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RAILWAY SECURITY SYSTEM WITH HALL EFFECT SENSOR BASED ON ARDUINO UNO

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Keywords

sensor,
system,
train,
crossing

This railway door security system is made and can be used to overcome problems that exist in railroad crossing doors. The large number of cases and fatalities that have occurred to date have been caused by a lack of security and the large number of individuals who have committed acts of violations, causing many fatalities and other cases that have occurred at railroad crossings. The existence of these tools and systems can change mindsets and reduce the number of accidents at railroad crossings. Because the system in this prototype is able to provide a deterrent effect to persons who violate the rules. Overall this tool can work and function properly according to the desired system. The sensor output voltage is around 3 – 5V DC. Hopefully this tool can be a reference for improving the existing system at the current train gate. So that the number of accidents that occur at railroad crossings can be reduced.

1. INTRODUCTION

The train is the favorite means of land transportation for most Indonesians. Because the cost of travel is cheap and the comfort provided is quite balanced. We see a lot of trains in big cities in Indonesia, especially on the island of Java. As we know today, PT. KAI as a train service provider in Indonesia provides supporting services at railroad crossings such as doorstops, indicator lights for passing trains, reminder alarms, etc. But as we also know, until now there are still many cases of accidents that occur at railroad crossings due to the lack of responsiveness and the lack of safety of the existing systems at the railroad crossings. Because some are still manual or use human power which is definitely not optimal. Also, there are still many of our people who are not aware of safety when driving, so many of us violate the road dividers or rail bars when the train is about to cross the crossing which results in accidents.

2. RESEARCH METHOD

The research method used is to design and manufacture tools consisting of:

a. Arduino uno
b. LEDs
c. Hall effect sensor module KY-024
d. SW-420 vibration sensor module
e. LCD 16 x 2
f. servo motors
g. Adapter 5V 2A
h. 5V DC relays

Block Diagram

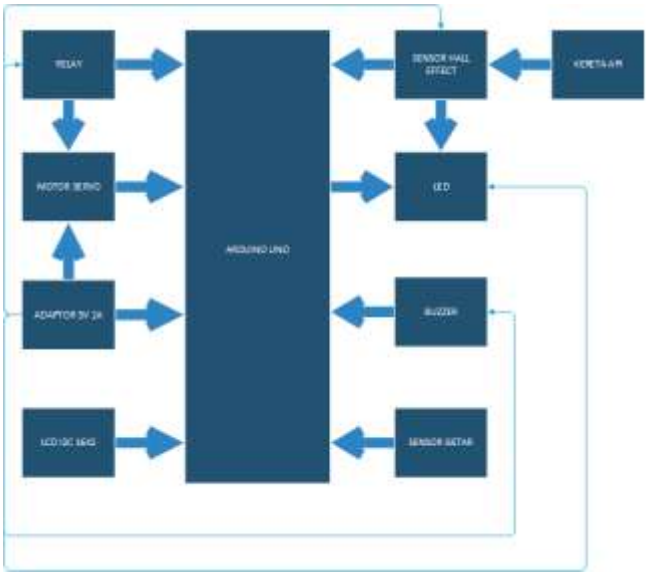

Figure 1 Block Diagram

From the explanation of the picture above, it can be concluded that:

a. Arduino is the main component
b. The train as the initial input for the KY-024 hall effect sensor
c. LED as an indicator that the train will pass
d. 5V 2A adapter as the main power source
e. SW-420 vibration sensor as input

Program Flowchart Design

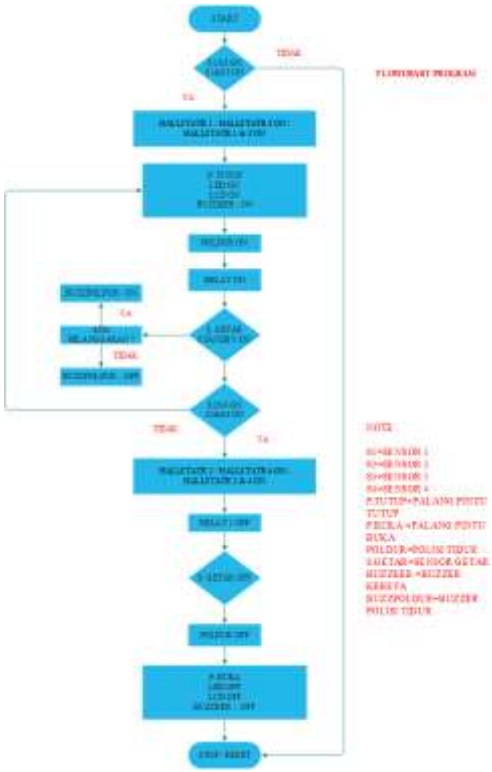

Figure 2 Program Flowchart

From the flowchart below it can be concluded that:

a. The initial condition of the bar is open
b. Sleep police off
c. Buzzer, LED and LCD off
d. If the hall effect sensor is on the rail, in this case if one or both sensors 1 or 3 are on then the door latch will close
e. Existing outputs such as train buzzer, LCD and LED will be on
f. Accompanied by speed bumps will be on or up 500 , accompanied by a relay on to provide power by the SW-420 vibration sensor
g. If a violation occurs, the vibration sensor will activate the speed bump buzzer
h. When the train has passed through the doorstop, then between sensors 2 and 4 or both are active, then the relay will turn off
i. Pause a few moments, the latch opens and a speed bump will descend
j. LED, train buzzer and LCD will turn off
k. And reset

Tool Making Flow

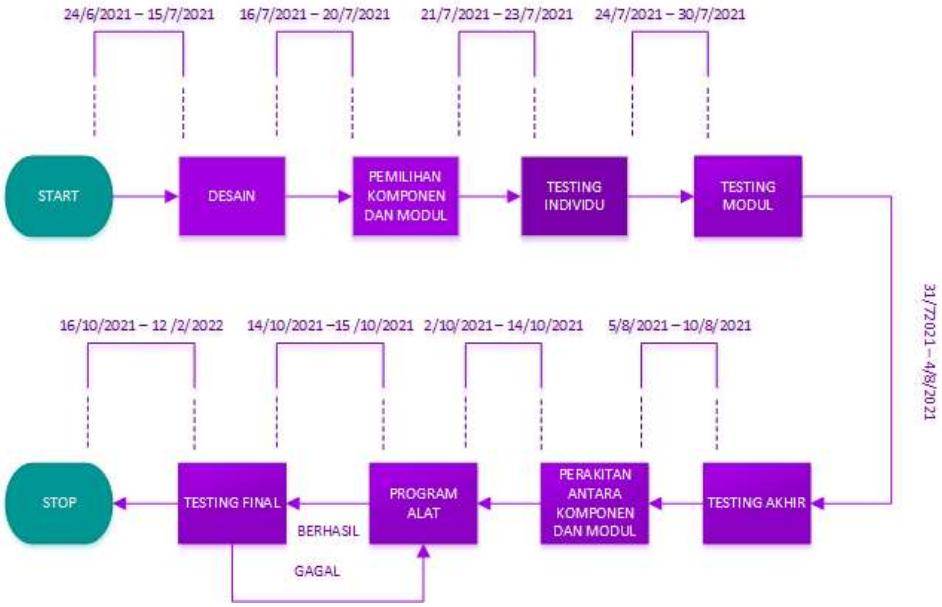

Figure 3 Tool making flow

From the flow chart for making this tool, it can be concluded that:

a. The design of the tool to be made aesthetically
b. Selection of components and modules to be used
c. Components in individual tests
d. Assembly of modules into one unit
e. Tool program with Arduino IDE software
f. Overall test
g. Done

Manufacturing Flow

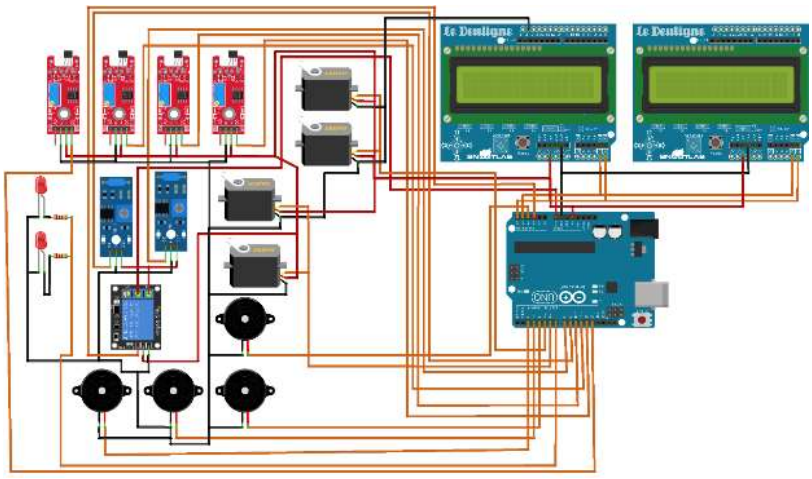

Figure 4 Wiring diagrams

Form of the Overall System

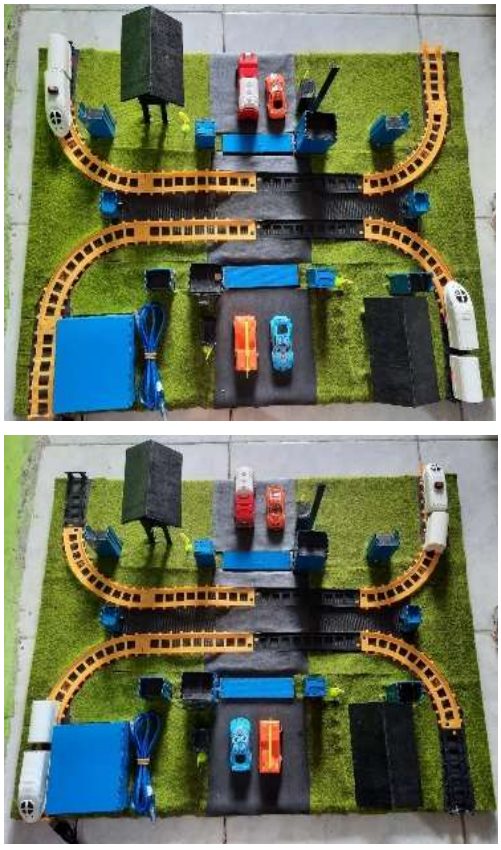

Figure 5 Tool Results

3. RESULTS AND DISCUSSION

After checking all components with the program provided for each component, then the final stage of testing is to find out whether the device runs according to the program given on the Arduino Uno microcontroller. Tool testing is done by entering all the programs and installing all the components

that have been determined. Tool testing is by entering the program for each component that is used. Such as testing programs for sensors and testing programs for output components such as LEDs, Servos and LCDs. The following are some examples of the results of component testing that has been carried out, such as:

Testing of LED Components

Figure 6 LED Testing

LCD Component Testing

Figure 7 LCD Testing

Servo Component Testing

Figure 8 Doorstop Servo and Sleeper Position

Testing of Sensor Components

Figure 9 Sensor Testing

Summary of Test Results

Table 1. Tool Testing Results

HALLSTATE				ACTION
Hallstate 1	Hallstate 2	Hallstate 3	Hallstate 4	
0	0	0	0	Kondisi Awal
0	0	0	1	Undefined
0	0	1	0	B
0	0	1	1	RESET B
0	1	0	0	Undefined
0	1	0	1	Undefined
0	1	1	0	Undefined
0	1	1	1	Undefined
1	0	0	0	A
1	0	0	1	Undefined
1	0	1	0	C
1	0	1	1	E
1	1	0	0	RESET A
1	1	0	1	Undefined
1	1	1	0	D
1	1	1	1	RESET C,D DAN E

Table 2. Description of Tool Testing Results

D	E	Undefined
Palang Pintu Tertutup	Palang Pintu Tertutup	
Polisi Tidur Naik	Polisi Tidur Naik	
Buzzer Kereta 1 On	Buzzer Kereta 2 On	
Buzzer Polisi Tidur Stand By	Buzzer Polisi Tidur Stand By	
LED On	LED On	Tidak Ada Aksi, Seperti Keadaan Awal atau ketidak mungkinan
LCD On " Kereta 1 Segera Melintas "	LCD On " Kereta 2 Segera Melintas "	
Relay On	Relay On	
Sensor Getar Stand By	Sensor Getar Stand By	
Delay	Delay	
Buzzer Kereta 1 & 2 On	Buzzer Kereta 2 & 1 On	
LCD On " Kereta Segera Melintas "	LCD On " Kereta Segera Melintas "	

		KETERANGAN
A	B	C
Palang Pintu Tertutup	Palang Pintu Tertutup	Palang Pintu Tertutup
Polisi Tidur Naik	Polisi Tidur Naik	Polisi Tidur Naik
Buzzer Kereta 1 On	Buzzer Kereta 2 On	Buzzer Kereta 1 On
Buzzer Polisi Tidur Stand By	Buzzer Polisi Tidur Stand By	Buzzer Polisi Tidur Stand By
LED On	LED On	LED On
LCD On " Kereta 1 Segera Melintas"	LCD On " Kereta 2 Segera Melintas "	LCD On " Kereta Segera Melintas "
Relay On	Relay On	Relay On
Sensor Getar Stand By	Sensor Getar Stand By	Sensor Getar Stand By

Resumes of Test Results

- Cycle A : 0000, 1000, 1100 and 0000
- Cycle B : 0000, 0010, 0011 and 0000
- Cycle C : 0000, 1010, 1111 and 0000
- Cycle D: 0000, 1000, 1010, 1110, 1111 and 0000
- DD Cycle: 0000, 1000, 1010, 1011, 1111 and 0000
- Cycle E : 0000, 0010, 1010, 1011, 1111 and 0000
- EE cycles: 0000, 0010, 1010, 1110, 1111 and 0000
- Undefined:Like initial state or impossibility

From the test results, it can be concluded that:

- Cycle A when train 1 passes
- Cycle B when train 2 passes
- Cycle C when trains 1 and 2 pass together
- Cycle D when train 1 comes first, then train 2 passes
- Cycle E When train 2 comes first, then train 1 passes

4. CONCLUSION

After all the processes have been carried out, from designing to assembling the tool to the whole tool testing process, it can be concluded that: The components used are divided into 2 parts, input and output components. The input component is a sensor while the output is a buzzer, LED, LCD and servo. The rails used are double track. The second level of security for this device is a speed bump

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