will display the coordinate point The latest vehicles..

Picture **Error! No text of specified style in document.**.4 History Interface Design Coordinates

3.8 Jaringan semantik



Gambar 3.27 Jaringan Semantik

4.1 Implementation of the system

This stage is the development of customized software to the design or the design of a system that has been created. Applications are made to be applied based on need. Further, the application will be made in such a way so as to facilitate the users to use the vehicle's position on the application pelcakakan Shandy Rent.

Before running this application, there are things that must be considered are the needs of the system. In accordance with the need to design using mobile tracking applications using a microcontroller required hardware and software.

Minimum requirement of hardware needed to run this application is :

Implementation of the hardware requirements

A. Laptop

a. OS Windows 7

b. Ram 2 GB

c. Procesor intel dual core

HP Android

a. OS Android 6.0.1

b. Ram 1 GB

c. Procesor 1 GHz

6. GPS Modul NEO6MV2

7. GSM Modul SIM900a

4.3 Software Requirements Specifications

Software requirements specification is a software requirement of the results of the analysis process that is performed when doing software development. Specification analysis software needs to be explained is the analysis of the specification of functional requirements and non functional.

Software Requirements Analysis:

4. Android Studio

5. Arduini IDE

6. JDK (Java Developmen KIT) Versi.8

1.2 Menu Contacts

Picture 1.2 Menu Contak

3.6 Struktur Tabel

3.6.1 Struktur Tabel SMS

Tabel 3.6 Struktur Tabel SMS

No.	Nama Field	Tipe Data	Ukuran	Keterangan
1	Id	Integer	11	Primary key, Not Null, auto

				increment
2	Date	Datetime	-	With Time Zone, Not Null
3	Body	Text	-	Not Null

3.6.2 Struktur Tabel Kontak

Tabel 3.7 Struktur Tabel Kontak

No.	Nama Field	Tipe Data	Ukuran	Keterangan
1	nomor	Varchar	14	Primary key, Not Null
2	nama	Varchar	100	Not Null
3	id_user	Integer	11	Foreign key , Not Null

3.6.3 Struktur Tabel User

Tabel 3.8 Struktur Tabel User

No.	Nama Field	Tipe Data	Ukuran	Keterangan
1	id_user	Integer	11	Primary key, auto increment, Not Null
2	nama_user	Varchar	100	Not Null
3	password	Varchar	100	Not Null
4	nama_perusahaan	Varchar	100	Not Null
5	email	Varchar	100	Not Null

4 Closing

5.1 Conclusion

Based on the results obtained from studies conducted in the preparation of the final project refers to the purpose of research, it can be concluded:

1. Users can monitor the position of the vehicle from a distance.
2. The user can control the vehicle remotely.
3. Users can prevent vehicle theft.

5.2 Saran

For the future, be able to use the GPS module that performs better, so that GPS signals can be detected in a confined space, it is advisable to use CN-06 GPS Module.

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DAFTAR PUSTAKA

[1] I. Ziad, "Rancang Bangun Pelacak Lokasi Dengan Teknologi GPS," TEKNOLOGI DAN INFORMATIKA (TEKNOMATIKA), vol. VOL. 3, pp. 1-14, 2013.

[2] A. Kadir, Buku Pintar Pemrograman Arduino, Melaka: MediaKom, 2014.

[3] A. Mazharuddin, "Global Positioning System," Trilaterasi Dalam Global Positioning System (GPS), vol. Vol.1, p. 1, 2011.

[4] A. Sunyoto, "Integrasi modul GPS Receiver dan GPRS untuk penentuan posisi dan jalur pergerakan obyek bergerak," GPS dan GPRS,Pergerakan Obyek, p. 3, 2013.

[5] N. Safaat, Android Pemrograman Aplikasi Mobile Smartphone dan Tablet PC Berbasis Android, Bandung: Informatika, 2014.

[6] W. Komputer, Android Programming with Eclipse, Yogyakarta: Penerbit Andi, 2013.

[7] M. Arafah, "Rekayasa Perangkat Lunak Monitoring Dan Evaluasi Rencana Strategis Universitas Hasanuddin 2011/2015," Rekayasa Perangkat Lunak, vol. Vol 1, p. 3, 2011 – 2015.

[8] J. Purba, Membongkar teknologi pemograman Web service, Bandung: Gava Media, 2012.