The implementation of car security system based on sms gateway and gps (global positioning system)

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Abstract. Car security system which is controlled by phone seluler based on SMS (short message service) and GPS (global positioning system). Interface application of SMS maps is automatically connecting with Google Maps to show car position via SMS. Interface application of SMS Maps is arranged by using Basic 4 Android programmer, so it car make user savety if their car is far from the parking area and maximizing smartphone as monitoring system. This research method is examining security system using SMS Maps application and Google Maps. Tense resources use adaptor 7.5 V. Examining of the first and the second modul GPS has average value between longitude and latitude SMS Maps and Google Maps application that is 6 M. While on the third examining has 18 M. So the difference from all the third different place has 10 M. The result which has been done, showed that security system has well done as specification which is decided by average is not more than 1%.

1. Introduction
Recently car security system has many limitedness. it makes many anxiety the owner of the car, such as distance which is impossible to hear sound of alarm, by untracker system in security system so it is impossible to track a car that has been stolen and it is easy to cut because the resource of alarm is from the storage battery.

Alarm system in the market is still conventional system that is alarm that can be sound when sensor gets respon without signal that can be understood by the owner or people around the car. If there is a fobery, such as the thief break the window of the car, come to the car and turn on the machine and then go with the car, so all the incident above will be not known by the owner, because there is no signal from the system to the owner, although alarm has sound, but sometime the owner can not hear the sound of alarm because of the distance between the owner of the car and parking area, if alarm sounds, often be ignored by the people around the car because they considered that it was mistake in system [1].

On 2012, Maurya and friends, on their research with the title “Real Time Vehicle Tracking System using GSM and GPS Technology – An Anti-theft Tracking System”, a vehicle tracking system using GPS and GSM microcontroller AT89C51 which is serial connected to the modem GSM and GPS receiver. Modem GSM is used to send position (diagonal and longitudinal) from the vehicle which is far from the place. Modem GPS will give data continuously as diagonal and longitudinal, show the place of vehicle. The result of this research shows such as SMS about the result of coordinate reading by GPS [2].

From the problem above, so can security system is made to make an anti-theft. Recently, car security system has been completed by SMS (short message service) and GPS (global positioning
system), but they lack of upgrading effectivity in processing maps laman access as principal means to know vehicle coordinate position. It’s caused by the tool which only tell the coordinate point through SMS and can not connect with the maps.

In this research, we develop the function of vehicle security system using sensor PIR as sign detection, GPS with SMS and completed by SMS maps application as a tool to give news, whether any people or not in the car, and can be know directly the position of the car as longitude or latitude.

2. Literature Review

2.1. Control System

Control system is an arrangement process or restraint to the one or more scale (variable, parameter), so it will be on a specific range. In industry, safety work process and efficiency is needed to get high quality and quantity of product by the time fixed. Automation assists more in smooth operational, safety (investment, environment) economy (cost of product), quality, etc. On application, a control system has a certain target. The target is to manage output on an condition which is determined by input passed system element control [3].

![Figure 1. Diagram of Control Diagram](image)

2.2. SMS Gateway

SMS is Short Message Service, that is component of communication text service from mobile communication system which uses communication protocol standard which is enable to have exchange message between mobile phone equipment [4]. SMS forms of short message service based on the text using handphone as media of communication text message which is usually used is letter and number. Capacity of one message of the text is 160 characters roman script. The data which is provided by provider, has been collected using specific code that has been standarized and on specific form, and based on SMS ability. So, the requester can choose the data which is required by sending specific code that has been standarized [5].

![Figure 2. SMS Worksheet](image)

2.3. Unified Modelling Language (UML)

Unified Modelling Language is a language based on a figure to visualize, specificationize, build and documentationize, from system developing of software based on object. Unified Modelling Language (UML) is not programming language but models which are created, connect to many programming language. So it’s possible to have mapping from models which are created by Unified Modelling Language (UML) with 91 programming languages, object oriented, such as java [6].

2.4. Modul GPS

GPS tracker is a technology which is used to track position, whether vehicle, fleet or in condition real time. Technology GPS tracking uses GSM and GPS combination to determine coordinate an object and is would be translated to the digital maps, so utility of GPS is to find an object. According to the datasheet on modul GPS, determining GPS location as horizontal is 2.5 M [7]. Longitude is a stretch out of line which connects between north side and south side of the earth (pole). This longitude is used to measure west – east side coordinate of point of hemisphere. Longitude is divided 2, there are east longitude and west longitude. Which is coordinate in the east is negatif, and in
the west is positif. Latitude is a line which is crossing between north pole and south pole, that connects
between east side and west side of the earth. This latitude is made to measure coordinate north-south
side point of hemisphere. The value of longitude and latitude which is showed by modul GPS is
decimal degree. To convert degree decimal to be degree minute second on astronomical position on a
place in distant unit (km and m) use formula:

\[
1^\circ \text{(latitude/longitude)} = 111,322 \text{ m}
\]

\[
1^\circ \text{(latitude/longitude)} = 60 \text{ minutes} = 3600 \text{ seconds}
\]

1 minute (latitude/longitude) = 60 seconds

1 minute (latitude/longitude) = 1,885,37 m

1 second (latitude/longitude) = 30,9227 m

Value D or Degree taken by degree

Value M or Minute taken by \(((\text{fraction degree value}) \times 60)\)

Value S or second taken by \(((\text{fraction degree value}) \times 60)\)

2.5. Smartphone Android

Smartphone is phone cellular with microprocessor, memory, screen and nature modem. Smartphone is
multimedia phone cellular which connects PC functionality (Personal Computer) and handset, so
luxurious gadget is created, which has text message, camera, music, video, game, e-mail, GPS fitur and
internet phone service [8].

3. Implementation

Implementation that would be used in this research is, collecting data by study literature method, and
the next step, problem identification until doing examination using hardware and software system and
to get data which is analized until getting conclusion.

3.1. Hardware System Design

Hardware design on this tool use some components to arrange work of car security system based on
SMS Gateway and GPS. Sensor which is used is PIR sensor which has function to detect human
moving, and then the data will be send to the microcontroller. Besides sensor, microcontoller gets
input data from GPS about vehicle location. Processing data by microcontroller will be transmitted to
the modul SIM800L, its function is to send coordinate of vehicle position in the form of SMS and it
will connect to the maps SMS application, in order to get vehicle position from coordinate longitude
and latitude without opening the message. Hardware design, could be seen on figure 3.

![Figure 3. Diagram Block Research](image)

3.2. Design SMS Maps Application of Software Basic4Android

In this research, make to SMS Maps Application of software Basic4Android. This step is more
important because connects to SMS Maps Application. Optimize the function of the tool by added
android application automatically, SMS Maps Application will connect directly to the Google Maps to
inform the place of vehicle to user (longitude and latitude). SMS Maps sketch, can be seen on figure 4.
There is 1 button to review, and 7 labels. Button 1: to review maps on the first position, if the maps has been zoomed out or zoommed in to see the first position by press the button, if there is no inbox message (SMS), and pressed button 1, it will show. Label 1: receive message, label 2: inbox message, label 3: people status, label 4: longitude, label 5: latitude, label 6: contain of status (people or no people), label 7: longitude coordinate, label 8: latitude coordinate.

3.3. Flowchart Programme Arduino

The worksheet of tool above is by activated the save mode. If save mode actives, the tool will receive respon from PIR GPS censor. The result will show longitude and latitude, on LCD showed movement status, and send SMS at once, after receiving SMS and smartphone and open Maps SMS Application, the message from the tool will be copied directly on Maps SMS Application and knowing the position of the car from longitude and latitude. Flowchart program arduino, can be seen on figure 5.

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**Figure 4.** SMS Maps Sketch

**Figure 5.** Flowchart Program Arduino

3.4. Diagram Activity Program Basic4Android

Diagram Activity shows flowchart begining from the start of condition until finish. Application works, when user opens SMS Maps Application, it shows main menu. And there is inbox SMS on smartphone, it show automatically the content of SMS, formed moving status, longitude and latitude.
button zoom maps is to get easy to be big or small maps, and review button is to review maps on the first position when it had to be big or small. If there is no inbox message on SMS Maps application, when button review is pressed, so it shows “no message”. Diagram chat shows the connection between user and application. Diagram activity program Basic4Android, can be seen on figure 6.

![Figure 6. Diagram Activity Programme Basic4Android](image)

4. Result

4.1. Examining of Modul SIM800L SMS

Examining SMS is by receiving SMS from Modul SIM800L after security mode is activated. SMS will be receive every 10 seconds, based on respon which is got. The content SMS which is received will be shared, based on lable and directly will be get car position from the data longitude and latitude on SMS Maps Application. Screenshot the result of examination could be seen on figure 7.

![Figure 7. Screenshoot The Result of SMS Examination](image)

4.2. Examining of ON-OFF Button

Examining of ON-OFF button is by pressing ON and OFF button, do they well work, ON button is to activate save mode, in order to send all respon and data which is got from sensor PIR and GSP. ON-OFF security mode, data which is showed on LCD is still longitude and latitude, security mode status
is non-active, moving status and could not send SMS. The result of examination ON-OFF button such as figure 8.

![Figure 8. ON-OFF Button Examination](image)

**4.3. Examining of PIR Sensor**
Examining of this tool is by hand warning on PIR sensor. Could it well respon or no when delay is given on 10 seconds. So, when the first respon has moving, and for 10 second, there is no moving again, so it could be read “moving” because delay on PIR sensor is arranged for 10 second. Examining of PIR sensor could be seen on figure 9.

![Figure 9. Examining of PIR Sensor](image)

**4.4. Appearance Examining of SMS Maps Application**
Examining is done by receiving SMS on SMS Maps application, next to know the position of vehicle, just opening SMS Maps Application on smartphone without open inbox message. It could be send figure 10.

![Figure 10. Appearance Examining of SMS Maps Application](image)

**4.5. Examining of Modul GPS**
Examining of modem GPS Neo 6M by getting data longitude and latitude based on inputting data location, next, the result data of data which has been got from the hardware will be compared with longitude and latitude google maps it self from smartphone by versi 6.0 Android (marsmellow). It is taken 10 time in 3 different places. Error value or differential from longitude and latitude which is
compared by using SMS Maps Application, modul GPS Neo 6M and google maps on android itself. By converting value of longitude and latitude, it would be know the differential of data comparing which is gotten from SMS and google maps application itself in meter or kilometer. Because, longitude and latitude value which is gotten is still in DD (Degree Decimal). Based on the result of examining data on modul GPS, application program showed output data GPS and received by SMS Maps application and showing the data based on screen of LCD. Examining on the first and the second modul GPS is got the defferential of longitude and latitude from SMS Maps and google maps application, that is meters. While on the third gets 18 meters, why? Because of the position which is under the tree and building. In order to keep well signal, so, the device must be set in out side.

Examining of sending message time uses stopwatch on smartphone. The function is to know how long the tool would be started on SMS sending process, when PIR sensor detects on moving, and it took 10 times to the traffic and distance. Examining of sending message time is done after PIR sensor detected moving until SMS notification is received on smartphone. It could be seen on table 1. And 2.

Table 1. The Result of Examining of Sending Message Time to The Traffic and Distance (Noon)

| No | Sending SMS Time to The Traffic (Noun) and Distance (Second) |
|----|-------------------------------------------------------------|
|    | 10 m | 20 m | 30 m |
| 1  | 2.5  | 2.8  | 1.9  |
| 2  | 1.6  | 1.6  | 2.6  |
| 3  | 2.1  | 2.3  | 1.9  |
| 4  | 1.7  | 2.8  | 2.2  |
| 5  | 1.6  | 1.8  | 3.0  |
| 6  | 2.8  | 2.2  | 2.8  |
| 7  | 1.6  | 1.5  | 1.4  |
| 8  | 1.5  | 2.2  | 3.0  |
| 9  | 2.6  | 1.6  | 2.4  |
| 10 | 2.1  | 1.5  | 2.2  |
|    | Average | 2.01 | 2.3  | 2.34 |
|    | Total Average | 2.21 |

Table 2. The Result of Examining of Sending Message Time to The Traffic and Distance (Night)

| No | Sending SMS Time to The Traffic (Night) and Distance (Second) |
|----|-------------------------------------------------------------|
|    | 10 m | 20 m | 30 m |
| 1  | 1.2  | 1.4  | 1.7  |
| 2  | 1.4  | 1.4  | 1.4  |
| 3  | 1.8  | 1.1  | 1.2  |
| 4  | 1.2  | 1.1  | 1.2  |
| 5  | 1.2  | 1.3  | 1.4  |
| 6  | 1.1  | 1.2  | 1.3  |
| 7  | 1.4  | 1.3  | 1.2  |
| 8  | 1.2  | 1.5  | 1.3  |
| 9  | 1.0  | 1.3  | 1.2  |
| 10 | 1.3  | 1.7  | 1.5  |
|    | Average | 1.28 | 1.33 | 1.34 |
|    | Total Average | 1.31 |
According to the result of examining of sending SMS time to the traffic (Noon) and distance as send on table 1, it is comparison between traffic noon and distance. The response of it is variability of SMS speedy, it proved that response of speedy SMS sending which is received is not influence, and the value can be variable, not constant or unstable. Next, examination of sending SMS time to the traffic, could be send on table 2, it is comparison of traffic. Respond of sending SMS to the traffic night is more faster than respond to traffic noon, it could be seen on table 1 and table 2 by distance comparison which is used is 10 meters. It proved that respond of sending SMS which is received, influenced to the traffic comparison and overload traffic. Delay of value sending based on condition which is doing.

5. Conclusion
From the research of the car security system based on SMS Gateway and GPS are concluded:

- It has done based on planning and it can be proved by simulation. The result of simulation between longitude and latitude value on SMS Maps Application with google maps android itself, has differential value from all of the third different places, that is 10 meters.
- Directly, the car security system connects to SMS and SMS Maps Application, the user knew, where the position of vehicle based on coordinate (longitude and latitude).
- Respond of sending SMS noon time showed that the time which is get is 2.1 second. But on night time got 1.2 second, it proved that respond of sending SMS which is received influenced to the traffic or overload network.

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