

Sound Sensors to Control Traffic System for Emergency Vehicles

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Abstract

Traffic congestion is the biggest problem faced by densely populated cities. This work mainly aims on providing solution for the problem faced by ambulances which are moving towards the traffic signal during high density traffic. This is implemented by detecting the frequency of the ambulance heading towards the traffic signal by using the sound sensors and monitoring the ambulance to pass the respective traffic lane using Xbee protocol. This module is also advantageous on high priority vehicles such as fire disaster prevention vehicles, VIP vehicles and Police Jeeps which are heading towards high density traffic signals.

Keywords: Traffic congestion, Ambulance, Sound sensors, Xbee.

Introduction

The number of vehicles used by the people is constantly increasing due to rapid growth in population leading to high density traffic which increases the waiting time of vehicles. Emergency vehicles such as ambulances, fire disaster prevention vehicles, VIP cars are required to reach their destination as quickly as possible. The main constraint is time which is been consumed by the vehicles high density traffic signal. This method focuses on providing smart way of controlling the traffic when ambulances are arriving towards the signal. This work is carried on Arduino UNO platform along with two sound sensors that detects the frequency of the incoming ambulance i.e., Frequency of around 700Hz-900Hz. The sensors detect the threshold value of sound in decibels. Once the frequency exceeds the threshold value, indicates that the ambulance is detected and the respective lane is made green providing the necessary delay for the ambulance to pass the lane completely.

Literature References

The system specifies the design of a secure and well organized traffic flow, to assign the proper way by minimizing the lagging interval at road. The traffic jam is reduced by making the signal green for more duration for the lane with more number of vehicles and reducing the red signal duration in non busy road. IR sensors were placed on the road

that detects the length of the vehicles and decides the duration of the signal. The car drivers are provided with the necessary data about the congestion and the alternate path to be taken by using his mobile phone with the help of GSM[1]. PIC microcontroller controls the different operations, notices a traffic volume and density flow through IR sensors and alters the transition of light slot. IR radiation emitted by the LED travel towards photodiode, accordingly due to the magnitude of the emitted light the output voltage varies[2]. The module is implemented by assigning the highest priority to the ambulance then to priority vehicles and lastly to control the traffic density. RFID is a use of A wireless non-contact system such as RFID uses radio frequency, electro-magnetic fields to transfer data. This is done by attaching RF transmitter to ambulance which provides automatic recognition and tracking. IR transmitter and receiver are used for normal and priority vehicle control [3]. When the traffic arises, the photoelectric sensors get activated and notice the sensed signal in the central control system and monitor the respective traffic signal. During the emergency issues, it uses a RFID Technology to pave a way for the vehicles such as ambulances.[4]. A concept of dynamic traffic light is introduced to control the time interval of Red and Green light accordingly by sensing the traffic flow. A GPS appliance is installed instead of placing GPS on each pole which will monitor entire area and sends the details of the traffic. To monitor the traffic behaviour a data center is established [5]

Proposed Work

This work is implemented by using the following four cases for providing the solution for an ambulance heading towards the traffic signal for two ways. The state 0 indicates an ambulance is not detected and 1 indicates an ambulance being detected in which sensor 1 is placed at a distance range of 100mts away from the traffic signal and sensor2 near the traffic lights.

Table 1: following four cases for providing the solution for an ambulance heading towards the traffic signal for two ways.

Sensor-1 State	Sensor-2 State	Operation
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0	0	No ambulance detected then normal traffic operation continues.
1	0	Ambulance is detected at sensor1, make the signal green for 120s.
0	1	Ambulance is detected at sensor2, continue the lane to be green for 2s.
1	1	Ambulance is detected at both sensor1 and sensor2.



Fig:1

1Implementation

This method uses two sound sensors to detect the frequency of the ambulance heading towards the traffic signal. The sound sensor1 is connected to Arduino uno1 and sensor2 is connected to Arduino uno2. The connection between sensor1 and sensor2 is done using wireless Xbee protocol. The first sensor is placed at a distance range of 100mts away from the traffic lights and the second sensor is placed at the traffic signal. When there is no ambulance detected at both the sensors, normal traffic operation continues. When the ambulance is detected at sensor1, the respective lane in which it is travelling is made green for duration of 120s for the ambulance to reach sensor2 position which is placed at traffic lights and the remaining lanes are made red. When an

ambulance is detected at sensor2, the green signal of the respective lane continues along with an extra 2secs delay for the ambulance to pass the corresponding lane completely. When an ambulance is detected at sensor1 and if another ambulance is detected at sensor 2 at the same time, the respective lane in which the ambulance is travelling is made green and is provided with a delay of 2s plus an extra 120s for the ambulance to move forward in the corresponding lane and get detected at sensor2 near traffic light by continuing green signal of the lane in which it is moving for another 2s so that both the ambulances are made to pass the signal completely. Then the normal traffic operation continues.

Pin Diagram

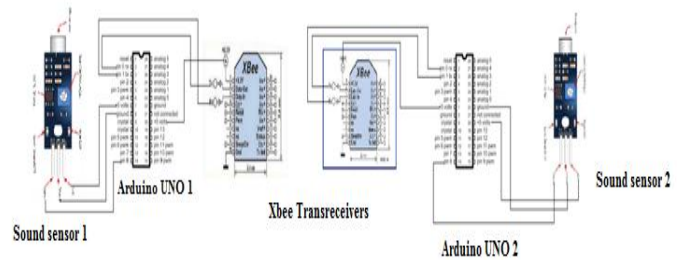


Fig. 2: two sound sensors are connected to Arduino 1 and Arduino 2 respectively.

In fig.2 , two sound sensors are connected to Arduino 1 and Arduino 2 respectively. Each sound sensors are having 3 pins namely Vcc connected to 5V supply of Arduino, ground connected to ground terminal of Arduino board and O/p connected to pin number 3 and 4 of Arduino1 board and Arduino2 board respectively. Arduino1 and Arduino2 are connected to Xbee transceivers with the Tx and Rx terminal of Xbee being connected to pin number 1 and 0 respectively. 3.3V supply of Xbee is given to 5V supply and ground terminal is connected to ground terminal of Arduino board.

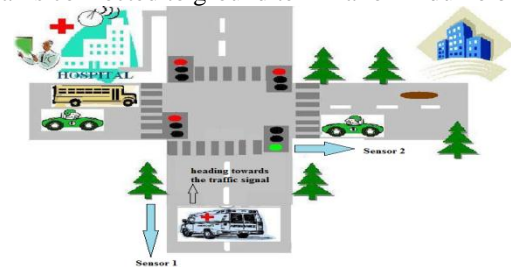


Fig. 3

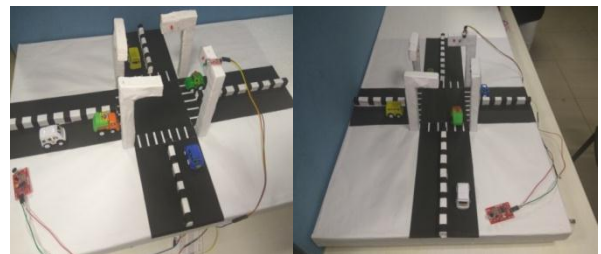


Fig. 4

Conclusion

In this work, we are providing solution for existing problem of an ambulance stuck in traffic by employing 2 sound sensors

and Xbee communication protocol. This solution will completely eliminate the waiting time of an ambulance stuck in high density traffic. The proposed solution can be expanded for many lanes of traffic.

References

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