CONSTRUCTING MOTORCYCLE SECURITY SYSTEM USING GPS TRACKING AND SMART IGNITION KEY BASED ON ARDUINO MICROCONTROLLER

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ABSTRACT

Security system is an attempt to secure any resources from being used by unauthorized persons. Motorcycle security systems are categorized into two types, namely passive security systems which is usually given example with lock and active security system like an alarm. Cases of vehicle theft still often occur, this is caused, by the lack of supervision of vehicle owners or the shrewdness of thieves in crippling the vehicles. Indonesian Central Bureau of Statistics in the 2016 Criminal Statistics report noted that, vehicle theft in 2015 reached 38,389 cases.By using General Packet Radio Service and Global System for Mobile Communication, the ignition key can be controlled through internet network, so there is no limit on the distance in controlling the ignition and can be used as early warning directly to the owner of the motorcycle by utilizing a phone call. Manipulating Global Positioning System can determine the position of the motorcycle and send the data to the owner of the motorcycle. Based on the results of tests that have been implemented, motorcycle security system has been made to facilitate the owner of motorcycle to monitor the location of motorcycles and control the ignition key via Internet network.

Keywords: Security, GPS, Contacts, GSM, Arduino

1. INTRODUCTION

Motor vehicle transportation from year to year increase. This is driven by the ease with which people have motorized vehicles with various convenience programs offered by both manufacturers and finance companies. Indonesia's Central Bureau of Statistics (BPS) report in 2016 Land Transport Statistics report, the number of motorcycle owners in 2013 to 2015 increased from 84,732,652 units to 98,881,267 units or an increase of about 16.7%. With the increasing population of motorcycles in Indonesia indicating that motorcycles are starting to become a primary need for society, this can affect the crime of motorcycle theft [1].

The case of motor vehicle theft still often happens today. Indonesia's Central Bureau of Statistics (BPS) in the 2016 Criminal Statistics report noted the crime of motor vehicle theft from 2013 to 2015 decreased from 42,508 incidents to 38,389 incidents or down about 9.7%. But it is still worth noting, for the number of motor vehicle thefts continue to decline [2].

Motorcycle security systems can be categorized into two types: passive security systems such as padlocks and active security systems such as alarms, but the system still has limitations, this is reinforced based on the results of questionnaires obtained from 50 motorcycle owners, That on the question of the use of motorcycle security system and the lack of the system that has been used can be concluded that 39 people or 78% have used the security system either in the form of a padlock or alarm that is attached to the motorcycle. However, according to the users of the security system that has been used still has deficiencies, such as the padlock that is easily damaged by using cutter or chemical liquor and alarms that are too sensitive to the vibrations or limitations of the distance so that the sound produced is not up to the owner of motorcycles, and 11 people or 22 The other% stated not using any additional security system. Based on the questionnaire data obtained, motorcycle theft at this time is still rampant happened, seeing from three questions about motorcycle theft, found that 43 people or 86% have experienced motorcycle theft and 7 people or 14% never experienced acts Motorcycle theft. From these results stated that at this time the motorcycle theft is still rife happening. From these problems, it needs a more innovative security system so that motorcycle owners can better monitor motorcycles and minimize the act of motorcycle theft.

Based on the sample data taken by using incidental method as much as 50 people to motorcycle owners who use android smartphone, found that 39 people or 77% have used android smartphone, and 11 people or 17% others do not use android smartphone. From these results obtained that the average respondent using a smartphone with android operating system. By utilizing android technology is expected to help the owner of

motorcycles in improving the motorcycle security system in the form of controlling and monitoring the motorcycle.

Based on existing problems at this time then needed a **Constructing Motorcycle Security System Using GPS Ttacking and Smart Ignition Key Based On Arduino Micocontroller .**

2. LITERATURE REVIEW

2.1 Theoretical basis

Theoretical basis describes several theories relating to the problems that will be discussed as an understanding of the system to be built on the development of motorcycle security system. Some theories related to the development of this software are the concepts used, software, hardware and programming languages required in Vehicle Safety System Constructing Motorcycle Secuity System Using GPS Tracking and Smart Ignition Key Based On Arduino Microcontroller.

2.1.1 Security System

The security system is an effort made to secure performance and resources. Implementation of security systems in everyday life is useful as a guardian of resources in order not to be used, modified, interrupted, and disturbed by unauthorized persons [3].

2.1.2 Motorcycles

Motorcycle is a two-wheeled transportation that helps all kinds of human activities related to the distance, in this distance traveled in long distances so that motorcycles can help and facilitate humans to the destination destination more quickly. Generally, a motor vehicle is a type of vehicle in which its motion system uses technical or machine tools [4].

2.1.3 GPS (*GlobalPosittionong System*)

Global Posittioning System is a satellite navigation system and positioning owned and maintained by the United States. The system is designed to provide three-dimensional position and speed as well as timely, continuous information around the world regardless of time and weather, for many people simultaneously.

Global Posittionig System or commonly abbreviated as GPS is an electronic navigation tool that receives information from 4 - 12 satellites so that GPS can take into account the position where we are on earth. GPS satellites do not transmit our position information, the transmitted satellites are the satellite positions and our GPS receiver distance from the satellite. This information is processed by our GPS receiver and the results are displayed to us. GPS is an open telecommunication system, no ownership (non-proorietary) but a copyright ownership of a company that is growing rapidly and constantly. The main part of the GPS system is the 24 satellites orbiting the Earth at an altitude of 20,200 kilometers. Satellite orbits are designed so that each ground point can see at least four satellites at any time [5].

2.1.4 GPS Tracking

GPS Tracker or often referred to as GPS Tracking technology is AVL (Automated Vehicle Locater) is a technology used to track positions that allow users to track the position of vehicles, fleets or cars in a state of Real-Time. GPS Tracking technology utilizes a combination of GSM and GPS technology to determine the coordinates of an object, then translate it in the form of a digital map [6].

2.1.5 Ignition key

The ignition key acts as a primary switch to connect and disconnect the ignition system chain and also other circuits on the motorcycle. The key contacts are divided into two namely:

1. Ignition key with AC ignition (Mass controller)
   In the OFF and LOCK positions, the ignition key deflects the voltage from the voltage source (alternator) required by the ignition system to the mass through the IG and E terminals of the ignition, so that the ignition system can not work. On the other hand, in the OFF and LOCK positions the ignition key also disconnects the voltage (+) of the battery (BAT and BAT terminal 1) so that the entire electrical system can not operate. At the ON position, the ignition key disconnects the IG and E terminals, so the voltage generated by the alternator is passed to the ignition system. The ignition system can be operated, in addition to the BAT and BAT 1 terminal connections so that all electrical systems can be operated.

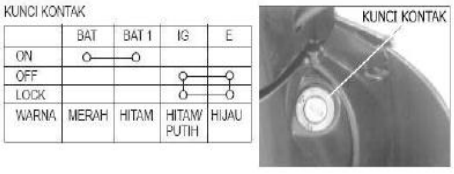


Figure 1. Ignition Key AC

2. The ignition key with DC ignition (positive controller)
   At the ON position, the ignition key connects the (+) voltage of the battery to the entire electrical system (including the ignition system) to operate all existing electrical systems. In the OFF and LOCK positions, the ignition key disconnects the

electrical connection from the voltage source (terminal (+) of the battery) required by all electrical systems, so that the entire electrical system can not be operated [7].

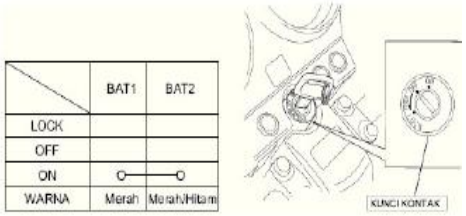


Figure 2. Ignition Key DC

2.1.6 Mikrokontroler

Microcontroller muerupakan main component or commonly referred to as the brain that functions as a regulator of motor movement (Motor Driver) and data processing generated by the comparator as a form of output from the sensor. A microcontroller is a processor used for control purposes [8].

2.1.7 Arduino

Arduino is an electronic device that functions like a microcontroller and is open source. Arduino has an Atmel AVR family processor. Arduino has software with a specific programming language. Arduino also has its own compilation software which can be downloaded at arduino.cc website. So users can develop their own as you wish.

The arduino board has the ability to read digital data input and analog data. The Arduino board also has the ability to extract digital data from analog. The programming languages used have language syntax C. Arduino users can develop some simple projects (motor, led serial data) and complex projects (Internet of Things, 3D printers and other advanced applications). Arduino can run on computer with mac oprasi system, windows and linux. The development of arduino quite rapidly because it is supported by the online arduino community [9].

2.1.8 Arduino Mega2560

Arduino Mega2560 is an arduino board that uses ic Atmega2560 microcontroller. The board has 54 digital inputs or outputs (15 of which can be used as PWM output), 16 input analogs, 4 UARTs (universal asynchronous receiver or transmitter), 16 MHz crystal acylator, USB connection, power jack, ICSP (In- Circuit System Programming), and the reset button. All the digital pins contained in the Arduino Mega2560 can be used both as input and output. By using the function pinMode (), digitalWrite (), and digitalRead (). The output voltage of each pin is 5 volts. The maximum current that can be given and received is 40 mA [10].



Figure 3. Arduino Mega2560

2.1.9 Dc-Dc *Converter*

Dc-Dc converter is an equipment that can convert electrical energy from certain directional voltage to desired or regulated directional voltage. Dc-Dc converter can be grouped into three types based on the resulting output voltage: voltage riser, voltage drop, and riser or voltage drop. The load borne by the converter is generally an electronic load. Ideally each load has a power factor equal to one [11].



Figure 4. Dc-Dc *Converter*

2.1.10 Hall Effect Sensor

Hall effect sensor is a sensor used to detect magnetic fields. Hall effect sensor will produce a voltage that is proportional to the strength of the magnetic field received by the sensor. The detection of magnetic field strength changes is quite easy and requires nothing other than an inductor that acts as a sensor. This sensor consists of a silicon layer that serves to drain the electric current [12].



Figure 5. *Hall Effect* Sensor

2.1.11 Relay

Relays are electronic components that have the function of working as a mechanical switch powered by electrical energy. The relay uses an electromagnetic force to break or connect an electronic circuit that is one with another set of electronics. Relay consists of coil and contact. Coil is a wire coil that gets an electric current, while the contact is a type of switch whose movement depends on the presence or absence of electric current in the coil.

There are two types of contacts: normally open (initial condition before activated open), and normally closed (initial condition before activated closed) [13].



Figure 6. *Relay*

2.1.12 SIM808 GSM/GPRS/GPS/ *SHIELD*

SIM808 GSM / GPRS / GPS / SHIELD is an arduino shield designed by AND Technologies with Quad-band GSM / GPRS engine and also supports GPS satellite navigation system. The GSM / GPRS / GPS combination allows for remote tracking and controlling of the system. SIM808 is a communication module that provides GSM / GPRS / GPS / BLUETOOTH network as a communication medium. SIM808 shield that can be directly integrated with arduino [14].



Figure 7. SIM808 GSM/GPRS/GPS/ *SHIELD*

2.1.13 GSM

Global System for mobile Communication or commonly abbreviated GSM is a mobile communications technology that is digital. GSM technology is widely applied to mobile communications, especially mobile phones. This technology utilizes microwaves and signal deliveries that are divided over time, so that the information signals sent will reach the GSM goal of becoming a global standard for mobile communications as well as the most widely used cellular technology in the world. GSM operates at a frequency range of 900MHz and a range of 1800Mhz. The ultra high frequency (UHF) has a frequency area of 300MHz - 3Ghz, with a wavelength area of 1m - 10cm. Its utility for radar and microwave communications [15].

2.1.14 GPRS

General Packet Radio Service or commonly abbreviated GPRS is a packet-based transmission system for GSM that offers higher data rates. The data rate is roughly up to 160 kbps compared to the 9.6 kbps that daat is provided by the GSM disembarked circuit. Multiple radio channels can be allocated to a single user and the same channel can also be used with multiple users to become highly efficient. In terms of cost, the price refers to the volume of users [16].General Packet Radio Service atau yang biasa disingkat GPRS merupakan sistem transmisi berbasis paket untuk GSM yang menawarkan laju data yang lebih tinggi.

2.1.15 Arduino IDE

Arduino IDE is an open-source, single-board micro controller derived from Wiring platform, designed to ease electronic usage in various fields, its hardware uses Atmel AVR processor and its software has a simple C ++ programming language and complete functions , So the arduino is easily learned by beginners [17].

2.1.16 Android

Android is a mobile operating system that grows in the middle of other operating systems are growing today. Other operating systems such as Windows Mobile, i-Phone OS, Symbian and many more also offer a wealth of content and optimization running on existing hardware devices. However, this existing operating system runs by prioritizing the built-in core application without seeing any substantial potential of third-party applications. Therefore, there is limited distribution of third-party applications for their platforms [18].

2.1.17 Intel XDK

Intel XDK is a development kit created by Intel to create native applications for mobile devices using web technologies such as

HTML5, CSS and JavaScript. Web apps are compiled using the Cordova platform on online servers to create cross-platform hybrid applications. The Intel XDK application itself is a cross-platform application available for Windows, Linux and OSX operating systems. With technology like this, developers can create one application that can run on multiple mobile platforms using just one codebase [19].

2.1.18 Web Service

Web service is a software component that is selfcontaining, a self-describing modular application that can be published, allocated, and implemented on the web. Web services are technologies that change the ability of the Internet by adding web transactional capabilities, ie the ability of the web to communicate with each other program-to-program (P2P) patterns. The focus of the web has been dominated by program-to-user communication with business-to-consumer interaction (B2C), while transactional web will be dominated by program-to-program with business-to-business interaction [20].

2.1.19 Wheel Rounds

Wheel rotation is where the bottom surface always attaches to the surface. If the spinning wheel of the wheel forms a straight line, it can be likened to the circumference of the wheel circle and proportional to the number of wheel spins. One wheel rotation ratio is proportional to 180 degrees of wheel spin or half wheel spin, then in one full rotation, the wheels rotate as much as two radians or 360 degrees in a single round.

2.1.20 *Mean Absolute Percentage Error*

Mean Absolute Percentage Error is the middle value of the absolute percentage error of a forecast. This method is used to calculate the difference in the difference between the original data and the data forecasting results expressed as a percentage of the original data. To get the error percentage value used the following formula [21]:

$$Nilai\ Error = \frac{\textbf{Nialai Acuan} - \textbf{Nialai Percobaan}}{\textbf{Nilai Acuan}} \times 100\%$$

Figure 8 *Persentase Error*

While to get the average value of errors of forecasting results used the formula as follows:

$$Error\ rata - rata = \frac{\textbf{Jumlah Nilai } Error}{\textbf{Banyaknya } Error}$$

Figure 9 Average *Error*

2.2 Communication

Communication is the decomposition stage of what is obtained from research to identify and evaluate the problems, opportunities, constraints and expected needs so that proposed improvements can be proposed.

2.2.1 Problem Analysis

Based on the results of questionnaires conducted to the owner of motorcycles conducted in various parking lots, found several problems are:

1. Security systems used by motorcycle owners in the form of padlocks and key handlebars have not been able to provide a sense of security for owners of motorcycles and systems that have been developed have limited distance if there is an obstructing object.
2. The alarm system used by motorcycle owners has not been effective enough, since there is no early warning directly to the owner of the motorcycle if the owner is away from the motor.
3. Motorbike owners find it difficult to track a motorcycle when a motorcycle moves from its starting point to another without the knowledge of the owner of the motorcycle.

2.2.2 Analysis of Current System

Analysis of the running system is a stage that gives an overview of the current system. The analysis aims to give a more detailed picture of how the system works. The focus of this research is the procedure of using the padlock keys used by motorcycle owners and the motorcycle turn on and off procedures.

1. Lock Pad Locking Procedure

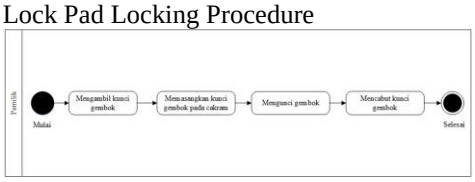


Figure 10. Lock Pad Locking Procedure

2. The Motorcycle Turning and Turning Off Procedures

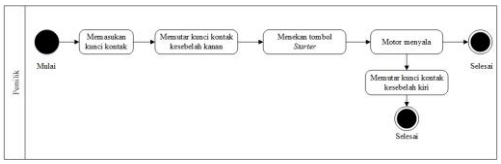


Figure 11. The Motorcycle Turning and Turning Off Procedures

2.3 *Quick Plan*

At this stage is done design of motorcycle safety system in the form of prototype. The prototype created is tailored to a predefined system of problems faced by motorcycle owners.

2.3.1 System Architecture



Figure 12. System Architecture

The process of viewing the position of a motorcycle is as follows:

1. The GPS module or receiver device on the motorcycle receives the information signal from the GPS satellites, then the GPS module determines its position in coordinate form.
2. The GPS module sends the data with the GPRS network as sending to the webserver and then stored into the database..
3. The mobile system sends requests over the internet.
4. The Internet forwards the request by accessing the webservice within the webserver.
5. Web Service retrieves the previously requested data to the database.
6. The database sends the requested data to the webservice.
7. Web Service sends the result of the request via internet.
8. Mobile devices receive data of latitude and longitude that have been requested in the form of JSON and displayed in the form of maps and data.

The process for turning on or off a motorcycle is as follows:

1. The mobile system sends a command to change the data on the database via the internet.
2. The Internet forwards the command by accessing the webservice within the webserver.
3. Webservice alter previously requested data to the database.
4. The database sends the changed data to the webservice.
5. Webservice sends results from commands over the internet.
6. SIM808 reads the result from webservice and sends the result to arduino.
7. Arduino processes what command is received and proceeds to the relay.
8. Relays respond according to received orders.
9. Motorcycles can be on or off.

The process for early warning information is as follows:

1. The hall effect sensor reads the spin of the wheel in the form of magnetic pulses through which the sensor passes.
2. Arduino manipulates the results of lap over lap limit or not.
3. If more than arduino ordered SIM808 to make phone call to the intended number.

2.3.2 Non-Fungtional Needs Analysis

Non-functional requirements analysis is the analysis needed to determine the system requirement specification. This specification also includes elements or components of what is required for the system to be built up until the system is implemented. This needs analysis also determines the input specifications required by the system, the output to be generated by the system and the process required to process the input to produce a desired outcome.

Table 1. Security System Specifications

Hardware	*Detail*
Arduino Mega2560	ATmega2560
Modul GSM	SIM808 *shield*
	GPRS
	GPS
	GSM
Modul *Relay*	*Relay*4 *Channel*
Sensor *Hall Efect*	Sensor *Hall Efect Magnetic type* 2
Dc-Dc *converter*	LM 2956

Table 2. Android Hardware Specifications

Type	Specifications
RAM	1GB
Memory Internal	8 GB
Operating System	Android 4.4 Kitkat

2.4 *Construction of Prototype*

At this stage will be the implementation and testing of systems and applications on the construction of motorcycle security system using GPS tracking and smart key based arduino microcontroller. The purpose of system implementation is to implement the design that has been done on the software so that the purpose and purpose of software development can be achieved.

2.4.1 Arduino Mega2560 Testing

Arduino Mega2560 is supplied with a 12VDC power supply that is routed through a switching regulator to produce 5VDC. The Arduino Mega2560 test aims to find out whether the Arduino

Mega2560 can perform the appropriate commands that have been uploaded via the serial port by turning the led on Pin 8 so it can be stated that the Arduino Mega2560 can be used and running properly. The tools used in the Arduino Mega2560 test are as follows:

1. Arduino Mega 2560
2. 1 pcs led
3. Power supply
4. PC / Laptop
5. Arduino IDE
6. USB *board* cable

Table 3. Arduino Mega2560 Calibration

Testing	Conditions	Results
1	digitalWrite(20,LOW)	Led Mati
2	digitalWrite(20,HIGH)	Led Hidup

Based on the above test results, Arduino Mega2560 can turn on the led by giving HIGH conditions in accordance with the given command.

2.4.2 Relay Testing

Testing relay module is done by connecting relay on pin GND, VCC and DO and connect Pin1 relay with the ignition wire and Pin2 relay with motorcycle starter cable which will be given power to start ignition and starter with output voltage value on the relay.

Table 4. Testing of Relay Modul

PIN	Relay Input	Logic	Output
1	LOW	0	0V AC
1	HIGH	1	9V AC
2	LOW	0	0V AC
2	HIGH	1	9V AC

From the above test results, it is seen that if the relay receives the voltage then the relay will be active with logic 1 and if the relay does not receive the relay voltage will be logic 0.

2.4.3 Testing Module Dc-Dc

Testing The Dc-Dc Module aims whether the Dc-Dc Module is able to decrease the input voltage provided by the motorcycle battery. The voltage supplied by 12 Volt batteries while the Arduino Mega 2560 and SIM808 Module in order to run smoothly required a 9 Volt power supply to run properly.

Tabel 5. Teting Modul Dc-Dc

Input	Dropped	Output	Results
12V	10V	10V	Arduino and SIM808 are On
12V	9V	9V	Arduino and SIM808 are On
12V	5V	5V	Arduino On SIM808 Off
12V	3.5V	3.5V	Arduino and SIM808 are Off

From the above test results, it appears that if the output voltage received Arduino Mega and SIM808 of 3.5 then Arduino Mega and SIM808 not light, this is because the minimum power supply received Arduino Mega of 5V and if the outcome of 9 or 12 Volt Arduino Mega 2560 And SIM808 can run, this is because Arduino Mega recommended receive power of 7V-12V.

2.4.4 Hall Effect Sensor Tests

Hall Effect sensor testing aims to make measurements on Hall Effect sensors by measuring the sensor output. Measurements are made by measuring in the absence of magnets and the presence of magnets.

Table 6. Hall Effect Sensor Tests

Testing	Distance (mm)	Output (V)
1	30	4,9
2	25	4,9
3	20	4,9
4	15	4,9
5	10	0,2
6	5	0,2
7	3	0,2

Based on the above test results, the sensor measurement results begin to work at a distance of 10mm. Then a distance of 10 mm is used as a benchmark to read the magnet that is attached to the disc of a motorcycle disc..

2.4.5 Testing Comparison of GPS Readings

GPS comparison test aims to compare whether the results displayed on the smartphone in the form of maps in accordance with the position of the motorcycle or not. To get the results of these measurements, the system will send data in the form of latitude and longitude to the server every once a minute. After the data is stored, then the comparison test readings of latitude and longitude on the system by comparing with the readings google maps.

Table 7. GPS Distance Comparison Testing

Location	Latitude Longitude	Trial the original distance of the motorcycle with Google Maps position
At home	-6.888452, 107.6754732	± 7 Meter
Outside the house	-6.888447, 107.547338	± 3 Meter
Gatot Subroto	-6.883616, 107.540360	± 10 Meter
Gunung Batu	-6.889432, 107.566608	± 9 Meter
Basement Unikom	-6.887251, 107.615043	± 27 Meter
Dipatiukur	-6.887805, 107.615188	± 0 Meter
Sekeloa	-6.888737, 107.618568	± 0 Meter
Panatayuda	-6.897685, 107.615869	± 0 Meter
Teku Umar	-6.891485, 107.614879	± 6 Meter
Tubagus Ismail Raya	-6.885147, 107.617909	± 5 Meter
Average distance difference		± 6.7 Meter

Table 8. Pengujian Perbandingan *Latitude*

Location	Latitude Google Maps	Latitude Modul	Error Value (%)
At home	-6.888452	-6.886092	0.03426
Outside the house	-6.888447	-6.888421	0.00038
Gatot Subroto	-6.883616	-6.882918	0.01024
Gunung Batu	-6.889432	-6.889297	0.00195
Basement Unikom	-6.887251	-6.886680	0.00829
Dipatiukur	-6.887805	-6.887106	0.01014
Sekeloa	-6.888737	-6.888570	0.00242
Panatayuda	-6.897685	-6.896497	0.01722
Teku Umar	-6.891485	-6.891322	0.00237
Tubagus Ismail Raya	-6.885147	-6.883676	0.02136
Average Error Latitude			0.01085

Based on the above test results, after experimenting on 10 different places, it is known the average error data latitude 0.01085% and the average longitude 0.000470% error data with the difference of the original position distance to the position of the map reaches 27 Meters. From the above test results, the error obtained has a very good performance because the error value obtained is below 10%.

2.4.6 Testing Control of Ignition Key

Test the control of the ignition key to compare the results. In this test is done by using 2 different providers. To get the test results, the user gives commands to the system by pressing the ignition button on and off.

Table 9. Testing Control of Ignition Key

Input from the user	Results are read on the web service	Relay and output conditions	Results
Contact On	ON	pin1 on, contact on	Succeed
Starter On	ON	pin2 on, starter on	Succeed
Contack Off	OFF	pin1 and 2 are off, contact and starter are off	Succeed
Starter On	OFF	pin2 off, starter off	Succeed
Contact On	ON	pin1 on, contack on	Succeed

Based on the above results, the control of the ignition key can run according to the given command.

2.4.7 Wheel Round Testing

Wheel rotation reading test aims to determine what action is done when the wheel spins, this test is done by measuring using the meter.

Table 10. Wheel Round Testing

Wheel rotation measurements (M)	Wheel rotation measurements (70/90-14)	Action
1	0.66	No Action
2	1.33	No Action
3	1.99	No Action
4	2.66	Make a call
5	3.32	No Action

Based on the above results, when the wheel spins as much as 2.66 putaaran or as far as 4M then the system will make phone calls.

3 CLOSING

3.1 Conclusion

Based on the results of software and hardware testing that has been made as a motorcycle security system then obtained the following conclusions:

1. The system has been built to turn on and off the ignition via an android smartphone connected to the Internet network.
2. The system has been built to provide early warning directly to the owner of the motorcycle if the motorcycle will be stolen.
3. The system has been built to provide information on the location of the motorcycle.

3.2 Suggestions

The system has been created still need to be developed again for kedepanya, so that the system has been built to work more real time. The suggestions on the development of software that is built is as follows:

1. Control of ignition keys can be more realtime considering madul SIM808 still using GSM 2G network.
2. Develop a platform that can be supported by other software, considering currently only supports the Android platform.

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