Controlling of Traffic Light in Four Crossroads By Visual Basic

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Abstract: Many crossroads in highways can cause bustle for officers to control traffic flows in well organize and accurately. Less of awareness of people who use the road, to follow traffic regulation when they are on the roads, increases traffic jams or accidents, possible happen in crossroads is base of this research. Objective of research is to make a simulation of traffic light circuit controller with four crossroads by Visual Basic. This research discusses about controller of active time of traffic lights in four crossroads uses simulation program based on Visual Basic. Supported components like transistor, relay, and regulation to keep stable in reading program. This research produces a simulation to control traffic lights in four crossroads with two conditions, Normal Condition (from 6am to 11pm), when all traffic lights active changeable and Quiet Condition (from 11pm to 6am) when yellow lamp actives flicker continuously. Sequence of active traffic lights, starts yellow lamp actives 3seconds, followed green lamp actives 41seconds, red lamp actives 132seconds in every crossroad, after got supply and program from software interface. Movement of traffic lights in four crossroads is clockwise. Using of Data Ports in two conditions, Active High and Active Low. System works as its framework.

Keywords: Power supply; Traffic lights; Conditions of road; Timing Diagram; Based on The Sequence of Active Lights, can be learned the using of Data Ports in two conditions, Active High and Active Low.

1. Introduction

Highway is transportation access that the most needed. Many crossroads in highway contribute to increase traffic jam. The rising of crossroads in one street is a proof that level from users of road in that part also raises. This circumtance will be followed with many traffic jams or accidents in that path. To overcome this problem, a good controling is needed in every crossroad to avoid many unpredictable things, for safety to every user of that road.

If this controling will be done by people, it will give many problems. For certain time, an officer in a road will be easier to control the traffic jams in two or three crossroads. However, that person can not do that in a long time without break because he/she will be tired if working continuously along the day. In addition, if one road has four crossroads or more, so that officer has problems to control this condition. It is also ineffective for one man to do it.

To handle this situation, using traffic lights in crossroads is effective. It can reduce the level of traffic jams. It also helps the officers because it will never be tired like human. However, to make this traffic light works continuously so, a good electrical source is needed to supply the system of traffic light without stop. Traffic light is one of traffic signs which familiar and can be found in almost every crossroad.

Generally, controling of traffic lights with four crossroads uses electronic components as controling element so it is hard to maintain and change the pattern of time to adopt the change of

traffic conditions. To anticipate the lack of electronic controling, the authors make a traffic controler based on Visual Basic to make it easier in operation and changing traffic conditions.

Basically, context of the problem in this research is how to control traffic lights in every crossroads to reduce traffic jams and accidents in the roads.

This problem can be observed by:

- displaying the length of active time from every traffic light in every crossroad so it can avoid the traffic jam in every crossroad.
- displaying the timing diagram from every traffic light in every crossroad based on the conditions of traffic, to see which path will go first.

This research can be used as replacement of officers in roads to control traffic lights in every crossroad to reduce traffic jams and accidents in the roads.

The problem in this research is how to identify the length of active time from every traffic light in every crossroad and how to produce the timing diagram from every traffic light in every crossroad based on the conditions of traffic.

The objective of this research is to make a simulation of traffic light circuit controller with four crossroads by Visual Basic.

The scopes of this research are:

- This research refers to traffic lights in Crossroad of Tuanku Tambusai Street –Soekarno Hatta Street, Pekanbaru on Juli 1st, 2015 from 12 pm until 12 pm.
- The length of active time from every traffic light in every crossroad
- Timing diagram from every traffic light in every crossroad based on the conditions of traffic
- This research is focussed for controoling trafiic lights in four crossroads to avoid the meeting point from two crossroads.

This paper is organized as follows. In section 2, Base Theory of this research, such as Traffic light, Parallel Port, Visual Basic, and Form are explained. Section 3 describes Material and Methodology. The implementation results and discussion are presented in section 4. Finally, section 5 concludes the paper.

2. Related Works/Literature Review

2.1. Traffic Light

Traffic light is one of control tools uses put lamps on the crossroad to control the flow of traffic. This thing is done to control the movement of vehicles on each path of its, that can move changeable so they will not disturb one each other's flow from available vehicles.

Based on Regulation of Relationship Ministry Number : KM 62 Year 2003 about A Tool as Traffic Signal Giver (APILL), traffic light is a set of technical equipment uses lamp signal to control the movement of vehicles which crosses in parts of a road.

Based on Regulatalion from Director of Land Relationship General Number. 273/HK.105/DR JD/96 about Technical Guidance of Traffic Controlling in The Stand Alone Crossroad with a Traffic Giver Tool, that a crossroad should be put a traffic giver tool is:

1. The average of traffic minimal flow uses crossroad more than 750 vehicles/hour for eight hours in a day.
2. When waiting time / average obstacle of vehicles in crossroad more than 30 seconds.
3. If accident often happens on the connected crossroad.

If designed traffic light is bad and does not maintain well so as a consequence number of accidents will increase, give long delay and infringement of traffic light. Base principle to control time of traffic light is releasing of traffic flow when traffic light is green, done as effective as possible to produce the smallest delay.

2.2. Parallel Port of Computer

Parallel Port or Printer Port is one interface in a computer. Interface is used electronic circuit to connect between two systems so that system can communicate. In this research, interface has a task to adjust the framework of hardware instrument with the framework of compter. With assistance of interface, computer can be used as a giver and receiver signal from controlled circuit.

Parallel Port or Printer Port consists of three parts, such as Data Port (DP) address in 378h (888), Printer Control (PC) address in 37Ah (890), and Printer Status (PS) address in 379h (889). DP is used to send printed data by printer, PC is used to send controlled codes from computer to printer, and PS is used to send status codes of printer to computer.

PC Port and DP Port are read/write ports. PS is read only port. This ability is only owned by Enhanced Parallel Port (EPP). On the other hand, on Standar Parallel Port, DP Port has write only ability. DB-25 Female configuration, is shown in Figure 1.
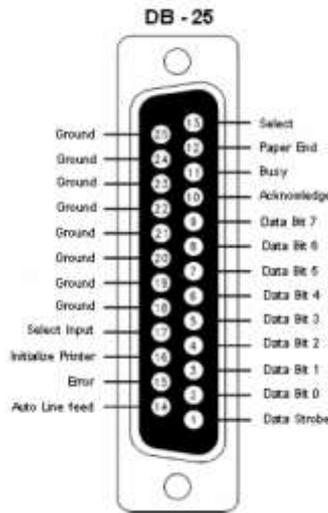

Figure 1. DB-25 Female configuration, is shown in

2.3. Visual Basic

Visual Basic is one of programming languages can be used to arrange and make interface program. In its development, application of Visual Basic menggunakan uses visual Graphical User Inteface (GUI) to arrange interface. Microsoft Visual Basic 6.0 has many superiorities. Some of these superiorities are :
1. Its display is easy to understand.
2. Base of programming language uses Beginner All-Pulpose Symbolic Intruction Code (BASIC).
3. Can use the ability of Microsoft Windows well.
4. Compiler can be done quickly.

Display of Visual Basic interface with its parts, can be seen in Figure 2.
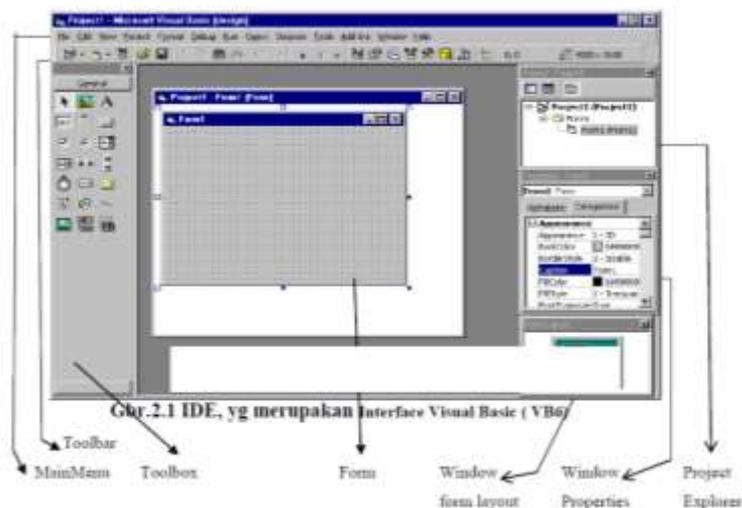

Figure 2. Display of Visual Basic interface with its parts

2.4. Form

Form is work sheet can be used to design the displaying from every item that will be displayed based on made program. Display of form sheets, is shown in Figure 3.
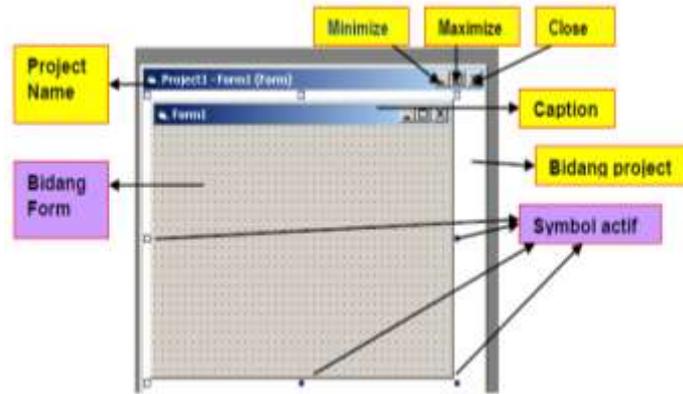

Figure 3. Display of form sheets

In this case, the size of form can be changed in making program interface. In a form, consists of menu, knob, box of list and other items. Project name is a name of project.

3. Material & Methodology

3.1. Data

Data was collected by observation in the highway. Based on this data, Researchers make a design of circuit and program to get the length of active time from every light in four crossroads and timing diagrams for all conditions happen in the highway refer to the occurences in the highways.

3.2. Method

Methods in this research are :
1. Make a design and program from a circuit of traffic light controler for four crossroads.
2. To apply the circuit design in a real ricuit.
3. Execute the tool.
4. Do tests to the tool.

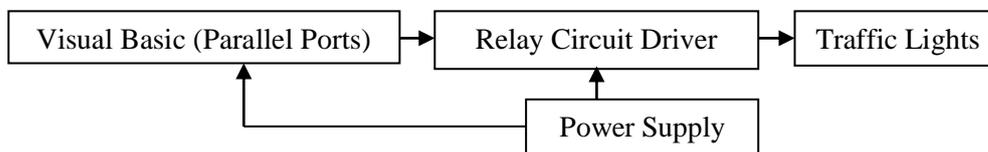Diagram block from this research, is shown in Figure 4.

Figure 4. Diagram block from this research

From Figure 4, can be seen that power supply is a source to supply used Parallel Ports and Relay Circuit Driver. Using of Parallel Ports for Relay Circuit Driver are determined by Visual Basic to control which traffic light will be active in every second for 24 hours.

The framework of this system is started with initiation number of cross-roads, number of lights, conditions of road, and active time of every traffic light in four crossroads for 24 hours. If condition is quiet, means from 12 pm to 6 am, so yellow lamp will be active and flicker continuously in 4 crossroads. If condition is not quiet, means from 6 am to 11 pm, so the sequence of yellow lamp will be active in three seconds, followed green lamp actives for 41 seconds, and red lamp will be active in 132 seconds will occur sontinuously. Flowchart of this research, shown in Figure 5.
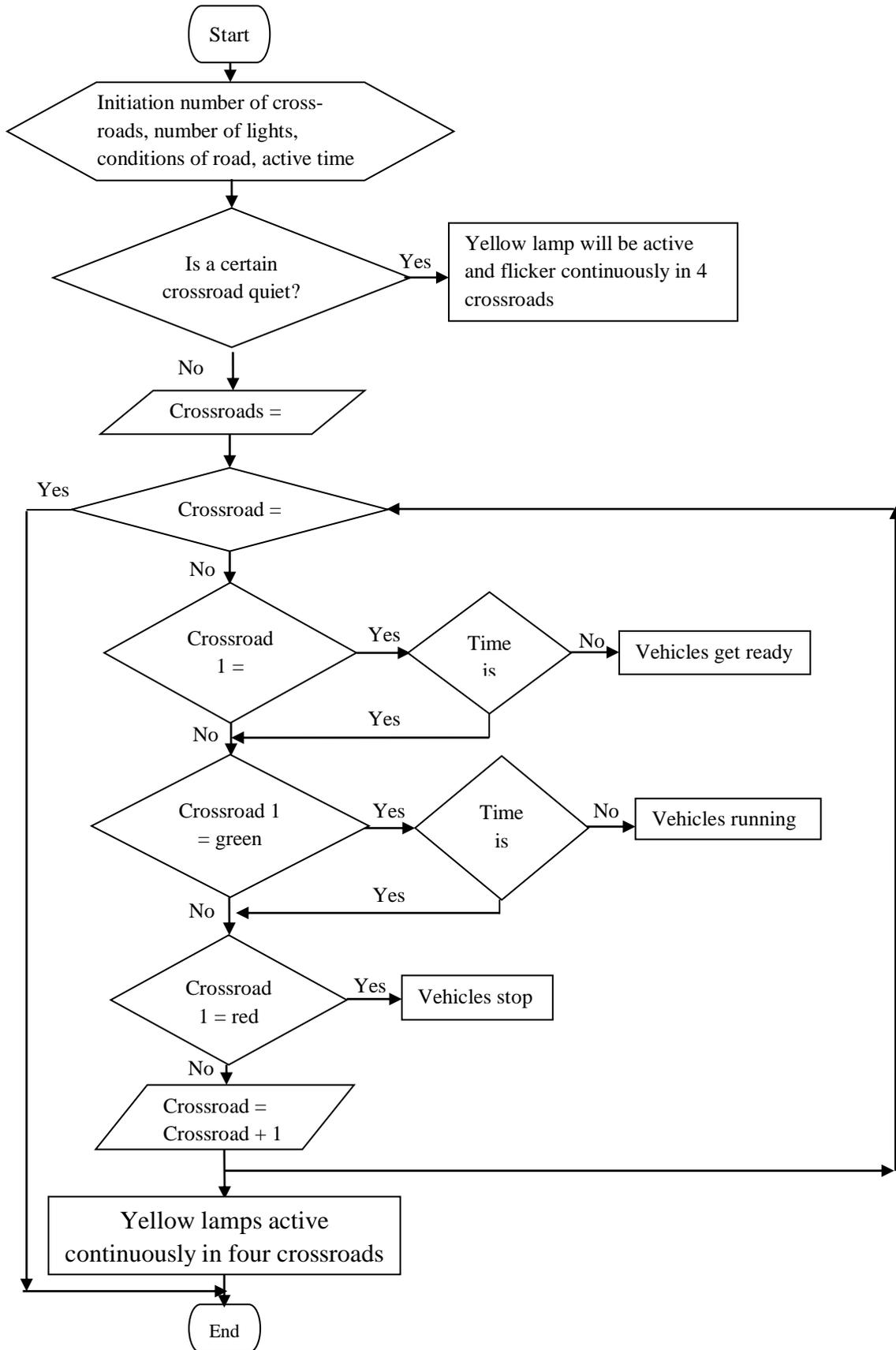
Figure 5. Flowchart of this research

4. Results and Discussion

4.1. Result

This research refers to traffic lights in Crossroad of Tuanku Tambusai Street –Soekarno Hatta Street, Pekanbaru on Juli 1st, 2015 from 12 pm until 12 pm. There is no change in the active length of green lamp in Normal Condition or Peak Condition. The sequences of active traffic lights in this research are Yellow Lamp – Green Lamp – Red Lamp, whereas :

1. Yellow lamp will be active for three second after red lamp is off as a signal for rider/driver to decrease the speed of their vehicles or stop.
2. Green Lamp is active for 41 seconds, after yellow lamp is off to beckon rider/driver to ride/drive their vehicles.
3. Red Lamp will be active after green lamp is off as a signal for all of vehicles to stop.

The results of this work are :
1. Testing of Power Supply
Power Supply circuit is the most important part from one circuit system because the availability of power supply determines the system can work as hoped. This testing performed to know whether power supply circuit can work as its design.

The result of this test shows that circuit of power supply can produce output voltage as planned, even there is a light reduction from measuring result. The produced output voltage is 0.26 Volt.

2. Form of Time Controlling
The content of this Form is controlling of traffic lights with the time condition in every crossroad. Crossroad 1 is in Tuanku Tambusai Ujung Street, Crossroad 2 in Soekarno Hatta Street, Crossroad 3 in Tuanku Tambusai Street, and Simpang 4 in Soekarno Hatta Street (Lottemart) in Pekanbaru. With enter the length of active time of green and yellow lamp, so it shows the movement of the timing as clockwise. Displaying of Controlling Time Form on every crossroad, is shown in Figure 6.

a. Displaying of Controlling Time Form on Crossroad 1

b. Displaying of Controlling Time Form on Crossroad 2

c. Displaying of Controlling Time Form on Crossroad 3

d. Displaying of Controlling Time Form on Crossroad 4

Figure 6. Displaying of Controlling Time Form on every crossroad

From Figure 6, can be seen that the movement of Controlling Time on every crossroad has worked as the fact.

3. The Sequence of Active Lights

This testing is performed to determine which port will be used to turn on the available traffic lights. To turn on the red, yellow and green lamp on Crossroad 1 and Crossroad 2, also red, yellow lamp on Crossroad 3 use Port D0 – D7. All these ports are Data Ports, work as Input Ports. All of them are Active High, means with logic 1 can activate the lamps. For green lamp on Crossroad 3 and red, yellow and green lamp on Crossroad 4 use Port C0 – C3. These ports are Data Ports which is Active Low, means with logic 0 will activate the lamps The Sequence of Active Lights, can be seen in Tabel 1. It shows that all of the ports are used and working properly.

Tabel 1. The Sequence of Active Lights

Crossroad	Lamp	Port											
		D7	D6	D5	D4	D3	D2	D1	D0	C3	C2	C1	C0
1	Red	0	0	0	0	0	0	0	1	0	0	0	0
	Yellow	0	0	0	0	0	0	1	0	0	0	0	0
	Green	0	0	0	0	0	1	0	0	0	0	0	0
2	Red	0	0	0	0	1	0	0	0	0	0	0	0
	Yellow	0	0	0	1	0	0	0	0	0	0	0	0
	Green	0	0	1	0	0	0	0	0	0	0	0	0
3	Red	0	1	0	0	0	0	0	0	0	0	0	0
	Yellow	1	0	0	0	0	0	0	0	0	0	0	0
	Green	1	1	1	1	1	1	1	1	0	1	1	1
4	Red	1	1	1	1	1	1	1	1	1	0	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	0	1
	Green	1	1	1	1	1	1	1	1	1	1	1	0

4. Testing of Traffic Lights

The length of active time from every traffic light in every crossroad from available crossroads does not depend on the traffic jam at the moment. Based on monitoring in the road, active or inactive of traffic lights divided in two conditions, Normal condition and Quiet Condition of the road.
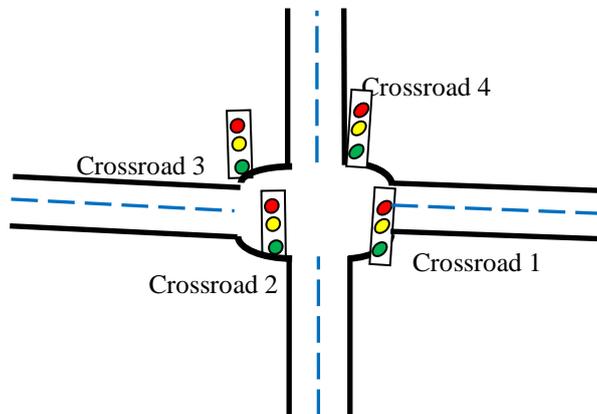

Figure 7. The Condition of Traffic Lights in Four Crossroads

Based on these, this highway is Quiet from 11.00 pm – 06.00 am so the active traffic light is just the yellow lamp for all of crossroads. Normal Condition starts from 06.00 am – 11.00 pm so the yellow lamp is active for 3 seconds, green lamp is active for 41 seconds as long as this time. Beside it,

red lamp in one crossroad will be active in according with the length of active time from yellow and green lamp for other crossroads. The Condition of Traffic Lights in Four Crossroads, can be seen in Figure 7.

Based on the conditions of the road and length of active time of Traffic Lights, is shown in Tabel 2.

Tabel 2. The Conditions of Road and length of active time of Traffic Lights

Road Condition	Time (24 hours)	The length of active time of Traffic Lights in every crossroad (second)											
		Road 1			Road 2			Road 3			Road 4		
		M	K	H	M	K	H	M	K	H	M	K	H
Quiet	12 pm – 6 am	Off	On	Off	Off	On	Off	Off	On	Off	Off	On	Off
Normal	6 am – 11 pm	132	3	41	132	3	41	132	3	41	132	3	41
Quiet	11 pm – 12 pm	Off	On	Off	Off	On	Off	Off	On	Off	Off	On	Off

Whereas :
- M = Red Lamp
- K = Yellow Lamp
- H = Green Lamp
- On = Time when lamp is on (active) and flicker until the limited time
- Off = Time when lamp is off (not active) until the limited time

From Table 2, can be seen that the controlling of active lamp and the length of active lamp every second during 24 hours, work as planned.

5. Timing Diagram of Traffic Lights in Four Crossroads

The content of Timing Diagram is the diagram of active lamp in every type of controller in *Software Visual Basic* 6.0. The objective of Timing Diagram is to see the sequence of active lamps in every crossroad for one cycle. Timing Diagram also shows the sequence of activate controller in four crossroads.

On Timing Diagram in four crossroads, the first active lamp when Normal Condition is yellow lamp for 3 seconds, then followed by green lamp 41 seconds and red lamp merah for 132 seconds. The sequence of these active lamps will be working continuously and repeated from 6 am to 11 pm.

On Timing Diagram in four crossroads, during Quiet Condition so yellow lamp is on and flicker from 11 pm until 6 am. Timing Diagram For Normal Condition of The Road from 6 am to 11 pm, can be seen in Figure 8.a. Timing Diagram For Quiet Condition of The Road from 11 pm until 6 am is shown in Figure 8.b. From Figure 8.a and Figure 8.b, Timing Diagram For Normal and Quiet Condition of The Road are working well as framework.

4.2. Discussion

Controlling from sequences of active traffic lights for one period in every crossroad, is started with the active of red lamp first. Then, it will be followed with yellow lamp and green lamp in a series. After these, it will reactivate red lamp again continuously, based on observation on the road. It is performed because many traffic jams happen caused by the driver/rider who keep driving/riding their vehicles even the traffic light has changed be red lamp (after changes from green lamp). The same occurence happens in the opposite of this crossroad. The driver/rider start to drive/ride even the traffic light still yellow lamp before changes to green lamp.

These cases can cause the traffic jams or accidents in the meeting point from two crossroads because the time changing from red lamp to yellow lamp before change be green lamp, just take three seconds. By these occurences, Researchers make a controlling of traffic lights in the four crossroads be from Red Lamp, Yelloow Lamp, Green Lamp, Red Lamp again and so on. Hopefully, it can reduce the traffic jams or accidents that can happen in the meeting point from two crossroads.
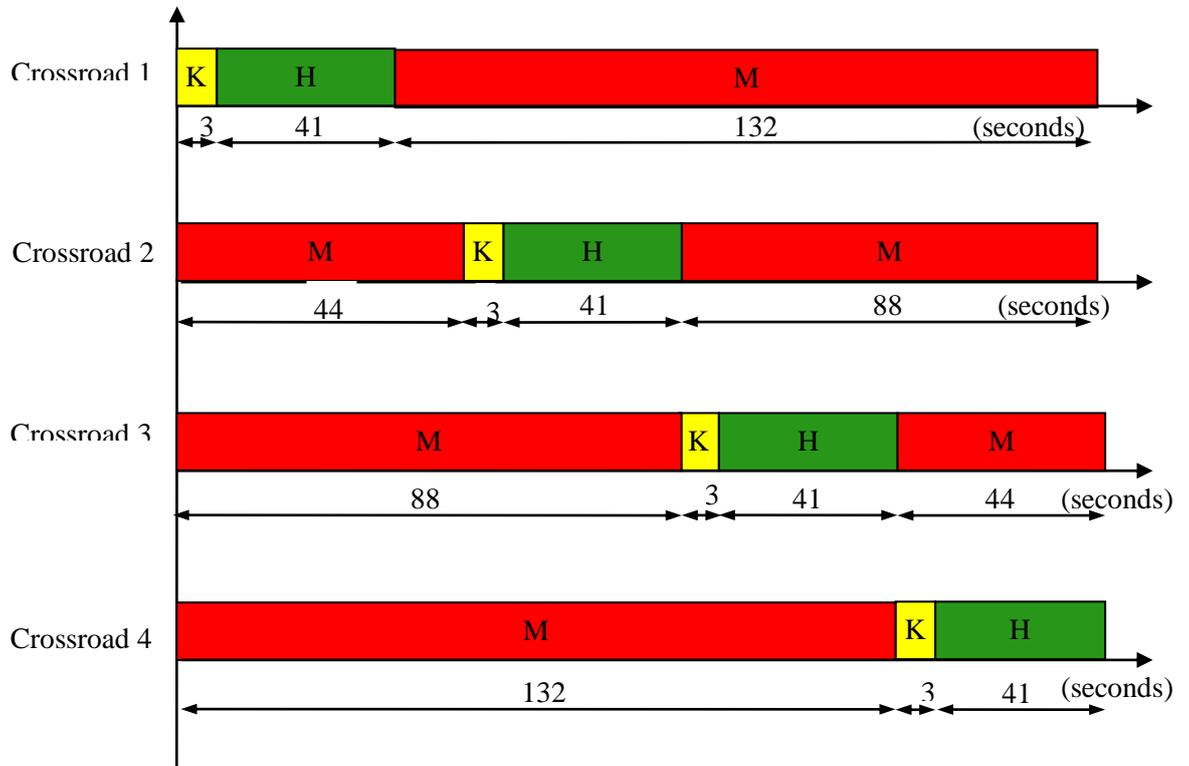
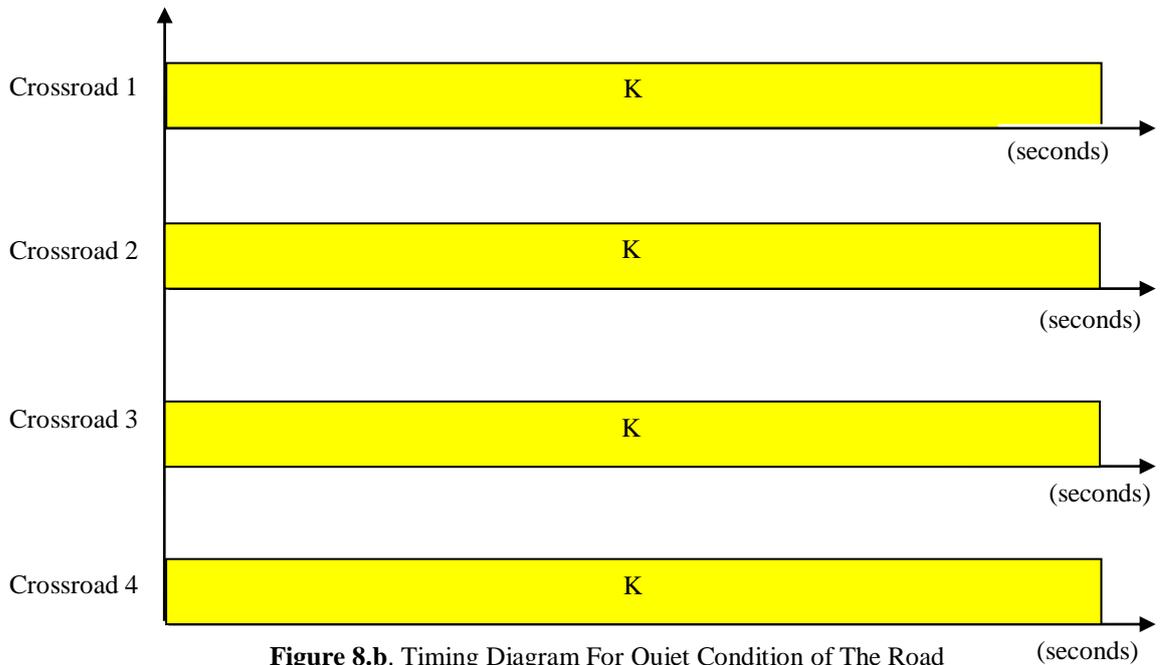**Figure 8.a**. Timing Diagram For Normal Condition of The Road

Figure 8.b. Timing Diagram For Quiet Condition of The Road

Based on people's activities daily cause there is two conditions of time can be arranged to make the flow of vehicles be fluently in the highway based on the length of active green lamp determined, such as :

1.   Quiet Condition

This condition occurs from 12 pm to 6 am and from 11 pm to 6 am daily because generally, activities of people are doing in the house or closed room, not in the highways. So, the number of vehicles in the highways in this moment should be rare, tends to quiet because people should use this time to take a rest or stop from all of activities inside or outside of the houses.

Based on condition, the traffic light will be active is just the yellow lamp and flicker from 11 pm to 6 am. On the other side, red lamp and green lamp are inactive at all. So, the active yellow lamp function as a signal for the rider/driver in the highways to be careful because the dark and quiet condition can cause the rider/driver be less wary for condition of the road at that moment.

2. Normal Condition

This condition happens when the number of vehicles in the highways are normal and still can not appear the long queue. The Normal Condition occurs from 6 am until 11 pm because people do their activities daily in this time. There is possinle if these activities are still doing in their neighborhood, so the highways is still not crowded. Based on this condition, the active length of yellow lamp is three seconds. Otherwise, green lamp is arranged normally to be active in 41 seconds and red lamp is active for 132 seconds in every crossroad.

When red lamp is active in Crossroad 1 so yellow lamp is active in Crossroad 2 for three secons, followed by activating of green lamp for the next 41 seconds. Then, red lamp will be active in Crossroad 2 when yellow lamp starts to turn on in Crossroad 3. These conditions will works continuously until the traffic lights active in Crossroad 4.

5. Conclusion

Conclusion of this research are:

1. This reserach produces a simulation controlling to control the traffic lights in four crossroads with two conditions such as Normal Condition (from 6 am t0 11 pm), when all of traffic lights in four crossroads active changeable and Quiet Condition (from 11 pm to 6 am) when yellow lamp is active continuously and flicker during this time.
2. The sequence of active traffic lights, starts from yellow lamp is active for three seconds, followed green lamp will be active in 41 seconds and red lamp is active for 132 seconds in every crossroad, after got supply and program from software interface.
3. To turn on the red, yellow and green lamp on Crossroad 1 and Crossroad 2, also red, yellow lamp on Crossroad 3 use Port D0 – D7 which are Active High. For green lamp on Crossroad 3 and red, yellow and green lamp on Crossroad 4 use Port C0 – C3 which are Active Low.
4. Based on Form of Time Controlling, can be seen the movement of the traffic lights in four crossroads is clockwise.
5. Based on The Sequence of Active Lights, can be learned the using of Data Ports in two conditions, Active High and Active Low.
6. In the future, energy alternative to supply traffic lights is important to be learned.
7. The shortcoming of this research is the two conditions of four crossroads in the highway determined based on people activities daily. In addition, Timing Diagrams are obtained based on these two conditions (Normal Condition and Quiet Condition).
8. The advantages of this research are to reduce the number of traffic jams and accidents, especially in the meeting point from two crossroads and to replace officers in the highways to control traffic lights in every crossroad.
9. In the future, this prototype can be developed with a smartphone.

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