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# Smart Traffic Monitoring and Signalling System

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***Abstract:*** Nowadays traffic congestion is a severe problem in many major cities across the world. The traffic congestion can likewise be brought about by expansive red light deferrals and so on. Ordinary activity light framework depends on settled time idea allocated to each side of the junction which can't be changed according to differing traffic density. Junction timings allocated are fixed. In some cases higher traffic density at one side of the junction requests longer green time when contrasted with standard assigned time. This system is intended to build up an automatic density based traffic system. The signal timing changes naturally on detecting the vehicle density at the junction. The project contains IR transmitter and IR receiver which are mounted on either side of roads separately. Based on the vehicles density, the arduino takes decision and updates the activity lights delays therefore.Thus based on vehicles density, arduino defines different ranges for traffic light delays and updates those accordingly. In this way from the recorded information, the arduino through a correspondence medium will send adjust motion into the LED lights.

***Keywords:*** *Traffic control, Arduino, IR Transmitter, IR Receiver, Displays*

## I. INTRODUCTION

In current life we need to confront with numerous issues one of which is traffic congestion ending up noticeably more genuine for quite a while. It is said that the high volume of vehicles, the insufficient foundation and the unreasonable conveyance of the advancement are principle purposes behind expanding congested road. The significant make driving traffic jam is the high number of vehicle which was created by the populace and the improvement of economy. Traffic congestion is a condition on street organizes that happens as utilize increments, and is portrayed by slower speeds, longer excursion times, and expanded vehicular lining. The most widely recognized illustration is the physical utilization of streets by vehicles. At the point when activity request is sufficiently extraordinary that the communication between vehicles moderates the speed of the movement stream, these outcomes in some clog [1] [10] [7]. At the point when vehicles are completely ceased for time frames, this is informally known as a congested driving conditions or movement growl up. Congested roads may emerge because of substantial red light defers which are hard corded and is autonomous of activity [2].

The proposed system tries to diminished the congested roads to some degree. We have built up a practical project utilizing Arduino system, IR sensor to accomplish the coveted outcomes. We go for controlling traffic density utilizing IR sensor. The IR system gets actuated at whatever point any vehicle passes on street between IR transmitter and receiver. Arduino controls the IR system and calculates the density of vehicles passing on the road. Based on the different vehicle density, the Arduino takes decision and update the traffic light delays as a result. It will give green signal in high density traffic lane, that same time it shows red signal in opposite lane [3]. Thus the present traffic system which is an open loop system is been converted to a closed loop system. Thus we can overcome the majority of problems at signal junctions in towns and cities. So by routing the traffic in an efficient manner, we can save time and eliminate the traffic congestion problem [6] [5].

Traffic control signals are signalling devices positioned at road intersections, pedestrian crossings, and other locations to control flows of traffic.The world's first, manually operated gas-lit traffic signal was short lived. In olden days, after this gas-lit traffic signal, several other systems are introduced. It used the words "STOP" and "PROCEED", although neither word lit up.Traffic lights alternate the right of way accorded to users by displaying lights of a standard colour (red, amber (yellow), and green) following a universal colour code.The green light allows traffic to proceed in the direction denoted, if it is safe to do so and there is room on the other side of the intersection.The amber (yellow) light warns that the signal is about to change to red.A flashing amber indication is a warning signal.The red signal prohibits any traffic from proceeding.A flashing red indication is treated as a stop sign.In some countries traffic signals will go into a flashing mode if the Conflict Monitor detects a problem, such as a fault that tries to display green lights to conflicting traffic. The signal may display flashing yellow to the main road and flashing red to the side road, or flashing red in all directions. Flashing operation can also be used during times of day when traffic is light, such as late at night[12].

Traffic congestion is a condition on transport networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queueing. The most common example is the physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion.As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is colloquially known as a traffic jam or traffic snarl-up. Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. Thus by introducing this current system can reduces this problem of congestion[13].

In the existing system, it can be seen that current innovations are insufficient to deal with the issues of congestion control, crisis vehicle leeway, stolen vehicles discovery, it is. In this current framework is utilized RFID strategy to dodge the activity thickness. Rundown of the segments utilized as a part of this current framework are zigbee module CC2500, microcontroller, GSM module SIM 300, RFID peruser 125kHz-TTL. [3]

The drawbacks in the current system are 1) PIC microcontroller is used in this existing system, so the server is cannot access in this microcontroller. 2) These systems are very insufficient because they are unable to handle various

simple situations which are occurs through the day. 3) Major drawback is it has unnecessary waiting time and there no facility to handle emergency vehicles. 4) RFID systems are expensive in comparison to normal bar code systems. [3]

## II. PROPOSED SYSTEM

The current system in view of the "time" which is now appointed in the project. As per those "time" the signs are working in every path. Be that as it may, in these system condition is happens as all vehicles in lane(L1) are passed and vehicles in another lane(L2) still in holding up state since time is not over and thus signal is as yet red [8].These frameworks are exceptionally wasteful on the grounds that they can't deal with different straightforward circumstances which are happens for the duration of the day. Significant downside is it has superfluous holding up time. We propose a savvy movement signal controller system. The proposed system tries to limit the conceivable outcomes of car influxes, brought about by the movement lights, to some degree by clearing the street with higher density of vehicles. Through which less number of vehicles in holding up state and can lessen time consuming[3].

The general block diagram of our current project has shown inFig 1.In this project, we used an arduino system and IR sensors which calculates the density of the vehicles when they are waiting when red signal is projected in the display. Required number of sets of IR pairs are been used on either sides of the road at adjacent junctions. For example, we have used six pairs of IR sensors in which two pairs as a set, thus a total of 3 sets in one lane. If it is a four way junction, then it requires 12 sets of IR sensors as a four way junction contains a pair of four lanes.

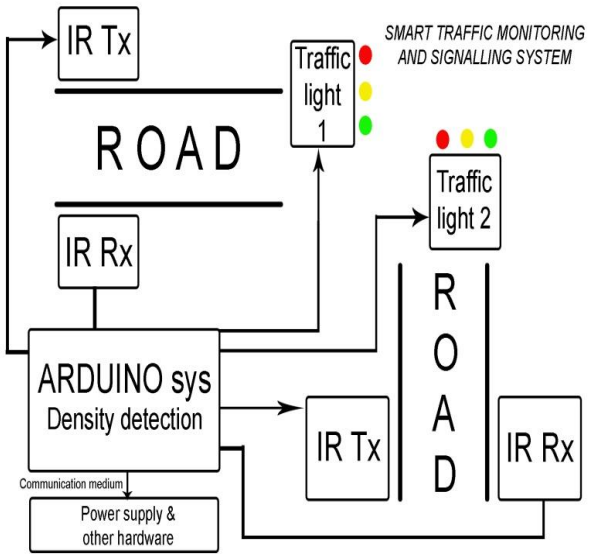



Fig 1: Basic Block Diagram of Smart traffic monitoring and signaling system

## III. ARCHITECTURE AND METHODOLOGY

The general arrangement of the IR sensors has shown in the Fig 2

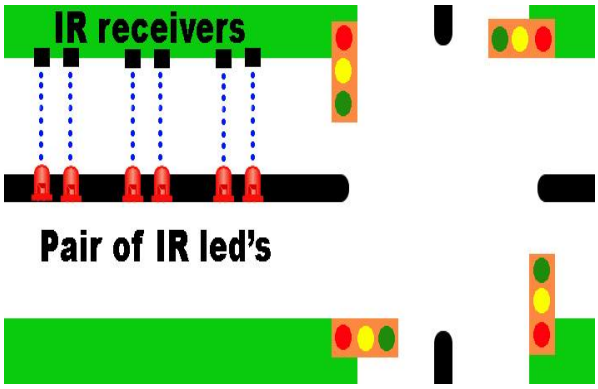



Fig 2: Basic Architecture and arrangement of IR transmitters and receivers

Here a pair of IR led's are considered as a set and thus a total of 3 sets on one lane. We taken a pair of IR transmitters as a set because, there may be a chance of missing a vehicle during the time of red signal. If the vehicle is between the two IR pairs, which means that the IR sensor feels that there is no vehicle at that range, since the vehicle is not in between IR transmitter and the receiver.

In general the shortest length vehicle is a motor cycle or a bicycle which will be of 6 to 7 meters length. Hence as mentioned above that a set contains a pair of transmitters, the distance between them will be maintained at 1.5 meters. So that any vehicle can be in between the path from transmitter to receiver.

There are different zones or parts in the lane. The first one is Zone-A. In Zone-A, which means the area from the signal light to the first IR pair. This is the general zonal area in which an average density of vehicles can wait. In general the time duration of green signal will be of 60 seconds or it may be 100 seconds depending upon the place and city. The Zone-A is the region in which contains an average traffic vehicles density, which can be cleared in that 60 seconds. The distance from the signal light to the first IR pair is maintained at a distance of 30 meters, that means the total distance of Zone-A is 30 meters.

The second one is Zone-B which means the area from the signal light to the area which is covered by first pair of IR transmitters.

The third one is Zone-C which means the area from the signal light to the area which is covered by second pair of IR transmitters.

The last one is Zone-D which means the area from the signal light to the area which is covered by third pair of IR transmitters.

The zonal areas are shown in Fig 3

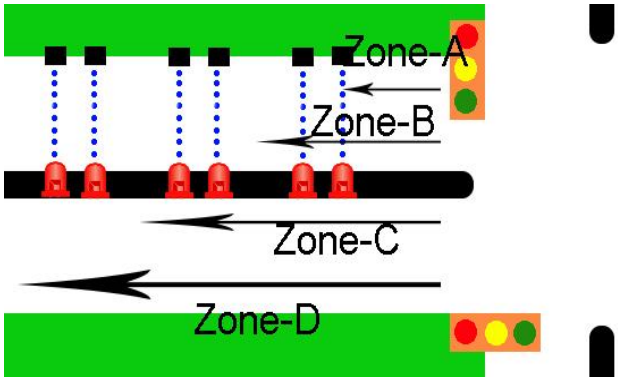



Fig 3: Different Zonal parts in the lane

Each zone is maintained at a distance of 15 or 20 meters in between that means the distance between the IR pairs is 15 to 20 meters. Depending upon the density and by comparing it with other lane's density, the signal lights can be controlled. If the density is up to Zone-A then the time period of the next green signal will be of 60 seconds in one path or road and the same duration that is 60 seconds will be the red signal in the adjacent road. If the density is up to Zone-B the time period of the green signal will be few more seconds, that means an additional of 20 seconds more. Thus similarly if the density is up to Zone-C then the duration will be 100 seconds and for Zone-D, 120 seconds[11].

The priority will be given to the higher zones that means if the first zone has a density up to Zone-B, the present situation is happening during the time of red signal in first lane and the green signal in the second road. Then as per assumption taken above, the first road will have a green signal of 80 seconds duration and the second road will have a red signal of 80 seconds duration.

## IV. IMPROVISATION FOR BETTER DETECTION

There may be a chance that the IR ray path may be in between the two stationary vehicles, which may results that there is no density at that IR sensor region, just like in the Fig 4.

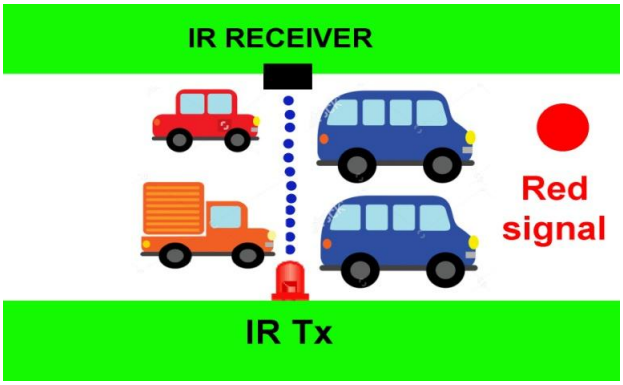
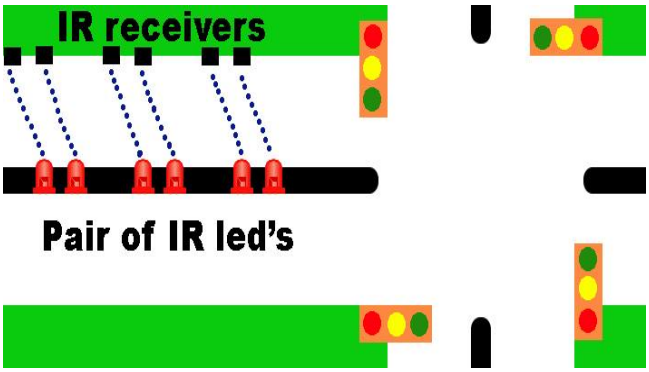



Fig 4: Missed detection

So following two are the methods which are used for better detection. The first on is placing the IR sensor with a slight inclination, which means at an angle and the second one is placing the IR sensor pairs in a cross position.



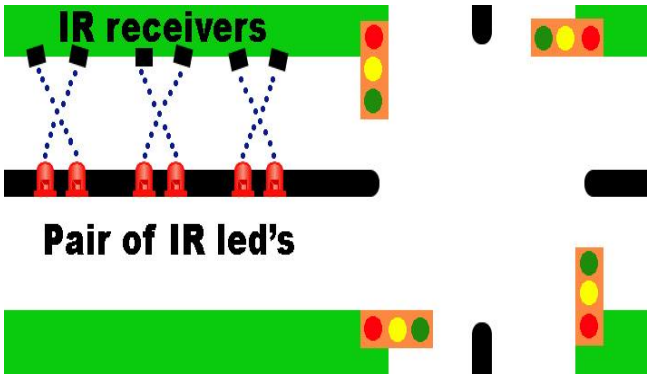




Fig 5: Arrangement of sensors in different Position for better detection

So by placing them in irregular alignments will give better detection. Here in the project we have used the inclination arrangement. By using this alignments the detection will be more accurate and there is no chance for missing of the vehicle. Thus obtains in the perfect density result.

The results are perfect by using these alignments and are shown below in the figures

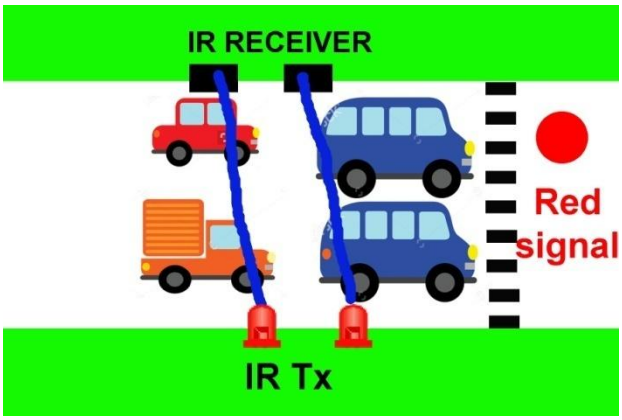



Fig 5 a : Inclined position

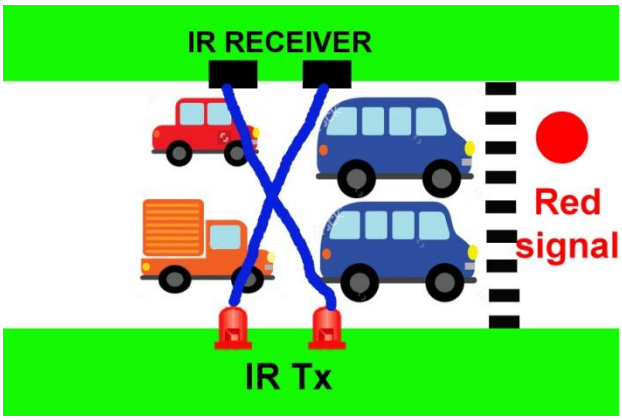



Fig 5b :Cross position

Fig 5: Arrangement of sensors in different Position for better detection

## V. RESULTS

The working starts when the signal is turned to red signal. The IR sensors start identifying the density of the vehicles on the road and depending up on the density the arduino can sends the output signal, regarding the time period of the next green signal.

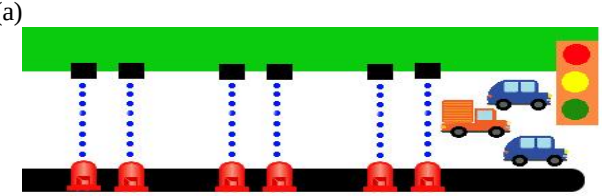
As we know that if one lane has a red signal which means that there is a green signal in the opposite lane. If one set

of IR sensors are working, the other one will be in rest, since there will be a green signal.

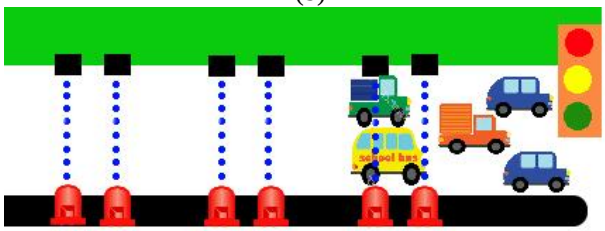
Thus as mentioned already above that if the road contains a density up to Zone-A, then the time period of next green signal will be 60 seconds and the same duration will be as a red signal at other road. Then after 60 seconds duration, the working of IR sensors at second road will start working and estimates the density and the respective duration of time period for green signal is given.

When the density is up to Zone-A and green signal duration will be 60 seconds. When the density is up to Zone-B and green signal duration will be 80 seconds. When the density is up to Zone-C and green signal duration will be 100 seconds. When the density is up to Zone-D and green signal duration will be 120 seconds. The below figures shows the different densities

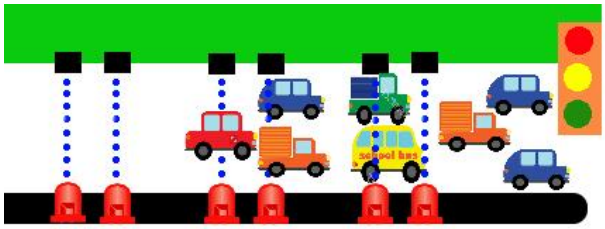
(a)



(b)



(c)



(d)

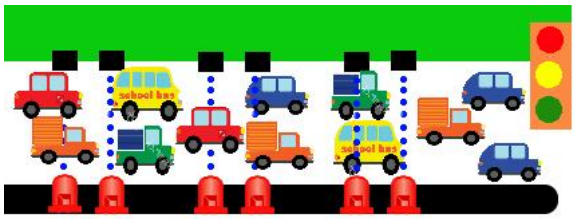


Fig 6: (a)Density up to Zone-A and green signal duration will be 60 sec (b)Density up to Zone-B and green signal duration will be 80 sec (c)Density up to Zone-C and green signal duration will be 100 sec(a)Density up to Zone-D and green signal duration will be 120 sec

## CONCLUSION

This proposed system decreases the conceivable outcomes of traffic jams, brought about by high red light postponements and gives the leeway to the crisis vehicle, to a degree effectively. A modernized method for controlling traffic. Number of street mishaps can be lessened to an expansive degree. Simple and easy traffic regulation is occupied in urban communities, for example, Metro urban areas, urban areas and so forth. Help the activity police in easy control of traffic.

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