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Security Equipment On Vehicles With Camera Systems Based On The Internet Of Things (Iot)

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Abstract: *Crimes on vehicles are increasing every year, it was recorded that in 2017 there were 35226 cases of motor vehicle theft in Indonesia, not including records of loss of personal items contained in the vehicle cabin. Even though the vehicle door was locked, the thieves did damage to the vehicle's glass.*

This study discusses the design and modeling of a safety system that was developed using the internet as a communication network to replace the previous version which only used SMS to turn off the vehicle injectors. A prototype glass breaker system will be used as a trigger for the system to be developed, then data will be taken in the form of the response time of the tool to send notifications and data in the form of images or photos of the thief's face

Keywords: *security systems, monitoring systems, vehicles, internet of things, IoT.*

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I. INTRODUCTION

Crime on vehicles every year has increased. according to data from www.bps.go.id in 2017 there were 35226 cases of motor vehicle theft. Meanwhile, according to news compiled from detik.com, a Honda Mobilio car with the number B-606-BL was broken. The perpetrator took a laptop and several valuables belonging to the victim from the car, other news There was a theft of a rental car that duplicated the key. (source: https://news.detik.com)

In this era, several vehicles from vehicle rental services have used GPS (Global Positioning) technology combined with an SMS gateway (short message) system to control vehicles remotely, but this system has many weaknesses including not being able to monitor the vehicle position in real-time. but must send an SMS message first to find out every current position, the device used such as the Arduino Mega 8225 Microcontroller which has a larger memory than other types of Arduino will still run out of memory because it stores too many SMS messages and has to reset it first on Microcontroller for reusability (Bagus : 2018)

To prevent this, a tool can be developed that can secure and monitor vehicles connected to the internet network, then an application installed on an Android smartphone as a notification receiver and also an image viewer as monitoring. Many providers in Indonesia provide 4G network services, of course, with high speed and also a fairly wide area coverage, these providers include Telkomsel, Indosat, XL Axiata, 3, Smartfren, and many more. This network will be used to communicate remotely between the devices installed on the vehicle to the android smartphone. With the creation of safety devices and vehicle monitoring, it is expected to reduce the number of crimes that occur in vehicles, both privately owned or transportation services such as car rental, taxis, and so on.

II. THEORY

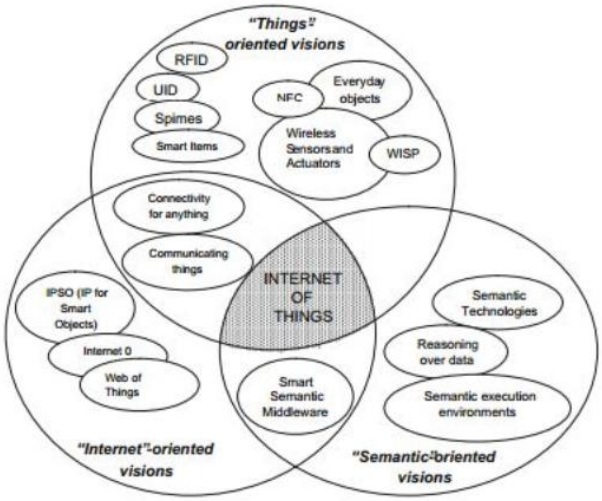
1.1 Internet of Things

Internet of things (IoT) consists of a combination of the two words "Internet" and "Things". Where "Internet" defines as a computer network that uses internet protocols (TCP / IP) that are used to communicate and share information within a certain scope. While "Things" can be interpreted as objects in the physical world that are taken through sensors which are then sent via the internet (Sukaridhoto S: 2016).

The results of the objects that have been sent still require a re-presentation which is expected to be more easily understood by the stack holder. To facilitate the model of storing and exchanging information, it is necessary to have semantic technology. Therefore, to realize the internet of things, 3 supporting components are needed, namely the internet, things, and semantics

Figure 1 illustrates the main concepts, technologies, and standardization of the Internet of Things paradigm.

Figure 1 Paradigm "Internet of Things"



Another similar meaning, Internet of Things (IoT) is a concept/scenario where an object can transfer data over a network without requiring human-to-human or human-to-computer interaction.

"A Things" in the Internet of Things can be defined as a subject such as a person with an implanted heart monitor, a farm animal with a biochip transponder, a car that has built-in sensors to alert the driver when tire pressure is low. By far, IoT is most closely related to machine-to-machine (M2M) communications in manufacturing and electricity, oil, and gas. Products built with M2M communication capabilities are often referred to as intelligent or "smart" systems. (example: smart label, smart meter, smart grid sensor). Although this concept was less popular until 1999, IoT has been in development for decades. The first Internet tool, for example, was the Coke machine at Carnegie Melon University in the early 1980s. Programmers can connect to machines via the Internet, check the machine's status, and determine whether or not a cold drink is waiting for them, without having to go to the machine.

1.2 **4G Network**

4G is an abbreviation of the term in English: fourth-generation technology. The term is generally used to refer to the fourth-generation standard of cellular telephone technology. 4G is the development of 3G and 2G technology. The 4G system provides an ultra-wideband network for various electronic equipment, such as smartphones and laptops using a USB modem. There are two candidate standards for 4G commercialized in the world, namely the WiMAX standard (South Korea since 2006) and the Long Term Evolution (LTE) standard (Sweden since 2009). In Indonesia, WiMAX was first launched by PT. first media with the trademark Sitra WiMAX in June 2010. Then the LTE technology was first launched by PT. Internux with trademark Bolt Super 4G LTE since November 14, 2013.

The 4G system provides a comprehensive IP solution where voice, data, and multimedia flows can reach users anytime and anywhere, at higher data rates than previous generations. However, some opinions are aimed at 4G, namely: 4G will be a fully integrated IP-based system. This will be achieved once wired and wireless technologies are convertible and capable of delivering speeds of 100Mb/s and 1Gb/s both indoors and outdoors with premium quality and high security. 4G will offer all kinds of services at affordable prices. Each 4G handset will immediately have an IP v6 number equipped with the ability to interact with Internet telephony based on Session Initiation Protocol (SIP). All types of radio transmissions such as GSM, TDMA, EDGE, CDMA 2G, 2.5G will be able to be used and can integrate easily with radios that are operated without a license such as IEEE 802.11 in the 2.4 GHz & 5-5.8Ghz frequency, Bluetooth and cellular. Integration of voice and data in the same channel. Integration of SIP-enabled voice and data applications

1.3 **Camera Serial VC0706**

Camera Serial VC0706 is a serial camera module produced by Adafruit which is used to capture images (snapshots) made for monitoring purposes.

Figure 2 Camera Serial VC0706

The resulting resolution is up to 640x480 pixels with the following specifications:

- Image sensor: CMOS 1/4 inch
- CMOS Pixels: 0.3M
- Pixel size: 5.6um*5.6um
- Output format: Standard JPEG/M-JPEG
- White balance: Automatic
- Exposure: Automatic
- Gain: Automatic
- SNR: 45DB
- Dynamic Range: 60DB
- Max analog gain: 16DB
- Frame speed: 640*480 30fps
- Scan mode: Progressive scan
- Viewing angle: 60 degrees
- Monitoring distance: 10 meters, maximum 15meters (adjustable)
- Image size: VGA (640*480), QVGA (320*240), QQVGA (160*120)
- Baud rate: Default 38400
- Current draw: 75mA
- Operating voltage: +5V
- Communication: 3.3V TTL (Three wire TX, RX, GND)

III. RESULTS AND DISCUSSIONS

3.1. Tool Design

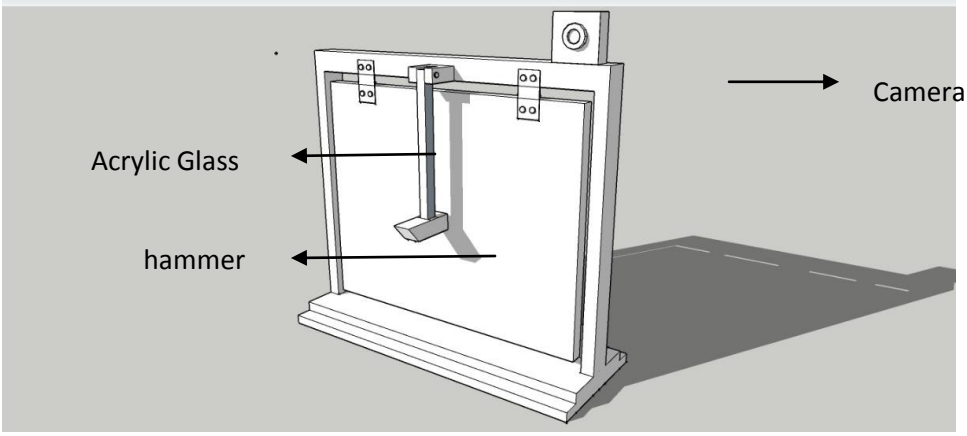
Tool design for vehicle safety and monitoring systems by combining two components, namely a camera as a monitoring system with ignition control automation as a vehicle safety system, as well as making a glass prototype as a replacement for the original vehicle glass which includes the preparation of tools and materials, glass breaker prototype design, circuit design, android application interface design, network installation. Furthermore, it will be tested by taking time for response data to determine the quality of the tools that have been made, then conclusions will be drawn from the tools that have been made.

3.2. Glass Breaker Prototype Design

The purpose of making a prototype is as a replacement for vehicle glass which is to simulate glass breaking on a vehicle, the prototype is made of clear acrylic with sizes of 5 mm and 2 mm as the main material. This design is programmed through the SketchUp application. Generates 2D JPEG images as follows.

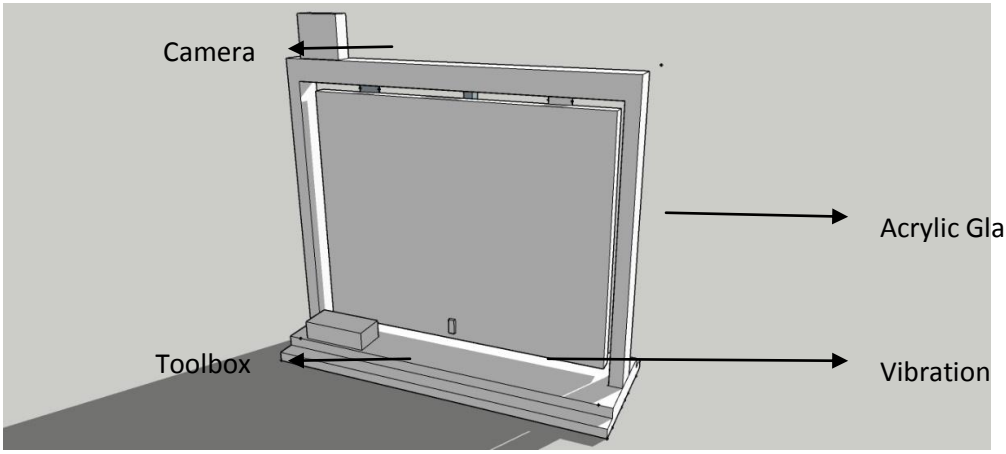
a. Front View Design

Figure 3 Prototype design front view



b. Back View Design

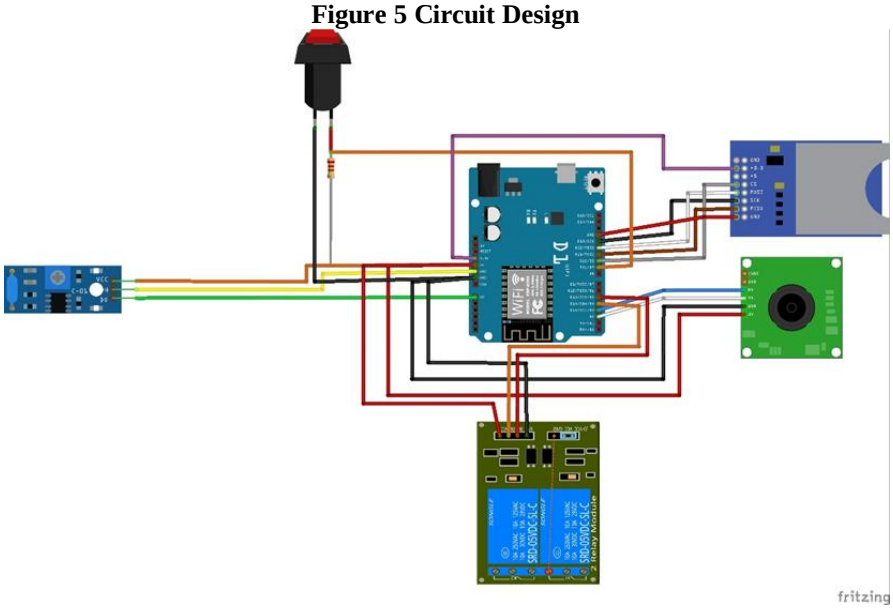
Figure 4 Prototype design back view



From the design that has been designed, it is expected to be able to replace vehicle glass that will be broken, as well as a trigger for vehicle safety and monitoring system tools

3.3. Circuit Design

Figure 5 Circuit Design



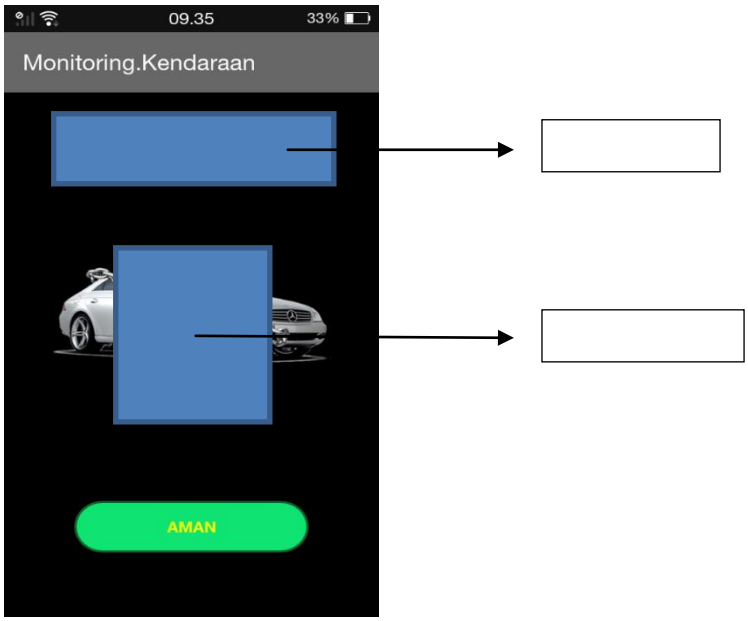
This design is made using the fritzing application, based on the block diagram that has been made so that there are no errors when the program is planted, while the pin installation circuit is described in the table below

Table 1 Pin Mode

PIN Mode	
Relay	**Wemos D1**
INV 1	D5
INV 2	D4
Camera	**Wemos D1**
RX	D3
TX	D2
Sensor Getar	**Wemos D1**
D0	A0
SD CARD Module	**Wemos D1**
Miso	Mosi
Mosi	Miso
Sck	Sck
Cs	D10
+3.3	3.3 V
PIN General	
Vcc	5 V
Gnd	Gnd

3.4. Android Application Design

Figure 6. Android Application Design



The android application is made using android studio software, it is used to monitor and notify that the vehicle is in danger, this application is equipped with image capture results and internet server RTC data which is used for retrieval of tool response time data. This design is expected for users to get notifications as soon as possible after a glass break occurs.

IV. CONCLUSION

Based on the results of the research that has been done, the following conclusions are obtained:
The design and manufacture of this tool use a vibration sensor type SW-420 as a vibration detector, camera VC0607 as monitoring, and a Wemos D1 microcontroller as a controller with an ESP-8266 chip connected to an internet server. can work well in detecting vibrations on the glass as well as from the camera can take pictures and send them to an android phone in real-time.

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