# DEVELOPMENT OF MONITORING SYSTEM FOR TRAFFIC STOPLINE VIOLATION VEHICLE LIMITS BASED ON INTERNET OF THINGS

Adi Abdurakhim[1] , Dedeng Hirawan[2]

[1.2] Information Engineering - University Computer Indonesia

Jl. Dipatiukur 112-114 Bandung

E-mail: abmedia.id@gmail.com[1], dedeng@email.unikom.ac.id[2]

## ABSTRACT

Order in traffic and obey the existing regulations while driving, It was all intended for us to safely reach the destination and avoid things that are not desirable. At the traffic junction Bandung there are still riders-riders who violate traffic rules. Based on data from the Department of Transportation Bandung level types of violations that often occurs that stops in Stopline 16789 cases and stop at zebra crossing 12827 cases for the period end of 2018. In addition, violation of the rules in traffic could endanger themselves or other road users. At this time the Department of Transportation Bandung has a special division that ATCS for traffic surveillance system for the intersection area. But supervision performed can not be carried out continuously as well as the warning sound by the operator through a loudspeaker because many of juncture can be monitored. Operating hours also membantasi traffic control intersection. To support that requires a tool that detects the existing violations crossroads that can work automatically by detecting vehicles passing Stopline and stop at zebra crossing. Research conducted using black box testing methods for the web and beta to determine compliance with the requirements and testing hardware to test the quality of the hardware prototypes violation monitoring system. Based on the test results it can be concluded that the monitoring system was able to breach it easier for officers in supervising intersections that are not supervised. The system is expected to continue to be developed. Design motor vehicle license plate monitoring system to detect vehicles violating by using a single sensor camera aided IR.Kata Keywords: Camera, Number Plate, Breach.

## 1. INTRODUCTION

### 1.1 Background

Road markings are a sign that is in the road surface or above the road surface which includes equipment or signs that forms longitudinal, transverse, often lines, as well as the symbols used to direct the flow of traffic and limiting the area of interest of Traffic. At the traffic junction markers are RHK (Stop Space Vehicle) is a facility that provides space for the motorcycle in front of the queue at the signalized intersection during the red phase.

General provisions in the planning of RHK RHK states that implementation can only be applied to perismpangan. Traffic monitoring sanggatlah necessary to know the traffic conditions, further ensure the smooth flow of traffic, traffic, anticipating offense and when needed can reduce the risk of accidents. Accidents occur due to driver violated traffic regulations. Based on the results of UB students study build tool for detecting violations of road markings automatically using RFID[1] still less efficient because not all motorists to install RFID.

In the city already has a system that can monitor traffic situation commonly called ATCS (Area Traffic Control System) is a traffic control system based on information technology in the area perismpangan whose aim is to optimize the performance of the road network through the optimization and coordination of traffic light settings. Violation of road markings occur at intersections occur because motorists passing through or abuse characteristics of the boundary line of vehicles, for example, road markings at intersections traffic lights, in a condition where the state of the light is red, which means the state of a vehicle must stop and therefore the function markers useful for giving space for pedestrians to cross, one of the functions that exist in the ATCS if there is one vehicle passing through and occupy the boundary line marking the vehicle will be tracked by the system via CCTV and will be reprimanded over the loudspeaker. According to regulations, motorists stopped when the red light should stop the vehicle speed before the existing line behind the crosswalk. The goal is that the zebra crossing remains in a state conducive reserved for pedestrians. Based on the results of research in DISHUB Bandung on ATCS division markings through CCTV Surveillance offense can not always be maintained as there are many intersection points that can be monitored and overseen officer limited operating hours for 8 hours

cause markings violation occurs again. Records of violations is still done handwritten data is recorded is still a total number of violations and required only a detailed mutilation, as well as warning against the offenders used loudspeakers dial so that the warning can not be done if the operator is resting or not all subjects. According to data from the city of Bandung DISHUB traffic offenses were in-the most that exceed stoplines stop zebra crossing in 1741 and 966 cases in the 2018 period.

With the description of the above problems we need a tool that can detect violations for vehicles that cross the boundary line road markings in the zone RHK located behind the crosswalk automatically so that the system is awake to monitor violations so that the process of detecting offenders and warn offenders into more effective. Based on the above results, it was taken topic thesis with the title "prototypes DEVELOPMENT SYSTEM MONITORING TRAFFIC VIOLATION OF VEHICLES Marka BOUNDARIES BASED INTERNET OF THINGS".

## 1.2 Identification of problems

Based on the background of the problem, the identification of problems in this research are as follows:
1. Surveillance markers can not be performed continuously for many points of intersection that can be monitored.
2. Warning manually can not do apabilla operators do not see pelaggaran markers do.
3. Pencacacatan unspecified violations still a number of vehicles breaking.

## 1.3 Purpose and objectives

Based on the existing problems, the purpose of the development of this system is to build a prototype Development System Monitoring traffic violations on marking the boundary line of things Internet-based vehicle can provide ease of monitoring violations of the intersection in the city of Bandung.
1. Creating markers violation detection system that works automatically.
2. Creating a system that can give a warning to motorists who violate the line markings.
3. Make records of violations automatically, and complete with a data plate offenders.

## 1.4 Scope of problem

Limitation of problems that exist in the construction of this system are as follows:
1. Hardware is placed around a traffic light.
2. Web-based system built.
3. Detection of the offense running when the vehicle passes the vehicle limit line road markings.
4. The faster the internet access will speed up the detection process

5. The camera will capture images when the vehicle passes the line markings.
6. Number plate will be detected by the system if the received image is quite good state.
7. When the plates were not detected / not recognized by the system still gives a warning by default.
8. Control of automatically continue to work the internet and hardware when switched on.

## 1.5 Research Methodology

Research is an activity to locate, record, formulate and analyze up to draw up a report. As a guide in conducting research is needed to look research framework necessary steps in research.

## 1.6 Data Collection Methodologies
1. Study of literature.
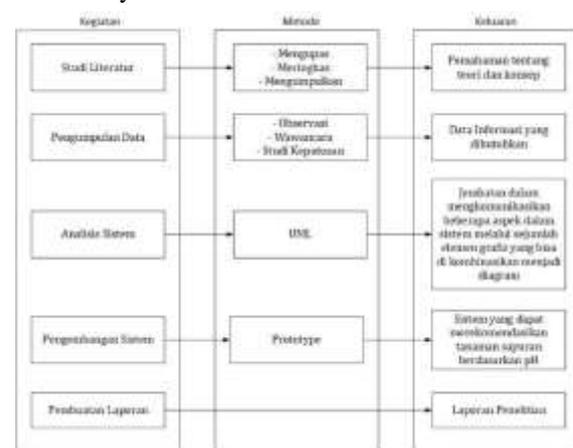


The method of data collection by reading and researching literature, journals, documents, books, and various references relating to the title of the research and development system, such as the book "Research Methods Combination 'author Prof. Dr. Sugiyono.
2. Observation.

Observation is the data collection is done by directly observing the monitoring process activities diarea BANDUNG City intersection
3. Interview

Done by asking questions directly to Mr. faiz as the Department of Transportation in BANDUNG ..

## 1.7 Software Development Methodology

The stages in implementing the prototype model is:
1. Communication

At this stage the process of communication between developer and operator (Monitoring traffic division DISHUB part Bandung ATCS) in order to implement the wishes of the Transportation Agency in accordance with the desired requirements ..
2. Quick planning

In this phase the plan by analyzing the requirements needed to create a prototype detector line markings at the intersection violations.

3. Design modeling quickly.

Process At this stage makes modeling in draft form quickly adapted to the design of the system.

4. Establishment of Prototype

The process of creating designs quickly lead to the manufacture of prototypes.

5. The delivery system / software

At this stage the prototype of the system is tested by the user, as the ATCS Division monitors the traffic situation, especially the junction region perform specific evaluations of the prototype that was created earlier which will then provide feedback used to refine the specification kebutuhan.kemudian evaluated customer needs still not been met. Development then started again with listening to complaints from users to improve the existing prototype.

## 2. CONTENTS OF RESEARCH

### 2.1 Theoretical basis

Discusses the basic concepts and theories related to the topic of the Internet of Things application development is done and the things that are useful in the analysis process Detection Tool Design of traffic violations on the boundary line marking vehicle-based Internet Of Things.

#### 2.1.1 Inernet Of Things

Internet of Things (IOT) is the concept of an object in which the object perform a delivery of data / information over the network without human intervention.[2]

#### 2.1.2 Microcontroller (Raspberry)

Raspberry Pi computer board is shaped board. Linux-based Operating System. In this experiment 3 Raspberry Pi model B is equipped with WiFi capability, Bluetooth and USB boot on-board and installed by bundling (Raspberry Pi Foundation, 2012)[2]

#### 2.1.3 Camera Module Raspi

Raspberry Pi camera module or abbreviated Raspicam is a camera used for taking photos or videos. Raspicam has a resolution of 5 megapixels and supports video resolution of 720p, 1080p and VGA90. Which will be used to capture images of vehicles.[2]

#### 2.1.4 Sensor IR (Infrared)

Infrared sensor system basically using infrared as a medium for data communication between the receiver and transmitter. The system will work if the infrared light emitted by an object obstructed resulting infrared rays can not be detected by the receiver. In this study, Infrared sensor is used to detect vehicles passing Stopline line.[3]

#### 2.1.5 Node-RED

Node-RED is based compiler node.js use the media browser to make the application of the Internet of Things (IOT) in which the visual form of flow. So just need to make logic without having to import the PIN slot used by the sensor. In this study, the Node-RED.[4]

#### 2.1.6 Open-ALPR

Open-ALPR It is an open source API that serves as an image processing request by the client is able to read a license plate from the image captured by the camera plate. In this study, the API will be processed by the Node-RED then the results will be sent to the WEB request with the format String.[5]

#### 2.2.1 Domain Analysis Case

Analysis of problems of the current system today is surveillance markers can not be carried out continuously because a lot of the point of intersection can be monitored as much as 41 points. There are 16 monitors in the monitoring system, two big Monitor, 10 Monitor who was in front, and 4 monitors that are behind that is used by the operator to monitor the crossing.

#### 2.2.2 Ongoing Analysis System

The grooves on the procedures for monitoring the violations are as follows:

1. Been watching every intersection through a screen cctv
2. Operator alert you when there is a violation line markings.
3. Operator does disfigurement offense.

#### 2.2.2 System Architecture Analysis

The system architecture is used to describe, simplify the system to be built so it can be easily understood and easily seen by the sequence of steps.
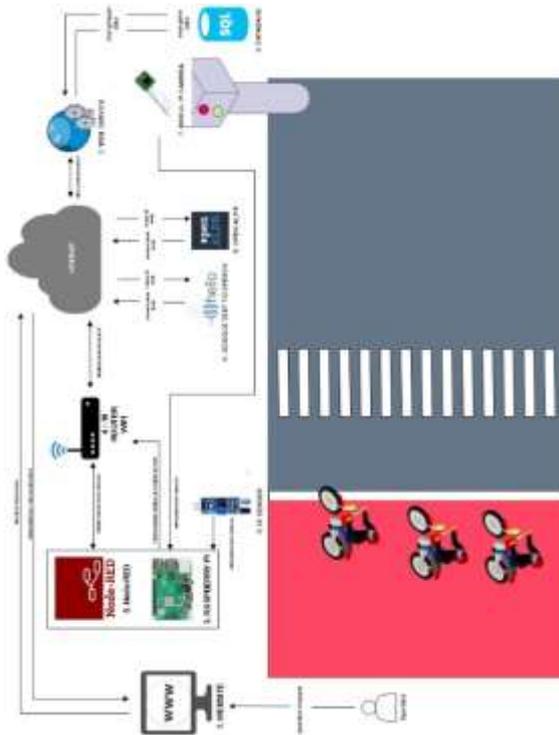
**Picture 1 System Architecture**

### 2.2.3 Analysis of User Needs

User needs analysis was conducted to determine the users who run the system. Before looking at user needs, it needs to know the user in use today that can be proposed to users of the system. The specifications of the available user needs in Angke estuary harbor can be seen in the following table:

**Table 1 Analysis of User Needs**

| users | Responsible | Level of education | Experience |
|---|---|---|---|
| Transportation Officers (Operator) | Have the authority and be responsible on ongoing activities Intersection Monitoring | S1 | Computer literate |

### 2.2.4 Use Case Diagram

Use case diagram is a model for the behavior of the system being designed. Use case interaction between one more actor. With the system to be built. Interaction with the advance of one or more systems to be built can be seen in the following figure.
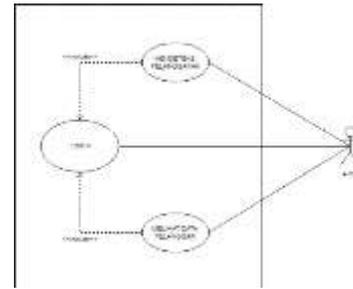


**Picture 2 Diagram usecase**

### 2.2.5 Hardware Implementation

Equipment (hardware) used in the manufacture of line markings violation monitoring system can be seen as follows.

**Table 2 Hardware Implementation**

| No. | Specification | Information |
|---|---|---|
| 1 | processor | Intel Core i3-6006U |
| 2 | RAM | 4GB RAM |
| 3 | HDD | 500 GB |
| 4 | Internet connection | Yes |

### 2.2.6 Software Implementation

Software (software) used in the manufacture of line markings violation monitoring system can be seen in the following table.

**Table 3 Software implementation**

| Specification | Information |
|---|---|
| web Browser | Google Chrome |

### 2.2.7 implementation interface

Interface implementation is done on the implementation of interface design or mockup kedalaam form of files. As for the line markers Abuse Monitoring System is as follows:

**Table 4 implementation interface**

| No. | interface name | Implementation | Information |
|---|---|---|---|
| 1 | Login | Login Fungtion | Used as the home page when a user logs in |
| 2 | detection Offenders | detection Fungtion | Pages that digunkana to detect in real time offenders |
| 3 | Data Offenders | Show Fungtion | Page for a user to view your location data from each pelangggar. |

### 2.2.8 implementation Tools

Here is a picture of the implementation of a series of components that digunkanan on line markings violation monitoring system.


**Picture 3 Networks Implementation Tools**


**Picture 4 Implementation of Overall Equipment**

### 2.2.9 Testing IR (Infrared)
Ir sensor testing by playing miniature vehicles which cross the boundary line of the same length with Infrared sensor.

**Table 5 Testing Infrared Sensors**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| Hardware The Tested | Which are expected | Observation result | Conclusion |
| IR sensor | Can detect vehicles that pass through the | The sensor can detect vehicles that | [√] Received [ ] Rejected |

| line markers | pass through markers | |
|---|---|---|

Based on the test sensor works properly every vehicle that passes through Stopline line will be detected.

### 2.2.10 testing Cameras
Camera testing by accepting requests from Infrared sensor, which will give the order to capture images that the camera has been redirected.

**Table 6 testing Cameras**

| Cases and Test Results (Data True) | | | |
|---|---|---|---|
| Hardware The Tested | Which are expected | Observation result | Conclusion |
| Camera | Capturing images can offender | The camera got a picture offenders over the line markings | [√] Received [ ] Rejected |
| Cases and Test Results (Data One) | | | |
| Hardware The Tested | Which are expected | Observation result | Conclusion |
| Camera | Capturing images can offender | The camera can not capture images of violators | [√] Received [ ] Rejected |

Based on the test data on the camera, the captured image has been already stored in memory. However, when testing the camera does not capture images because the flexible cable is less stable.

### 2.2.11 Delivery Testing Data
After receiving ir sensor data based on objects that pass through it. The camera will automatically capture the object passing vehicle markings. Then the results of the image will be sent by the Node-RED to API Open-ALPR which to request the data from the license plate camera image ditankgap. Once the process is complete API will transmit data to the license plate number of Node-RED in the form of JSON. Node-RED after receiving the results of the request will be displayed in the form of a string to the website. Here is the data delivery time.

| Trial | time Pengirimann | Time Data Sent | Condition |
|---|---|---|---|
| 1 | 12:00:01 | 12:00:19 | Data Sent |
| 2 | 12:01:01 | 12:01:12 | Data Sent |
| 3 | 12:02:01 | 12:02:15 | Data Sent |
| 4 | 12:03:01 | 12:01:16 | Data Sent |

### 2.2.12  BlackBox testing

Black box testing focuses on whether the software that is built to meet the needs indicated in the specifications. Testing is done by running or executing unit, and then observed whether the result of the unit being tested is whether the business in accordance with the process or not.

Here is a test on the line markings violation monitoring system.

**Table 7 BlackBox testing**

| No. | Items Tested | Testing Details | types of Tests |
|---|---|---|---|
| 1 | sensor Ir | detection Offenders | *Black Box* |
| 2 | Camera | detection Offenders | *Black Box* |
| 3 | raspberry | Processing data | *Black Box* |

### 2.2.13  Beta testing

Beta test is a test conducted to determine the assessment of the monitoring system markers line violation. by interview. From the results of these interviews will be concluded whether the system has been built in accordance or not with the expected goals.

**Table 8 Beta testing**

| Question | answer |
|---|---|
| 1. is traffic violation monitoring system on the boundary line marking vehicle can be monitor offenders with good? | Every vehicle that passes through the line markers can be captured picture and the license plate is detected. I was interested because it can be used for many vehicles. |
| 2. is traffic violation monitoring system on the boundary line marking vehicle This can provide a good warning? | Yeah own warning can be heard clearly. |
| 3. is traffic violation monitoring system on the boundary line marking vehicleThis can mengola well data breach? | Yes, the data can be stored and can be downloaded in the form of data. This will facilitate us in forwarding the report data. |
| 4. This system requires Internet to work, do not be a problem ?? | Not masalahl, because this has been the era of |

| | technology needs of the Internet has become commonplace. |
|---|---|

## 3. CLOSING

### 3.1  Conclusion

Based on the results of research on "the development of a prototype of a traffic violation monitoring system in marking the boundary line of Internet-based vehicle of things" done by testing the tool in the model and also observation, interview. The authors concluded that:

1. The detection of violations of road markings can be done without the need to be watched.
2. Warning offense under license plates of violators automatically.
3. Mutilations violations are stored in the form of updated data.

### 3.2  Suggestion

To develop a monitoring system peanggaran line markers, the authors provide suggestions that are expected to materialize and be the basis for further research. The suggestion of the authors, namely:

Detection of violations at the intersection of road markings is expected to be applied in order to add traffic order. Sensor appliance that is used now does not have a good durability against rainy weather. Is expected to be able to develop properly.

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