

Traffic Management Using Barricade System And Vehicle Speed Detection

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Abstract- Traffic light is the basic element of control flow of vehicles. Major reason for the accidents is violation of traffic signal rules. The drivers sometimes will not follow traffic signals while travelling on the road. This may lead to road rage. Implementation of the barricade system solves this problem by restricting the vehicles from jumping the signal and violating the traffic signal rules. The speed of the vehicle is detected. Message regarding the high speed is sent to the traffic police. The proposed system also allows the emergency vehicles like ambulance to move easily through the traffic using the RFID concept.

Keywords- Barricade system, RFID, Speed detection, Traffic management.

I. INTRODUCTION

Traffic refers to the movement of the vehicles between the other vehicles. Traffic may slow down the movement of the traffic stream, this results in some congestion. There is always a problem of traffic jams in metropolitan cities. The prime cause of traffic jams and road accidents are mainly due of the violation of the traffic signals and careless driving by the driver. It is very essential to keep a check on this. Practically, it is also difficult for the traffic police to control all the vehicles and prevent vehicles from jumping the traffic signal.

The proposed system retrieves and models the mechanism based on IoT applications. Vehicles can sometimes pose threat to the pedestrians. Channeling the vehicle in the road is important. The barricade system is installed to reduce violation of the traffic signal by vehicle and to manage the traffic. Speed of the vehicle is the most important risk factor for road traffic and accidents. It is also important to allow the emergency vehicle like the ambulance to pass through the traffic without causing much delay.

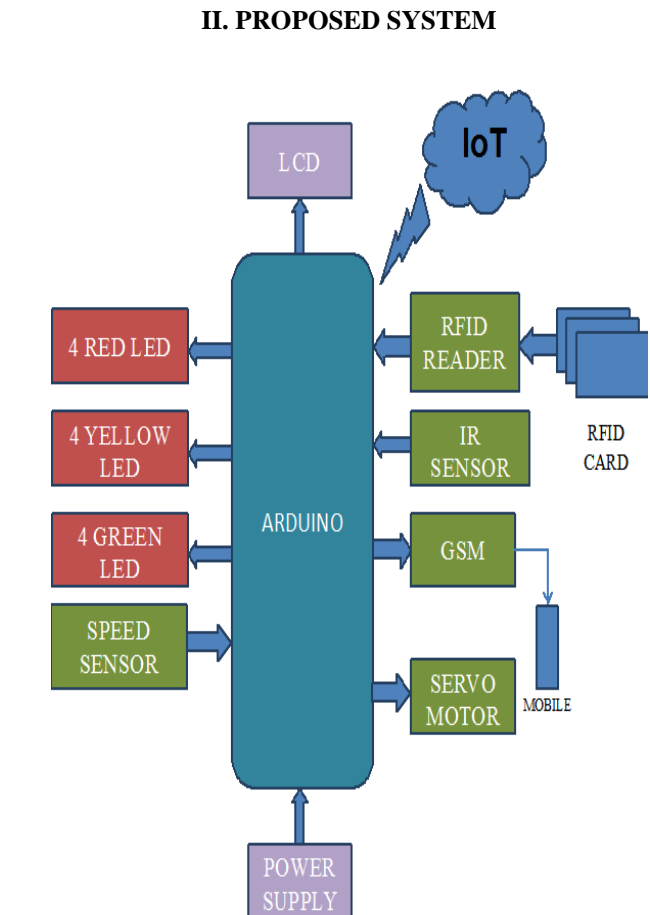


Figure 1. Architecture of the proposed system

The proposed system that is developed consists of Arduino mega microcontroller, IR sensor, speed sensor, servo motor, DC motor, LED's (red, yellow and green), GSM, RFID card and RFID reader, power supply, LCD, Wi-fi (ESP8266 module). This project is implemented by placing the barricades and LED's at the 4-way junction. Here, a small model is designed. So red, green and yellow LED's are used to depict the traffic signals. The real time setting is used for the traffic signal controller. So, whenever a road sequence starts it will primarily be opened for a specified time period.

The barricades are placed near the traffic signals of the respective roads to provide road safety. In the proposed

system the barricades will move down on the commencement of red signal. This restricts the driver from driving in high speed to cross the road even when there is red signal issued at that road. This will help in reducing accidents. The barricade rises up on the commencement of the green signal so that the vehicle can move. IR sensor is used to detect if the vehicle on the road. Status of the roads during the signals are displayed on the LCD.

Speed is one of the traffic rules that is commonly violated by the driver. Over-speeding is one of the factors for the road rage. The speed of the vehicles is detected using the speed sensor. In this scenario, the proposed system detects the vehicles that are violating the speed norms on the roads. Message regarding the high speed will be sent to the traffic police. The proposed system also provides convenience to the ambulance to pass through the traffic with less delay and attend the emergency case using RFID concepts.

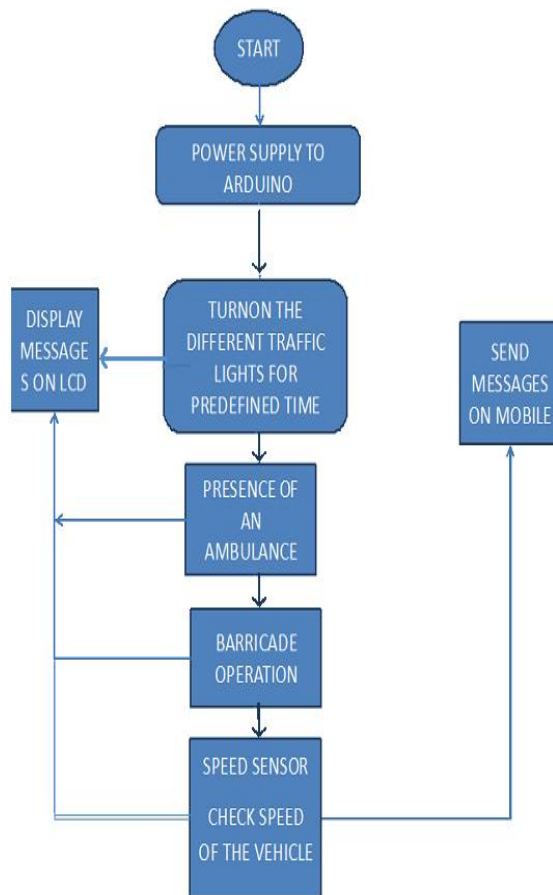


Figure 2. Block diagram of the proposed system

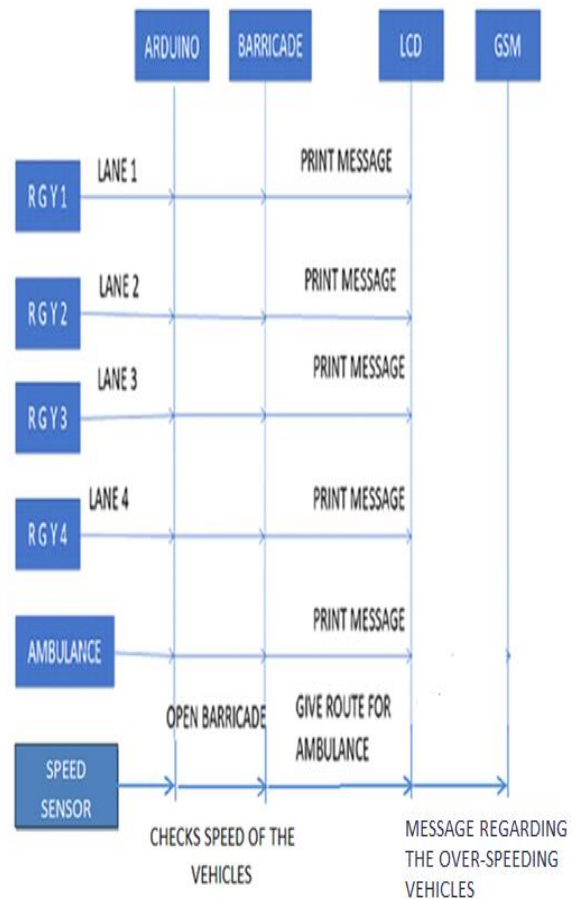


Figure 3. Sequence diagram of the proposed system

III. IMPLEMENTATION

A. Barricades module

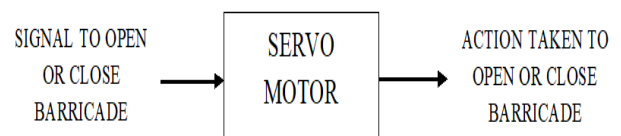


Figure 4. Block diagram of barricades module

The barricades are installed near the traffic signals of each roads (near the junction). The servo motors are implemented to demonstrate the barricades. The mechanism involved in the working of the servo motor is used to move the barricades up and down to according to the traffic signals at the respective roads. The barricades rise up when there is green signal and moves down when there is red signal. During the red signal for a particular road, the vehicle in that road are restricted to move through the signal as the barricades will be closed. When there is a green signal for a particular road, the other road will have red signal. The green signal first appears

at road 1 and the barricades rises up. The green signal exists at road 1 for a specific time period that is set for the road. After completing the specified specific time period, the green signal commences at the road 2. Now, the green signal exists at road 2 for a specific time period and then moves to road 3. At road 3 the same mechanism occurs and then the green signal occurs at road 4. The green signal at the road 4 exists again for a specific time period and then moves to road 1. This mechanism occurs as a cycle. The cycle is repeated to perform the barricade operations at each road constantly.

B. Speed detection module

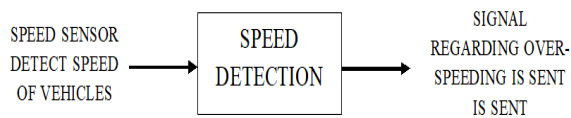


Figure 5. Block diagram of speed detection module

The IR sensor detects whether the vehicle is present on the road. If the vehicle is detected then, to ensure the further safety a module is implemented in order to detect the speed of the vehicle. The speed of the vehicle is detected using speed sensor. The threshold speed is set. It indicates the maximum speed that the vehicle should travel with on the road. If the speed of the vehicle is lesser than the threshold speed, then the speed of the vehicle is considered as normal speed. If the speed of the vehicle is greater than the threshold speed, it is considered as high speed. The information from the speed sensor is collected and given to the system for further process. Here, DC motor is used to represent the vehicle.

C. Message sending module

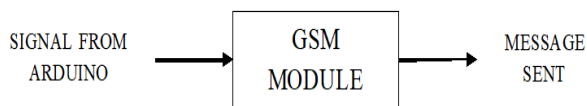


Figure 6. Block diagram of message sending module

The information collected from the speed sensors acts as an input and triggers the further process. A message regarding the high speed is sent to the traffic police. Message is sent using the GSM module. Wi-fi (ESP8266 module) provides the internet connectivity. A sim card is inserted in the GSM so that it there is a provision to send the message.

D. RFID module

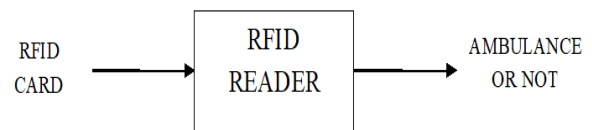


Figure 7. Block diagram of RFID module

A situation may arise wherein an ambulance has to attend an emergency case. RFID card is implemented in the ambulance. The RFID reader placed near the signal detects the RFID card in the ambulance as it arrives near the junction a road. The information present in both RFID card and RFID reader are checked. If they match, then the traffic signal for that road is made green if the they are red and allow the ambulance to pass easily. If there is green signal at road 2 and if the ambulance arrives at road 1, then the red signal in the road 1 is turned to green for a specific period of time so that the ambulance moves. At other roads, red signal is issued. After the completion of the time period, the operation of barricades resumes. The green signal commences at road 3 and the normal working of barricades continues in cycle. The same mechanism is applied when the ambulance arrives at other roads that have red signal. If there is green signal at road 2 and the ambulance arrives at road 2, then the operation of the barricades remains normal. The same mechanism is applied when the ambulance arrives at other roads that have green signal. If more than one ambulance is detected, then the ambulance that is detected first will be served first

1) Working of RFID

Automatic Identification and Data Capture (AIDC) strategies consequently recognize the objects, gather the information about them and enter them into computer framework without any human involvement. Radio Frequency Identification (RFID) is based on AIDC. Radio waves is used in this process. RFID framework comprises of RFID tag, RFID reader and an antenna. RFID reader is also called as the interrogator. The integrated circuit and an antenna are present in the RFID tag. They are used in the propagation of the information to the RFID reader. The interrogator emits an encoded radio signal. This signal is received by the RFID tag. In response to the interrogator, the RFID tag reacts by sending its identification number with the other data. RFID reader receives the information. The information that is fetched from the RFID tags is given to the computing system. The information that is fetched can then be used for further purpose.[8]

IV. RESULTS

The results of the hardware implementation are shown below:

A. Setup of the proposed system

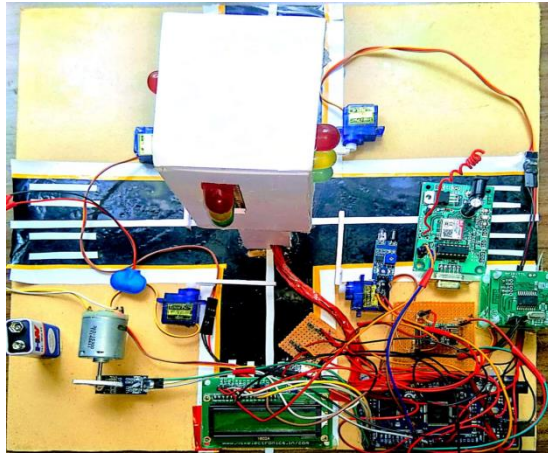


Figure 8. Setup of the proposed system

Figure 11 shows the hardware setup of the proposed system.

B. Setup of traffic signals and barricades

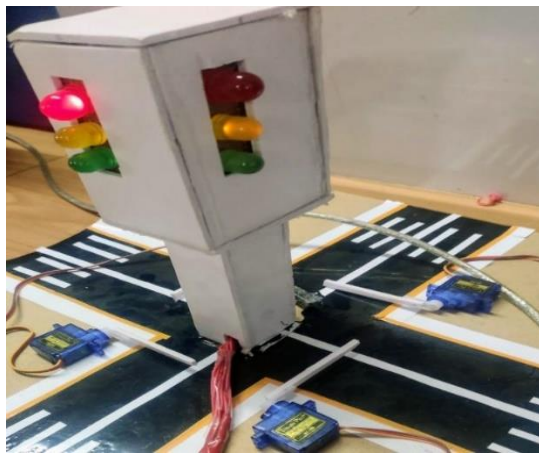


Figure 9. Setup of traffic signals and barricades

Figure 12 shows the setup of traffic signals and the roads with the barricades that are implemented at the junction of the roads.

C. Operation of barricades

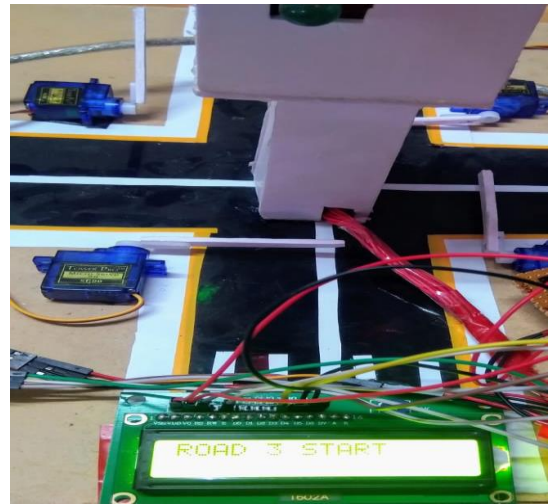


Figure 10. Operation of barricade

Figure 13 shows that the barricade rises up on the commencement of green signal at the road 3 and a corresponding message displayed on the LCD. At this time, the other roads have red signal. So, the barricades are closed. It works similarly as the green signal commences at other roads.

D. Demonstration of IR sensor and speed sensor

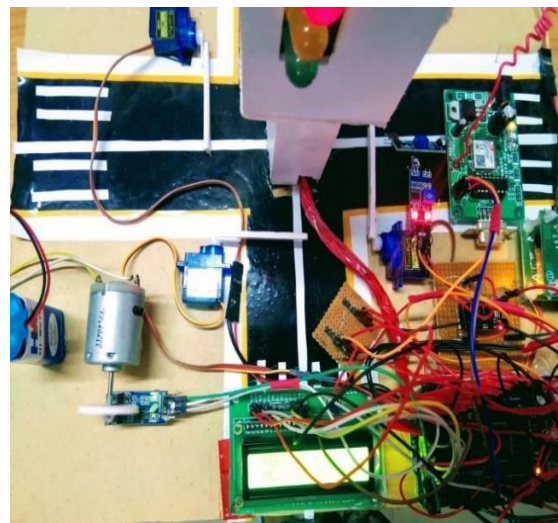


Figure 11. Demonstration of IR sensor and speed sensor

Figure 14 shows the demonstration of IR sensor and speed sensor. IR sensor checks if the vehicle is present on the road. If the vehicle is present, then the speed of the vehicle is derived using the speed sensor.

V. CONCLUSION

The improvement of traffic condition is largely dependent on the modern ways of traffic management and control. The proposed system contributes to the improvement

of the urban traffic problems. Implementation of the system reduces the chances of accidents. The barricades in the system restrict the drivers from jumping the signal. Thus, prevents the head on collision with the other vehicles or the pedestrians on the road. By using this proposed system, the possibility of the traffic jams caused can be reduced considerably. This system includes a speed detection module that keeps track on the speed of the vehicle and message sending module is implemented to send message. The proposed system provides convenience to the ambulance to pass through the traffic easily. In future, the features of speed detection module can be enhanced and large number of vehicles can be handled.

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