

DEVELOPMENT CAR SECURITY MONITORING SYSTEM BASED ON IOT

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ABSTRACT

Car security monitoring system based on Internet of Things is required by car owners currently considering in West Java on car crime according to the statistics agency (BPS) in 2016 was ranked three in Indonesia. One of them is a crime on the car when parking, especially car output before 2012 are common theft or robbery of car spare part on the car by damaging the windshield. Sometimes when a car alarm goes off sometimes are not heard by the owner of the car because of its position away from the parking area. Not to advances in automobile safety on long output result in no direct notification to the owner of the car that his car alarm is on. a tool that can solve the above problem, one using a camera to monitor the security of the car and can also be sensors to detect and take pictures when there is movement around the car that will be connected through the Internet with the car owner via smartphone applications based on Android that car owners can monitor the situation around the car in realtime , The system has been built is expected to see the state of the output year old cars in order to avoid destruction or theft of car spare parts car when parking by taking pictures captured by the movement around the car.

Keywords: Cars, Security. Internet of Things.

1. PRELIMINARY

Currently on car crime often occurs either car theft, or theft of the car spare part usually it occurs when the car is being lived by its owner.

According to the Central Statistics Agency (BPS) in 2016, motor vehicle theft cases in West Java was ranked third highest in Indonesia with 5129 cases of vehicle theft in 2016 [1]. Lower adrift of DKI Jakarta and North Sumatra in 5232 and 7089 cases of theft. Based on that data, vehicle theft occur when the vehicle is on a live or when not under supervision of the owner of the vehicle. One of the types of vehicles are automobiles.

There are various kinds of crimes in the car while in a state park, especially cars with year long output led to many cases of crime in one of the car theft car spare part also of a car by damaging the windshield.

Sometimes when the security alarm car sounds, car owners often do not know that the car alarm that sounds coming from car owners, because when parking, the number of cars in an older resemblance alarm sound security are almost the same, the owner of the car must be checked manually to the car park. This resulted in many of his crimes on cars, especially cars with long output due to lack of preventive measures of the car owner.

Not to advances in safety in the car besides the car alarm sound similar majority, resulting in the absence of an immediate notification to the owner that his car alarm is on. When the owner of the car away from the parking area, led to the opportunity for theft. Due to lack of parking the car when the security system is one reason the theft of cars or components on the car.

With the description of the above problems we need a tool that can solve the above problems, one of which is by using cameras that can monitor the security of the car and can also be sensors to detect and take pictures when there is movement around the car that will be connected through the Internet with car owners through Android-based smartphone application so that the car owner can monitor the situation around the car in realtime.

2. THEORETICAL BASIS

2.1 Car

Vehicle or type of steam-powered car that first made in the late 18th century for a successful demonstration of three-wheeled vehicles have been carried out by Nicolas-Joseph Cugnot in 1769. The increase in steam-powered cars is growing and is known in Birmingham, England by the Lunar Society and was made in Britain in 1896 by Frederick William Lanchester in addition to the brake discs. In 1890, the car has also grown in the presence of ethanol as a new source of power which is made in the USA.

With the development and design continues, eventually the technology is already highly sophisticated car with brake fittings, wheel-specific, multi-energy (steam, gas, solar and others), discs, features, accessories, display, car paint.



Picture 3, Car

2.2 Internet of Things

Internet of Things it is a concept that internet connectivity can exchange information with the objects around him.

According Burange & Misalkar, the Internet of Things is an object of the structure is provided with an exclusive identity and the ability to move data through the network without requiring both directions between human relations is the source to the destination or to a computer human interaction. Meanwhile, according Keoh, Kumar and Tschofening, 2014 Internet of Things is a very promising scientific developments to mengiptimalkan life based sesnsor and equipment brought together through an Internet network [2].

2.3 web Service

Web Service itself is a technology that converts Internet capabilities that can happen that P2P communication program to program considering the average - average web focus P2U are dominated by communications programs to user interaction, namely B2C business to consumer [3].

2.4 Android

Android part of an open operating system (opensource). First developed by Android Inc. This information system is made specifically to be the operating system in the smart phone (Smartphone) and tablet computers.

In 2005 Android Inc. was taken over entirely by Google. And in 2007 founded the company Kedas devices and software as well as telecommunications to promote open standards for hardware products. So that in October 2008 bore the beginning of the rise of phone-based Android operating system [4].

Android user interface is based on direct manipulation. And using the input corresponds to the action nyuata world. Such as swipe, tap, pinch and reverse pinch to manipulate objects on the screen.

2.5 Raspberry Pi 3

Raspberry Pi is a single board computer developed by the Raspberry Pi Foundation. Raspberry pi is a



Picture 1, Raspberry Pi 3

single board computer which is often used by practitioners and hobbyist computer science [5].

2.6 Passive Infra Red Sensor

These sensors are used to capture the heat energy generated from the passive infrared rays which every object with a temperature of the object is positive [6]. Used to capture the heat energy around the car, PIR sensor installed at the corner of the car when it detects movement it will send the digital signal to the Raspberry Pi and then sent to the database through the wifi network connected to the Internet. Then the data is



Picture 2, Passive Infra Red Sensor

displayed to car security monitoring applications on android smartphone.

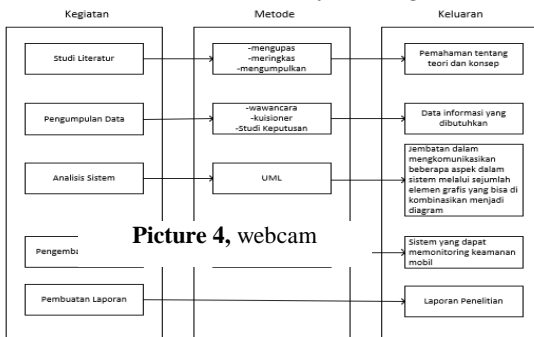
2.7 webcam

Webcam works by capturing a video or photo [7], is intended to capture photos / videos in the car, the webcam installed on the dashboard of a car that will work when the car owners to stream video and if a PIR sensor detects motion eat the webcam will capture images according to the position detected.



3. RESEARCH METHODS

research method is a method used to solve a problem and requires the data so that research can be done. The observations are the following methods:

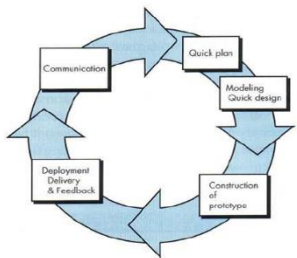


Picture 4, webcam

Picture 5, Research methods

3.1 Software Development Methods

In making this application using prototyping models as shown below:



Source: Roger s. Pressman [8]

Figure 6. prototyping

4. DISCUSSION

4.1 Work Analysis Tool

The workflow tool is a car security system in the following figure below:

4.2 Work System Analysis Application

Monitoring data movement around the car obtained from sensors Passive Infra Red (PIR), amounting to 4 sensors and mounted in the corner of the end of the car, used in the monitoring of movement around the car where when motion is detected, the camera will take pictures automatically .. Applications access database to retrieve data from the PIR sensor has been shipped Raspberry Pi 3.

While the car security monitors obtained from USB webcams, USB webcams itself serves to stream video in the car. Applications access the video to retrieve data heartbeat has been sent to the Raspberry Pi.

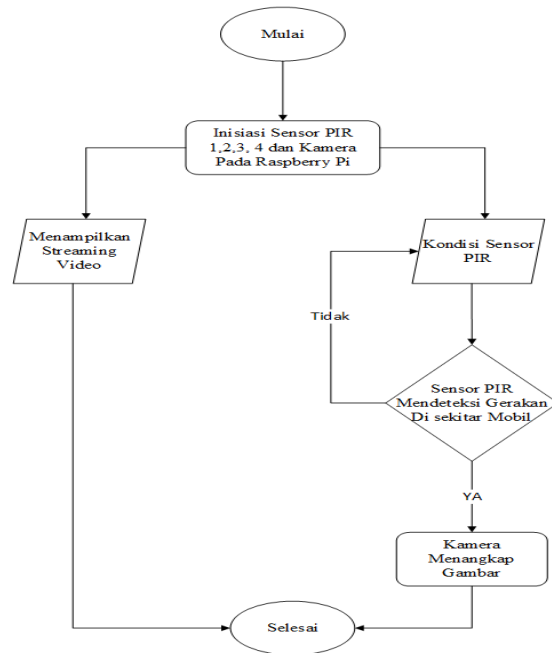


Figure 7. Work Analysis Tool

4.3 System Architecture Analysis

1. Raspberry Pi (server), serves as data storage and video sensor mounted on the car. Raspberry Pi is mounted on a car dashboard.

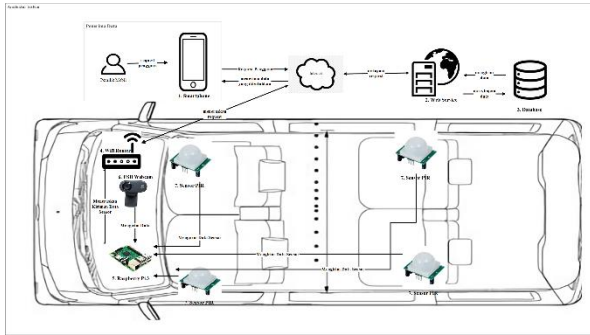
2. Sensor, serves to know that there are people close to the car, the sensor used is an infrared sensor (PIR). PIR sensor mounted on the second corner on the front of the car and near 2 rear window.

3. webcams, serves as a tool to know the state and condition of the car when parking will be sent to the server. Webcam mounted on the front of the car that is near the rearview

4. Modem WIFI, serves to bridge the communication between the server and the user. Modem WIFI in store in the near Raspberry Pi, which is in the car's dashboard.

5. Android, berfungsi as a means of monitoring the condition of the safety car when parking.

Security monitoring system based IOT car is placed car and is connected to a software or an application for monitoring, can be seen in Figure 8:



Picture 8. System Architecture Analysis

4.4 Functional Needs Analysis

Analysis of functional requirements describe the process of the activities to be implemented in the system and explain the necessary requirements for the system to run properly.

4.4.1 Use Case Diagram

Use Case Diagram describes an interaction between one or more actors with the system to be made [9]. can be seen in Figure 9.

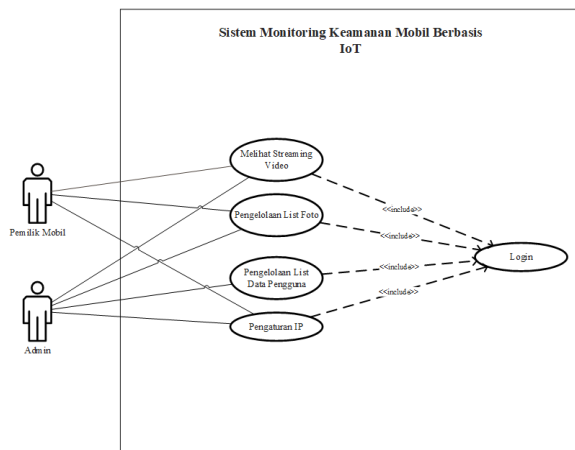


Figure 9. Diagram usecase

4.4.2 Activity Diagram

Activity The diagram is used to describe the process flow of the scenario that has been designed for each use case, can be seen in Figure 10.

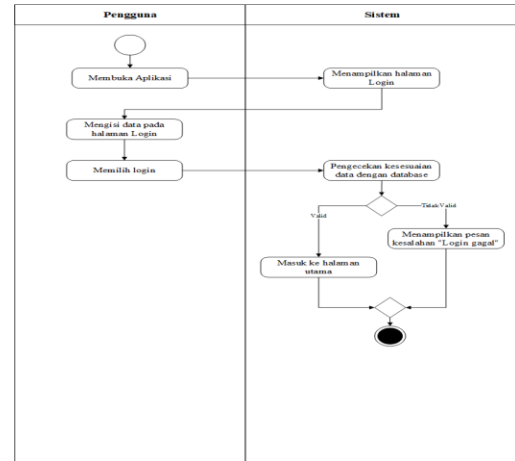


Figure 10. Activity Diagram

4.4.3 Class Diagram

Class Diagram is a specification of the functionality that the object and is the core of the development of this application, can be seen in Figure 11.

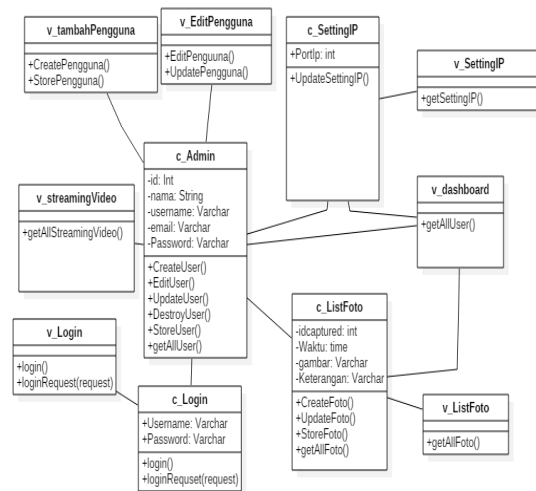


Figure 11. Class Diagram

4.4.4 sequence Diagram

sequence Diagram is used to describe the interactions between objects and indicates communication between these objects., can be seen in Figure 12.

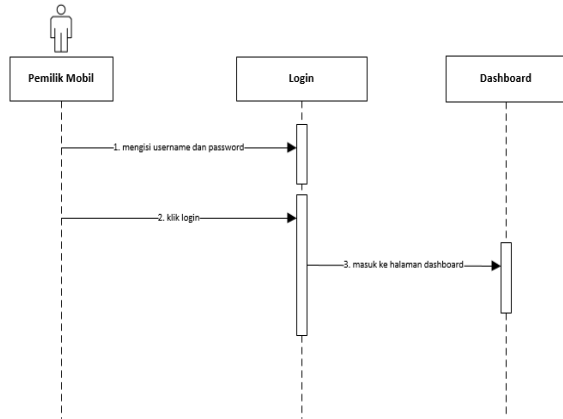


Figure 12. sequence Diagram

4.5 Menu Structure Design

The design of the menu structure is a design for the restrictions on the user in using the system. The menu structures can be seen in Figure 13

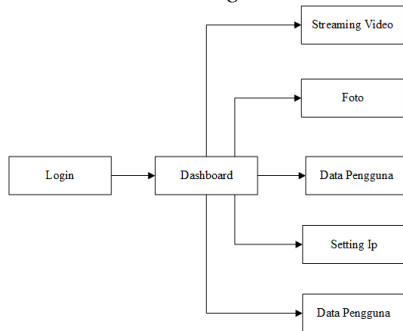


Figure 13. Menu structure

4.6 Hardware Implementation

This section discusses the hardware used to build the system in a mobile platform and a website for car security monitoring applications. Details of hardware used can be seen in **Error! Reference source not found.**, Table 2 and Table 3

Table 1, Computer Hardware Builders

No.	Hardware	Specification
1	processor	3.1 GHz
2	memory	8 GB
3	Hard drive	1 TB
4	VGA	2 GB
5	monitor	14 "with a resolution of 1336 x 768 pixels
6	Mouse	optical Mouse
7	keyboard	Standard
8	Network	Network connection using WIFI

Table 2, Hardware Smartphone To Implementation

No.	Hardware	Specification
1	processor	1.2 GHz
2	memory RAM	2 GB
3	memory Internal	16 GB

Table 3, Hardware IOT For System Implementation

No.	Hardware	Specification
1	processor	3.1 GHz
2	memory	8 GB
3	Hard drive	1 TB

4.7 Software Implementation

Software implementation is a specification of the software used in implementing the system is built [10]. can be seen in Table 4, Table 5 and Table 6

Table 4, Software Implementation On Computer

No.	Software	Specification
1	Operating system	Windows 10
2	browser	Google Chrome
3	Internet	Connected to the Internet network

Table 5, Implemntasi Software On Andoid Smartphone

No.	Software	Specification
1	Operating system	Android
2	Application security monitoring car	24.54 MB

Table 6., Software Implementation At IOT

No.	Software	Specification
1	phyton 2	Python 2
2	Programming language	python
3	Sublime Text 3	version 3
4	browser	Chrome

4.8 implementation interface

4.8.1 Website interface

Figure 14 is a website login interface for car owners.

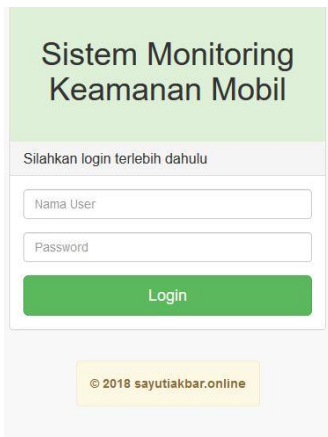


Figure 14. Login Website

Figure 15 is a user interface Photo List.



Figure 15. list Photos

Figure 16 is a Streaming Video interface.

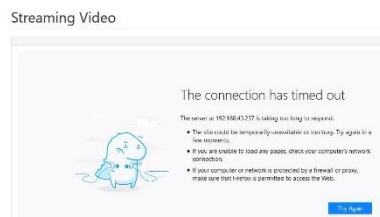
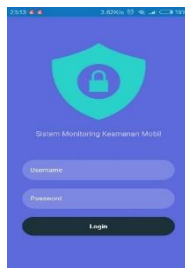


Figure 16. Streaming Video

4.8.2 Android interface

Figure 17 is a android application login interface for users.



Picture 16, Login

Figure 18 is a photo list interface.

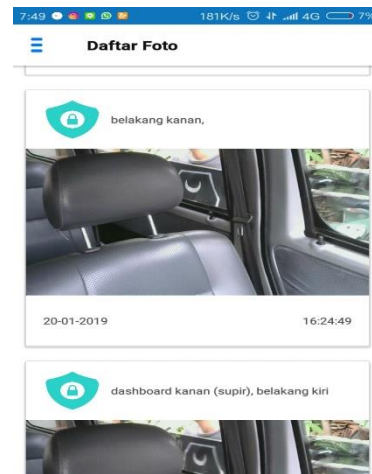


Figure 18. List Photos

Figure 19 is a Streaming Video interface.



Figure 19. Streaming Video

4.9 Hardware IOT testing

IOT hardware testing is done to measure the level of success of the tool used in the construction of security monitoring system of the car.

a. PIR Sensor Testing

Tests on the sensor is intended to determine the sensitivity of the sensor to be placed on the corner of the car jutting out to detect objects that are around the car, the object to be used in testing the man, which conducted six trials of the object at a distance of 50 centimeters up to 3 meters in Table 7.

Table 7, PIR Sensor Rear Left

No.	Software	Specification
1	PIR sensors detect an object 0.5m	100%
2	PIR sensor detects an object 1 m	100%
3	PIR sensors detect an object 1.5m	100%

4	PIR sensor detects an object 2 m	30%
5	PIR sensors detect an object 2.5 m	0%
6	PIR sensor detects an object 3 m	0%

b. testing Webcam

Webcams will be installed in the dashboard of the car in order to cover almost all parts of the car, a



Figure 20. Streaming Video

webcam that is used is the brand Logitech webcam with a resolution of about 3 Mega Pixel as in Figure 20.

5. COVER

5.1 Conclusion

Based on test results IOT-based car security system it could be concluded as follows:

1. The system has been built to see the state of the car long output via PIR sensor (Passive Infra Red) to avoid damaging the car when Parker took the captured image based on the movement around the car.
2. The system has been built to monitor the output year old car parker through a camera connected to the microcontroller to take videos.

5.2 Suggestion

Based on the research results as for suggestions that obtained for the reference car security monitoring system development in the future. As for the advice - the advice is as follows:

1. The camera mounted on a car can rotate or move and control by the owner of the car.
2. Develop a platform that can be supported by other software, since currently only supports Android platform.

BIBLIOGRAPHY

- [1] The Central Bureau of Statistics, "Crime Statistics 2016." [On line]. Available: <https://www.bps.go.id / ... /2016/12/15/.../statistik-kriminal-2016.html>. [Accessed October 17, 2018].
- [2] Apri Junaidi, "Internet of Things, History, Technology and Implementation: Review", *Scientific Journal of applied information technology*, Volume 1, No. 3, August 10, 2015. [Accessed October 25, 2018]
- [3] Top Yadi. "Introduction to Web Service". [on line]. Available: <http://elib.unikom.ac.id/download.php?id=132941> [Accessed October 1, 2018].
- [4] Dedeng Hirawan, Mochammad Dawn Wicaksono, "Implementation of Smart Key Android-Based Smartphone", *Faculty of Engineering and Computer Science University Computer Indonesia vol 15 no.2*. [Accessed October 8, 2018].
- [5] Suranata, Aditya. "Along with the Raspberry Pi Model 5 Comparison and Specifications". [on line]. Available: <https://tutorkeren.com/artikel/lengkap-5-model-raspberry-pibeserta-perbandingan-dan-spesifikasinya.html>. [Accessed October 13, 2018].
- [6] Siti Ahadiyah, Muharnis and Agustawan, *Implementation of the PIR Sensor Electronic Equipment Based Microcontroller*, 2017 [Accessed October 14, 2018].
- [7] Nadzirin Ansari Muhammad Nur, Bunyamin, Muh. Vishnu Word, "Online Monitoring System Design Based Motion Detector using the Raspberry Pi", 2017 [Accessed October 26, 2018].
- [8] Roger Pressman, *Software Engineering Section 7*, Yogyakarta: Andi, 2011. [Accessed October 14, 2018].
- [9] Fathansyah, *Database*, Bandung: Informatics, 2012. [Accessed October 11, 2018].

[10 As Hafidh Syahidulhaq, Hafiddudin, Suci Aulia,
] *"Ip Based Security System camera with passive
Infra Red sensor and sms gateway", 2016*
[Accessed October 28, 2018].