

## Traffic Light Notification System For Detecting The Emergency Vehicle Using Arduino

Mohamad Amir Rolie<sup>1</sup>, Megat Satria Zainuddin Yaacob<sup>1\*</sup>

<sup>1</sup>Department of Electrical Engineering Technology, Faculty of Engineering Technology,  
Universiti Tun Hussein Onn Malaysia, 84600, Pagoh, Johor, MALAYSIA

\*Corresponding Author Designation

DOI: <https://doi.org/10.30880/peat.2022.03.02.038>

Received 27 January 2022; Accepted 07 November 2022; Available online 10 December 2022

**Abstract:** The traffic notification was designed for helping the traffic flow to go smoother than before. As it will be plant on all the traffic light, it may receive an early information about the arriving emergency transportation that on their way to the destination from about 50 to 100 m from the recent position of that vehicle that time as they will notify by the device that attached on the traffic light. The objective of this production is first to alert traffic about the arriving of the emergency transportation towards the destination. Next, to make sure traffic flow is smooth without having any problem due to many transportation on the road. Then, to increase the safety for all traffic as we can keep the main road clear for a moment. This project is using some combination of component which is Sound sensor, Push Button, LED and Arduino. As we can see, all the traffic will immediately receive information that are install on the traffic light so they can ready for any possible outcome. In future, we may lead the traffic to give a cooperation to Emergency Vehicle that want to cross the road especially in town. Besides, this project can be receive worldwide.

**Keywords:** Emergency Vehicle, Sensor, Traffic Light, Arduino, LED

### 1. Introduction

Traffics are heavily congested by vehicle nowadays, especially personal vehicles at urban area during peak hours. While it is true that by having a personal transportation to reach certain destination is making people life much easier, but in reality it pose far greater problem when the emergency vehicle cannot reach intended destination quickly, because the traffic population is getting huge every year.

When the emergency unit cannot reach their destination quickly, there are people life on the line who may suffer from serious injury, waiting for the emergency unit to come but it will be too late then. People may counter a serious injury that need a fast aid from the rescue team, for example who lost lot of blood in road accident. In term of time, it is very crucial for the emergency vehicle to arrive as soon

as possible at the hospital or accident location. The problem is that emergency vehicles cannot get through congested traffic easily.

Next, if there a crime scene happen, the emergency unit will need to arrive immediately to the situation. Failure to do so may result in escalation into worst case scenario such as criminal already fled the crime scene or lives in danger. In case of fire hazard such as wildfires or fires in residential areas. This situation called for quick response from emergency unit especially if the fire is raging violently.

As a result, people need to be alerted by a device that can help to inform people when emergency vehicle is nearby. So they can clear a lane for the emergency vehicle to easily reach their destination especially at traffic light junction.

### 1.1 Product.

Traffic Notification is a product that design to alert traffic user from the emergency unit that available on the road. This product may help the rescue journey for the emergency unit to reach their destination on time. This product also may help traffic light to keep green light for incoming emergency vehicle.

Basically, this study was included sound sensor as a main component for detect the emergency vehicle sirens.

## 2. Materials and Methods

The idea of the invention, traffic notification is something that thought from everyday activities. The working principle of the invention is simply that the notification is embedded in the product and will notify user according to situation.

The study was sense the changes in different aspect of the traffic which is the appearance of Pedestrian. The LED lights to show the state of the notification that will go as blue LED, green LED for pedestrian to cross safely and LED traffic light for vehicle will stay red. The project will be controlled by a microcontroller which is the Arduino Uno and Sound sensor, LED and Push Button.

### 2.1 Materials

The development of our project is mainly to serve traffic user that need this equipment to ease journey. The project use some of component consist of:

- Arduino UNO
- Sound Sensor
- LED
- 150 ohm resistor
- Push Button

### 2.2 Software Development

The software development is required to be a part of the collecting data and information for this Project. The software that is used in this project is Arduino software (IDE), and Proteus software. The Arduino IDE is used to construct and design the coding of the programming code and Proteus used to do the simulation circuit project.

#### 2.2.1 Proteus 8 Software

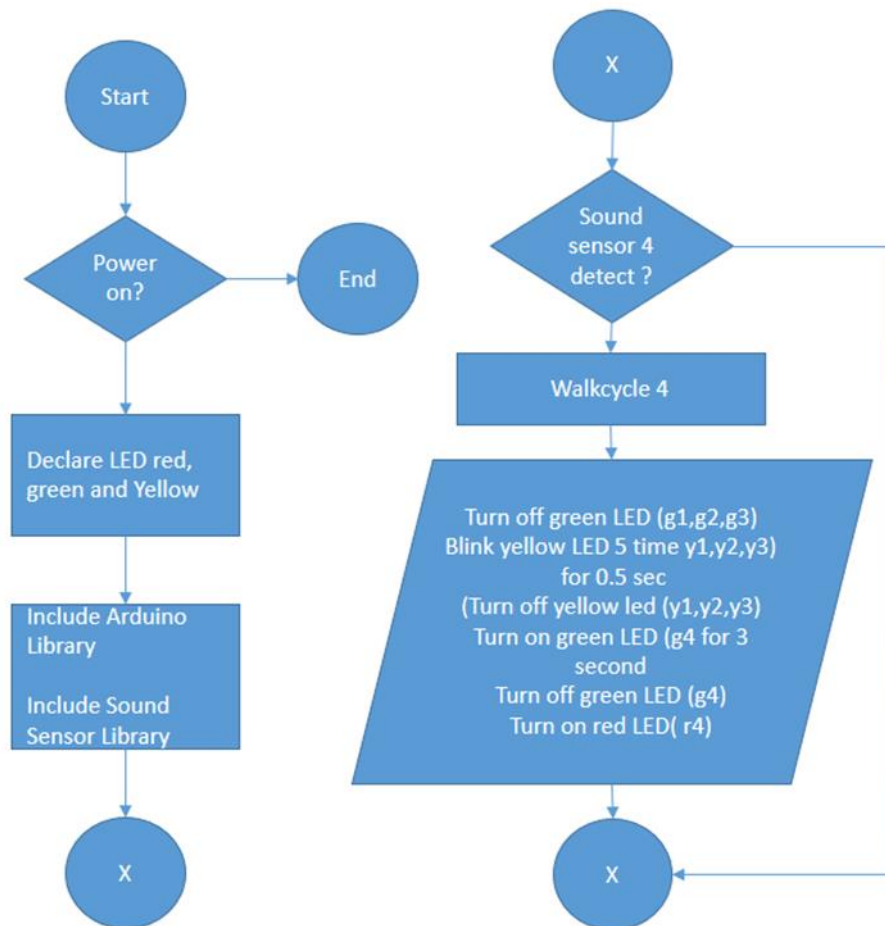
This software used to implement the simulation by using Proteus professional design software. Proteus is an electronic circuit design software that includes schematic capture, simulation and PCB (Printed Circuit Board). The tools in this software provide with a powerful, integrated and easy to use for the beginner.

### 2.2.2 Arduino IDE Software

The programming coding for this project was developed by using this software for controller Arduino Uno. The programmer can make the simulation of the coding and upload the coding to the Arduino controller board.

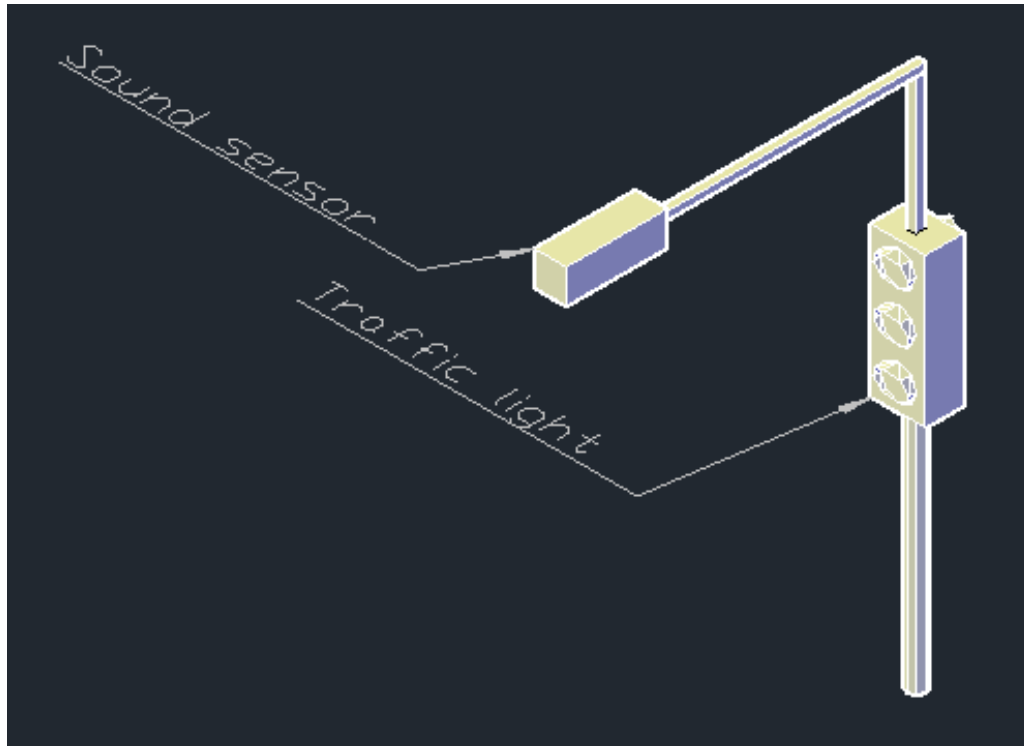
### 2.3 Methods

The first step of handling the methodology is discussing the parts distribution, the software used carry out the project, and the circuit/project layout. Figure 1 show the system flowchart. Next, the circuit diagram is designed using the Proteus 8 software. To simulate the circuit, the Arduino IDE is used to program the Arduino Uno board that controls all other components. The circuit and coding will be run to see whether any error will occur. If error were detected, the modification of simulation will be done.



**Figure 1: System Flowchart**

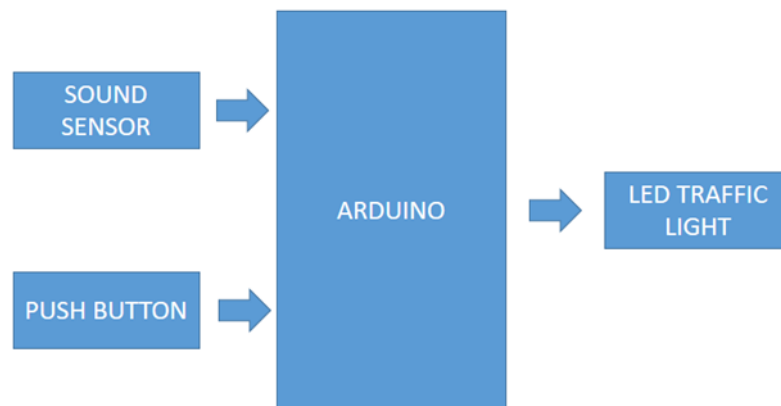
Thus, the data comparisons will be made to analyze the flow of system that might require any changes for later improvement. The final step is to write the complete methodology before making the submission. Meanwhile if the simulation is successful, the next step which is designing the project layout using AutoCAD software will be executed. The 3D layout was be drawn for front view, side view, and upper view. Figure 2 show the 3D layout. Moving on to the analyzing simulations results, the graphs from simulation tests will be observe. The program start when the switch is turned on. The library for Arduino and Sound sensor will be included to the Proteus. All the components including Sound sensor, push button and LED are declared. When emergency detected, traffic light operated based on the situation. If input source from sound sensor 4, walk cycle 4 will operate.



**Figure 2: 3D Layout**

### 2.3 Block Diagram

The detection of emergency vehicle was make the traffic light LED to be the indicator to the user. The LED for emergency vehicle lane will stay green and LED for other vehicle will stay red and will trigger another LED as blue as soon it receive command from microcontroller depending on the situation at the same time. This is the block diagram of the project:



**Figure 3: Block Diagram**

Based on the block diagram above, when Sound sensor and push button detects emergency vehicle, the microcontroller that received the information will send command to trigger the LED traffic light

### 3. Results and Discussion

As a successful simulation, in the modification part, the traffic light LED is working fine especially for the looping process. The looping process will light up the traffic light LED from one junction to the other junction. In this case, we have 4 junction, so the traffic light LED will start functioning at Junction

1 until Junction 4 and will continue looping as there are no any input source from sound sensor. Once the sound sensor detected the emergency vehicle, it will manage the traffic light LED to function due to the condition and situation. For example we can see that if sound sensor 4 at junction 4 detect the emergency vehicle. It will triggered the ‘walk cycle 4’ and start to manage the looping traffic light LED that in progress to start give a warning to traffic user by light up the yellow LED while the red LED is in its state for the traffic user that recently stopped at a junction and it also will immediately switch the green LED to yellow LED then to red LED for the traffic user that is under the traffic light looping process. Once it the traffic light clear, it will start to triggered the green LED to be function for the junction 4 which is contain the emergency vehicle and after a few moment it will light up red LED and continue the looping process normally. If the looping process was stopped at the Junction 1 and it give Junction 4 a priority to function, then it will continue to start looping process at Junction 2 as soon as Junction 4 stop function.

After the numbers of test that have been done, we had recorded the data after every test. So, for the data that we recorded we can get the response that we want for our project. There were three tests that have been done in our simulations which one of them is a test to monitor the sound sensor functionality.

In the test 1, 2 and 3 all the components that were used and run a test to see if they worked and each of the components worked as we wanted. In this test where we have test the Sound sensor and it function normally but it cannot manage the traffic light LED to be function for matching to the input source of Sound sensor. It only light up the LED randomly. Next for the traffic light LED, it function normally for the looping process but it will get confused and not perfectly function once it receive the input source from sound sensor.

For the recovery of the error during the simulation, we have re built the coding and making sure that the coding is working fine without any error, input and output issues or lag during simulation. We also make sure the simulator clean before running our project simulation.

### 3.3 Tables

The result can be see through the Functionality of the components traffic light junction due to the condition and situation as shown in Table 1.

**Table 1: Functionality of the components traffic light junction due to the condition and situation**

<b>Component</b>	<b>Condition</b>	<b>Junction</b>	<b>Success</b>
Sound Sensor 1	ON	Junction 1	Yes
Sound Sensor 2	ON	Junction 2	Yes
Sound Sensor 3	ON	Junction 3	Yes
Sound Sensor 4	ON	Junction 4	Yes
All Blue LED	ON		
All Green LED	ON		
All Yellow LED	ON		
All Red LED	ON		

In this table, all the LED is working fine. We also observe that the looping of the traffic light operation will change immediately based on the input that receive. In this case the walk cycle of each junction is working perfectly as soon it receive the input sensor. At the end, traffic light will continue looping as soon as the walk cycle have ended.

The simulation circuit of the Traffic Notification need to be refresh before running the simulation. This is because when the simulation run without a clean simulation, it will cause the simulation will run

not really smooth. So we need the fresh setup before running the simulation. The simulation and prototype shown in the Figure 4 and Figure 5.

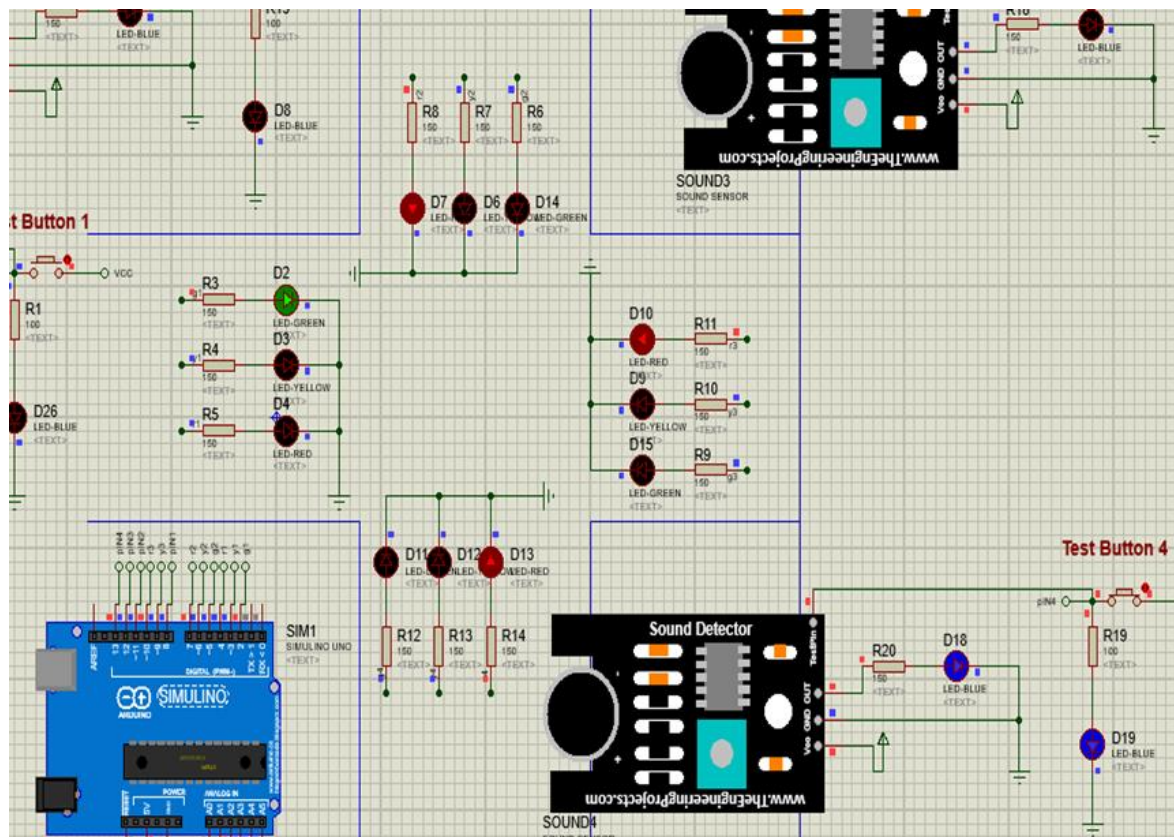


Figure 4: Simulation

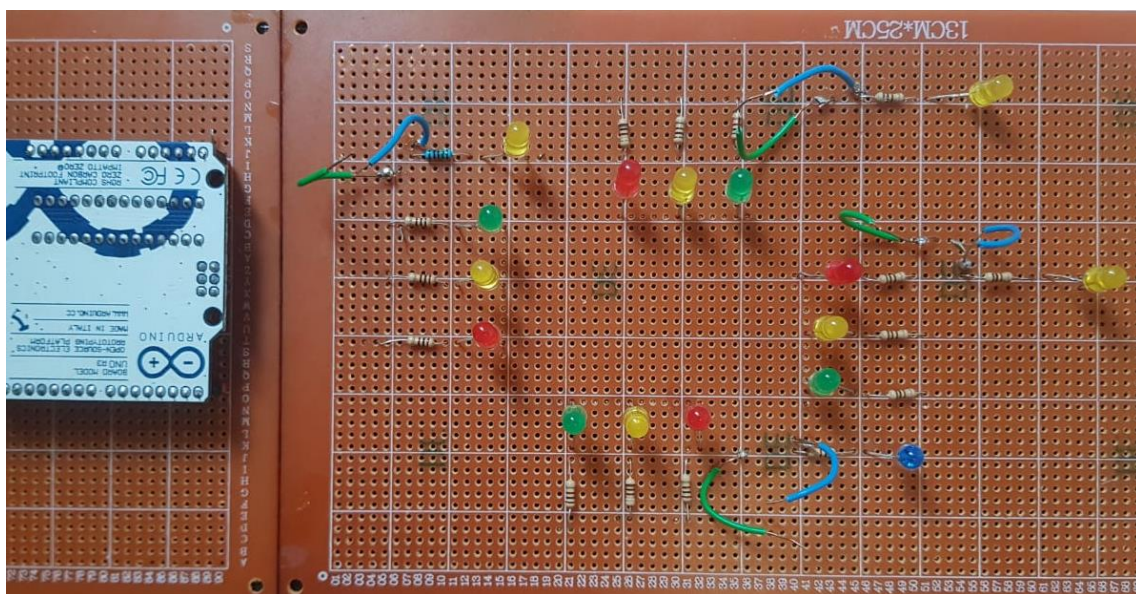


Figure 5: Project Prototype

This study has designed the circuit and run the simulation using the Proteus software. We are using some parts of component in our product which consist of Arduino Uno, LED, resistor, Push button and Sound sensor.

#### 4. Conclusion

As a conclusion, this study found that the result is determined by the objective. We know that if the result is fail, automatically the objective was not achieved. By default, this study also need to try and troubleshoot the error until the simulation give a good result in real time so we can relate the result with the objective where we can see what we will achieve. Next, this study also know how to collect data and analysis the project based on how many the simulation that we have done. Every simulation is need to be insert into a table of data so it clearly help analysis the project simulation.

#### Acknowledgement

The authors would like to thank the Faculty of Engineering Technology, Universiti Tun Hussein Onn Malaysia for its support.

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