National conference on Engineering Innovations and Solutions (NCEIS – 2018)
International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2018 IJSRCSEIT | Volume 4 | Issue 6 | ISSN : 2456-3307

Density Based Traffic Control with Emergency Override

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ABSTRACT

The human population in cities is increasing day by day and therefore number of vehicles is increasing exponentially. Traffic control signals have been playing significant role in managing traffic flow in cities. But the conventional traffic control signals fails in time management. It allocates equal time slots to each road irrespective of the traffic density. This creates unnecessary waiting for drivers, which is not possible every time.

Therefore, we propose density based traffic control system, which allocates different time slots to each road according to vehicle density. The vehicle density is measured in three zones low, medium and high. The traffic density in each lane is measured using IR sensors. Accordingly the traffic signal lights give the green light based on the vehicle density.

This system also comes with RF signal override control in case of emergency vehicles such as fire brigade and ambulance. The RF transmitter and a GPS module are placed in the emergency vehicle. Whenever the override feature is activated, the green light is given in the desired lane for some time by blocking all the other lanes by giving them red light. So this is also a priority based system. This system, therefore, offers advantages over conventional traffic control system.

Keywords. Density based traffic, IR sensors, RF transmitter and receiver.

I. INTRODUCTION

Traffic congestion is one of the major problems of urban life. This problem is increasing day by day because of the increasing number of vehicles with limited infrastructural development. One of the oldest ways was to have a traffic police to control the traffic manually through hand signaling. But as this became quite grueling, the conventional traffic light systems were developed to control traffic. But if a lane has more traffic congestion than the others, the existing system fails to control traffic. To solve this problem, a real time traffic control system is needed which will control the traffic.

This paper proposes a real time area based traffic density estimation method which will help an intelligent traffic control system to avoid wastage of time. The proposed system controls traffic lights according to traffic density. Also the project aims to provide signal override for emergency vehicles through RF communication.

II. LITERATURE REVIEW

The traffic density accurately because its range is less about 20m.

Automatic vehicle identification is basically an independent identification technique used with moving objects such as vehicles. This is implemented

using Radio frequency identification (RFID) as the object passes a RFID reader [3].

The major disadvantage in these systems is high implementation and maintenance cost.

III. OVERVIEW

Each lane is divided into three zone low, medium and high. IR sensors are fixed one in each zone as shown in Fig 1. The IR system gets activated whenever any vehicle passes on the road between the IR transmitter and IR receiver. If any one of the lane is blocked with a huge number of vehicles, then this system changes the signal timings automatically and thus avoids unnecessary waiting time at the junction.

Several researches have been made to collect the traffic data in real time to determine the nature of traffic. Some of them employ image processing technique [4] to estimate the traffic density of a road. But this method does not give Whenever there is an emergency, RF signal override is operated. So an interrupt is sensed and so the normal operation is halted for a few seconds. Then the normal operation is resumed.

There are three different modes of operation at any traffic junction. They are,

Normal mode.here the traffic signal lights change according to fixed time period just like a conventional traffic signals. This mode of operation can take place when the density in all the lanes is nearly same.

Density mode.this mode of operation controls the traffic signals according to the density of vehicles. This can happen when the density of vehicles in different lanes is not same.

Override mode.here the priority is given to the emergency vehicles by overriding the traffic signal sequence.

The system uses a pair of Arduino boards. One Arduino board is interfaced with the IR sensors. The second Arduino interfaced with the RF transmitter receiver and GPS module.

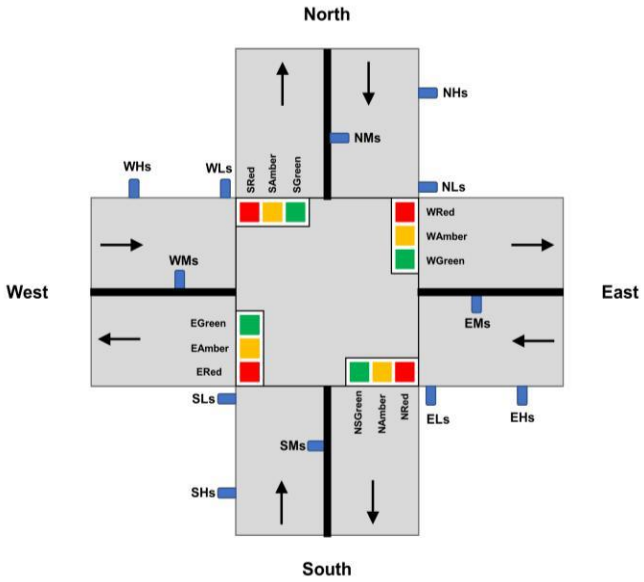

Figure 1. Representation of Traffic Signal Junction

IV. BLOCK DIAGRAM

The IR sensors are used for sensing the density of vehicles. This input is given to the Arduino board which changes the signal lights accordingly. GPS module is used for tracking the location of the emergency vehicle. The RF transmitter is used to transmit this information to RF receiver. The RF receiver, IR sensors and traffic signal lights are interfaced with the Arduino Mega as shown in Fig 2.

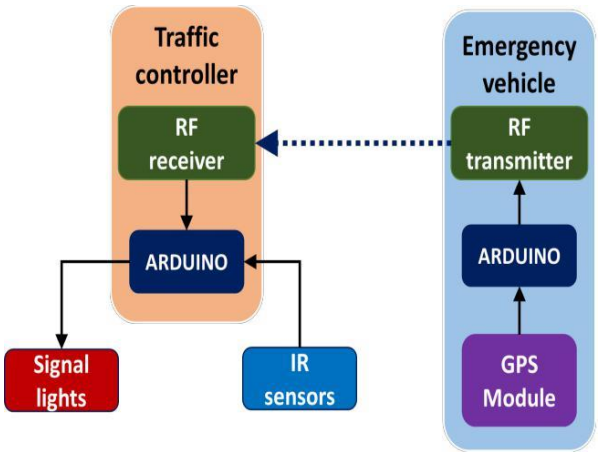

Figure 2. Block Diagram

V. METHODOLOGY

Measurement of traffic density is done by using IR sensors which are interfaced to Arduino board. IR sensors consist of IR transmitter and IR receiver i.e. emitter circuit and the receiver circuit. The emitter is an IR LED and the detector is an IR photodiode. The IR photodiode is sensitive to the IR light emitted by an IR LED.

The photodiode receives the radiation emitted by the IR LED once reflected back by the vehicle. Closer the vehicle, higher will be the intensity of the incident radiation on the photodiode. Thus we can determine whether the traffic density is low, medium or high.

Pre-defined time intervals are assigned to the signals. The green signal in the lane turns on only when the low sensor is activated irrespective of the medium and high sensors. If only the medium sensor or only the high sensor is activated and the low sensor is not activated, green signal for that lane is not given. So the operation skips to the next lane. This avoids unnecessary waiting by the traffic on the next road. If all the three sensors are activated then maximum time interval is assigned to this lane. No extra time is given to the road under consideration.

The emergency override is done with the use of RF transmitter receiver and GPS module. They are interfaced with another Arduino board in the emergency vehicle. Whenever the override signal is operated, the RF transmitter transmits the signal in all directions. The RF receiver which has the same crystal frequency as that of transmitter receives the signal. Here a crystal frequency of 433MHz is used. The receiver receives the information about the location of the vehicle. The coordinates of the vehicle and the direction in which the vehicle is

approaching is sent through the transmitter.

Whenever the override signal occurs the normal operation of the signals is halted (irrespective of the traffic density in other lanes), green signal is provided to that lane for a few seconds. Then the normal operation is resumed. i.e. after clearing the emergency the traffic signals are restored.

Using GPS module, coordinates of the emergency vehicle can be known. Using the latitude and longitude, the direction in which the vehicle is approaching can be accurately known.

The above method is quite advantageous because it helps in reducing the number of accidents and it is fully automatic.

The highest priority is given to the emergency mode of operation. The next priority is given to the density mode of operation. The least priority is given to the normal operation.

VI. HARDWARE CONNECTION DIAGRAM

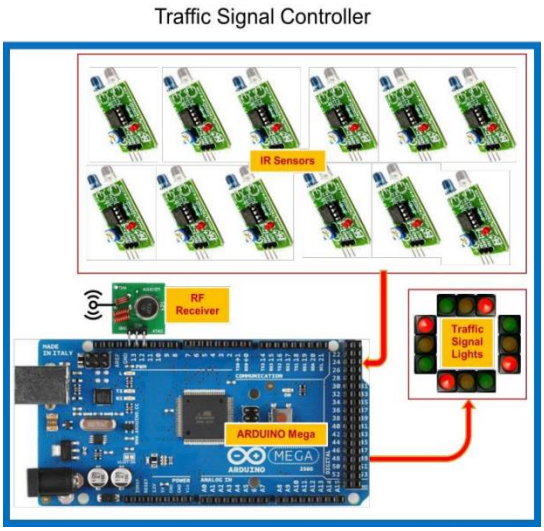

Figure 3. TrafficSignal Controller

Table 1

Components used	Specifications
Arduino Mega 2560	3.3V or 5V
IR sensors	4.5-6V
Traffic signal lights	3V
RF receiver	433MHz

Here three IR sensors are placed in each lane. They are used to measure the density of traffic. The low, medium and high sensors are separated from each other at certain

distance. The IR sensors and the traffic signal lights are interfaced to Arduino Mega 2560. The IR sensors which are used to sense the traffic act as input to the Arduino board. The traffic signal lights act as output controlled using Arduino Mega 2560.

Whenever there is normal mode of operation the IR sensors sense the traffic density and the traffic signal lights change according to pre defined time intervals. When there is density mode of operation the IR sensors sense the traffic density and change the traffic signals based on whether the density in the lanes is low, medium or high.

The GPS module SKG13BLRF transmitter is connected to Arduino Nano, are placed inside the emergency vehicle as shown in Fig 4.When there is emergency, the GPS module SKG13BL identifies the location of the emergency vehicle. Based on the values of latitude and longitude values the direction of the approaching vehicle can be accurately determined.

This data is sent by the RF transmitter to RF receiver .This data is received by the RF receiver is given to Arduino Mega as shown in Fig 3.These acts like an interrupt and thus override the traffic signal sequence in that lane. After a few seconds the normal operation is resumed.

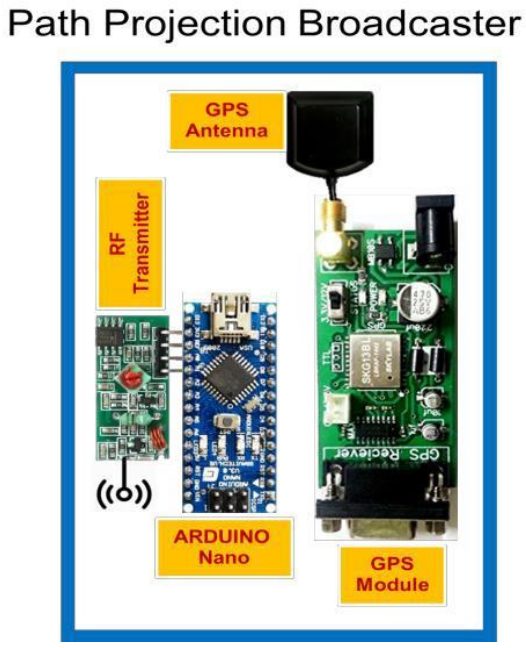

Figure 4. Path Projection Broadcaster

Table 2

Components used	Specifications
Arduino nano	5V
GPS module SKG13BL	3-5V
RF transmitter	433MHz

Based on the values of latitude and longitude the direction of the ambulance can be known.Some of the traffic signals may not be exactly alligned to North,East, South and

West.For North and North-East the direction is considered as North. For East and South-East the direction is considered as East.For South and South-West the direction is considered as South. For West and North-West the direction is considered as South. Fig 5 shows the directions considered.

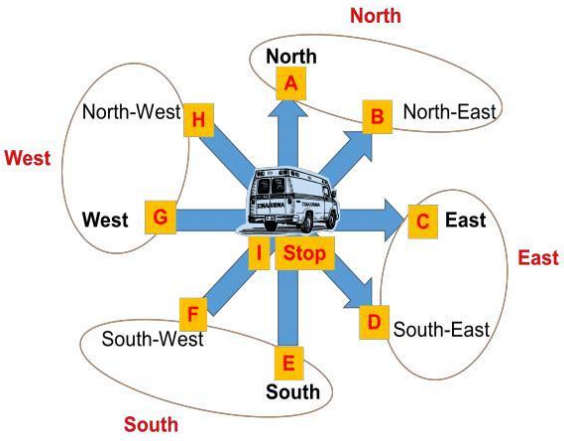

Figure 5. Direction Consideration

Sensors

Digital Input Pin	Assigned for
D22	NLs
D24	NMs
D26	NHs
D28	ELs
D30	EMs
D32	EHs
D34	WLs
D36	WMs
D38	WHs
D40	SLs
D42	SMs
D44	SHs

Figure 6 . Pins used for connectiong IR Sensors to Arduino Mega

Fig 6 shows the pins which are used for connecting Arduino Mega to the low sensors, medium sensors and high sensors present in North, East, West, South directions.

Fig 7 shows the pins used for connecting the traffic signal lights to Arduino Mega.

LEDs

Digital Output Pin	Assigned for
D23	NRed
D25	NAmber
D27	NGreen
D29	ERed
D31	EAmber
D33	EGreen
D35	WRed
D37	WAmber
D39	WGreen
D41	SRed
D43	SAmber
D45	SGreen

Figure 7. Pins used for connectiong traffic lights to Arduino Mega

RF Receiver

Pin	Assigned for
D10	RF_RX (INT4)
D9	RF_TX
D2	RF_EN

Figure 8. Pins used for connecting RF Receiver to Arduino Mega

RF Transmitter

Pin	Assigned for
5V	VCC
GND	GND
D12	DATA

Figure 9. Pins used for connecting RF transmitter to Arduino Nano

Figure 8 shows the pins used for connecting the RF receiver to Arduino Mega.
Figure 9 shows the pins used for connecting the RF transmitter to Arduino Nano.

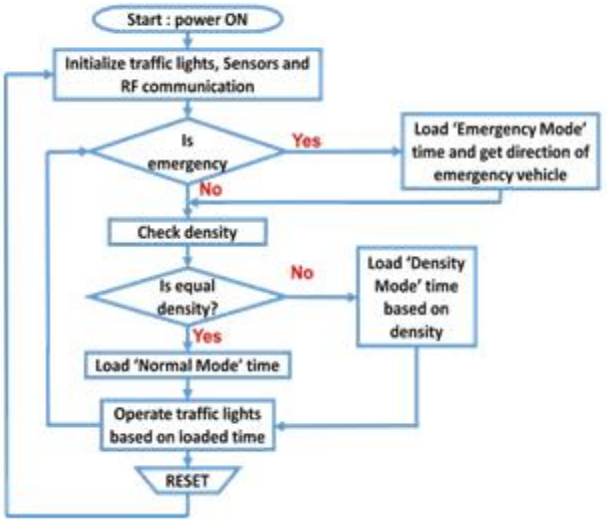

Figure 10. Flowchart of operation

The power supply is switched on. The traffic signal lights, IR sensors and RF communication are initialized. If there is an emergency, direction of the approaching vehicle is found and the emergency mode program is loaded. Check for emergency. If there is no emergency then the density of the vehicles is checked with the help of IR sensors. If the density in all the lanes is same, then the normal mode program is loaded and signals operate on loaded time. If the density is not same, then the density mode program is loaded and signals operate accordingly. Then program checks if there is an emergency and the loop continues. If the reset button is pressed, then the traffic lights, IR sensors and RF communication are initialized. The loop continues. This is depicted in the flow chart.

Fig 10 shows the flowchart of operation, and Fig 11 shows the hardware model.

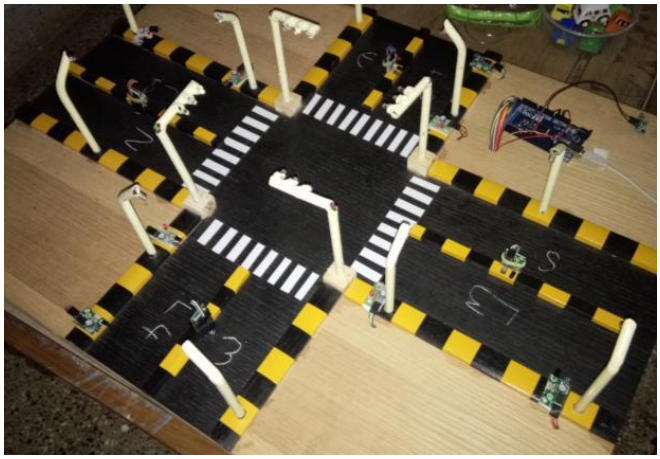

Figure 11. Hardware model

VII. CONCLUSION

The proposed system has many advantages compared to the existing one. The above system is time efficient ieavoiding unnecessary waiting at traffic signal junction by using density based controlling.

By introducing the above system, traffic jams can be avoided. So the traffic flows uninterruptedly and everyone will reach their destination in time. So time can be saved instead of wasting for waiting at junctions.

The priority is given to the emergency vehicles like ambulance and fire fighters which need urgent attention. So, human life is saved.

In future, this system can be extended to implement the authentication of emergency vehicles. Based on

the arrival and departure of emergency vehicle, optimization of traffic signals can be done.

VIII. REFERENCES

[1] Mr.Prathmesh Nikam, Mr.RohitPatil "DENSITY BASED TRAFFIC CONTROL SIGNAL WITH EMERGENCY OVERRIDE" International Journal of Electrical and Electronics Research ISSN 2348-6988 (online) Vol. 4, Issue 3, pp.(24-27), Month.July - September 2016

[2] Ranjan Sharma, Gaurav Kumar, AbhayNaik, ArjunPatil and D Jayadevappa "Density Based Traffic Control Signal with Emergency override"Int. Conf. on Signal, Image Processing Communication & Automation, ICSIPCA

[3] KoushikMandal,ArindamSen,Abhijnan Chakraborty, Siuli Roy, Suvadip Batabyal, Somprakash Bandyopadhyay "Road Traffic Congestion Monitoring and Measurement using Active RFID and GSM Technology" International IEEE Conference on Intelligent Transportation Systems Washington, DC, USA.October 5-7, 2011

[4] Mohammad Shahab Uddin Ayon, Kumar Das , Md Abu Taleb " Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System. Bangladesh Perspective" 2nd Int'l Conf. on Electrical Engineering and Information & Communication Technology (ICEEICT) 2015, 21-23 May 2015