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IoT Based Smart Traffic Signal Monitoring System

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Abstract—-- **In our present life situation congestion in traffic is a big problem in faster lifestyle. One of the main reasons for the congestion is large delay or the time fixed for the red light in the signal. The turnover time of corresponding light is already fixed in the traffic system and it is not based on the number of vehicles on the particular direction. In our idea, we proposed the enhancement of traffic system controller in a road junction using microcontroller. This idea tries to reduce the occurrence of congestion caused by traffic lights, to an extent. The proposed idea is based on Arduino.The proposed model contains IR transmitter and IR receiver which are fixed at the possible direction on the traffic signal roads. Based on the number of vehicles count, the arduino decides and controls the traffic signal time duration as a result. The vehicle count produced from arduino data will be recorded. For correct classification, the record details can be stored to the controller by informing arduino to the computer system then it will send correct delay of signal into the LED lights. In future this model can be used to giving information to travelers about different areas and the traffic condition for the same.**

Keywords—Arduino, led lights, traffic congestion., switching of signals.

I. INTRODUCTION

One of the major problems faced in any metro city traffic congestion. Getting stranded in between heavy traffic is a headache for each and every person driving the vehicle and even to the traffic police in controlling the traffic. One of the oldest ways of handling traffic was having a traffic policemen deployed at each junction and manually controls the inflow of traffic through hand signaling. However, this was quite cumbersome and then came the need for a different type of control- using Traffic signals.

Traditional traffic light controllers used a fixed predetermined schedule for traffic inflow for each direction in the junction. The controller was an electro mechanical controller which consists of mechanical systems operated mechanically. It consists of three major parts- a dial timer, a solenoid and a cam assembly. A motor and a gear assembly operates the dial timer which in turn are responsible to energize or de energize a solenoid which in turn operates a cam assembly which is responsible to provide current to each

signal indications. The timer is used to provide repetition of fixed duration intervals. However, the whole idea of fixed time traffic light controller is not convenient for cities where traffic flow is invariable. For this reason, a dynamic traffic control system is needed, which controls the traffic signals according to the density of traffic.

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. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion. While congestion is a possibility for any mode of transportation, this article will focus on automobile congestion on public roads. 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.
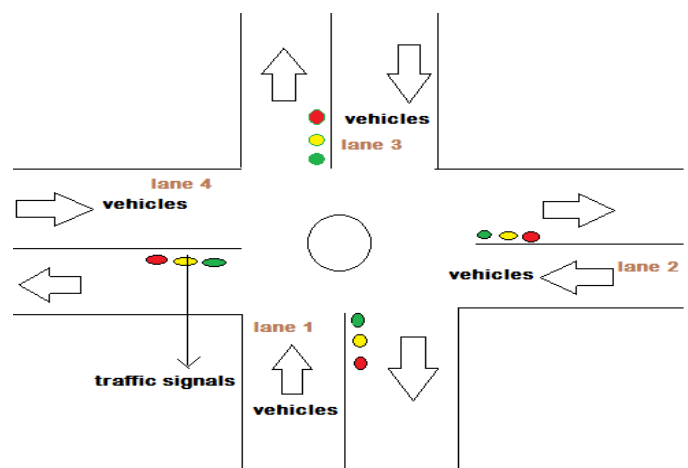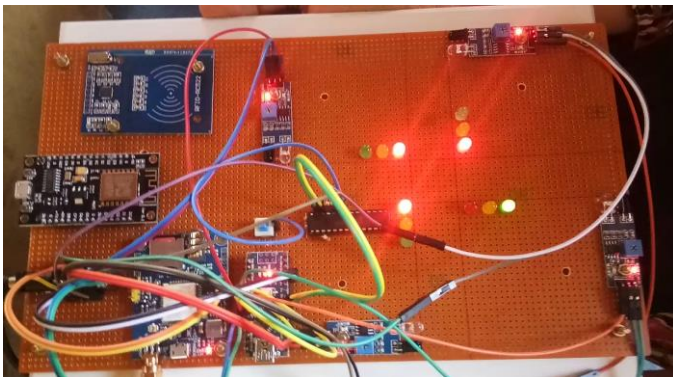

Fig. 1. Existing traffic model

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II. DRAWBACKS OF EXISTING SYSTEM

Traffic congestion has a number of negative effects:

- Wasting time of motorists and passengers. As a non-productive activity for most people, congestion reduces regional economic health.

- Delays, which may result in late arrival for employment, meetings, and education, resulting in lost business, disciplinary action or other personal losses.

- Inability to forecast travel time accurately, leading to drivers allocating more time to travel "just in case", and less time on productive activities.

- Wasted fuel increasing air pollution and carbon dioxide emissions owing to increased idling, acceleration and braking.

- Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements.

- Stressed and frustrated motorists, encouraging road rage and reduced health of motorists

- Emergencies: blocked traffic may interfere with the passage of emergency vehicles traveling to their destinations where they are urgently needed.

- Spillover effect from congested main arteries to secondary roads and side streets as alternative routes are attempted which may affect neighborhood amenity and real estate prices.

- Higher chance of collisions due to tight spacing and constant stopping-and-going.

III. PROPOSED SYSTEM

The proposed system contains the solution to three problems of traffic system. First one being the pre-defined set of timings set for each traffic signal despite the density circumstances. For this we have changed the signal timings. The working would be as follows, in a traffic junction of four lanes the density is measured on each lane at distance of 100 meters through the infrared sensors. Once the count reaches the maximum limit of the IR sensor on any lane that lanes signal is turned on to green, this is done so that the lane having highest density is allowed to clear the traffic first, the other lanes will be given green signal after this in a circular pattern. If in cases where the density is greater, the signal timing is increased to 90 seconds.

The second problem being the easy and convenient way for emergency vehicles to pass through the traffic junction. Though it is not necessary for emergency vehicles like the ambulance, fire engine, etc. to follow all the traffic rules, but still our public doesn't make way for these vehicles to pass through the junction easily. for this we have come up with a solution of using an RFID reader that will be installed on the roads and an RFID tag that will be installed in every emergency vehicle. Once the Emergency vehicles are detected through an RFID reader on any lane. That lanes signal is switched to green despite the density circumstances.

The third issue is about the non-working of traffic signals. In cases where the traffic signal is not working properly, this may lead to accidents, overflow of traffic, sudden increase in the number of vehicles etc. To address this problem, we are using the GPS module to track the location of the non-working traffic signal. once the location is tracked the information or the message is sent to admin through a GSM module. This notification is to alert the responsible authorities to take the necessary actions.

IV. METHODOLOGY

ALGORITHM

Initialize start time=7.00 am, end time=10.00 pm;
repeat below steps start from starttime to endtime
set counter value as 1 to 4 by incrementing counter value by 1 for each green signal

if counter=1:
calculate time delay for green as number of vehicles at north multiplied by 3 in seconds switch on green for time delay switch on yellow for 3 sec on & off green signal
if counter=2 :
calculate time delay for green as number of vehicles at east multiplied by 3 in seconds switch on green for time delay switch on yellow for 3 sec on & off green signal
Go to red signal

if counter=3 :
calculate time delay for green as number of vehicles at west multiplied by 3 in seconds switch on green for time delay switch on yellow for 3 sec on & off green signal
Go to red signal

if counter=4:
calculate time delay for green as number of vehicles at south multiplied by 3 in seconds

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switch on green for time delay switch on yellow for 3 sec on & off green signal
Go to red signal

End

Switch on yellow lights in all direction

V. ADVANTAGES

- Manual control of traffic is reduced
- Man power is reduced.
- Easy flow of vehicles.
- Monitoring vehicle crowd.

VI. CONCLUSION

This proposed model decreases the occurrence of traffic jams, caused by high red signal delays and provides the required time to vehicles to cross the signals. Here we are designing the system with the purpose to clear the traffic in accordance with density of vehicles by counting on the lane. Emergency vehicles like ambulance need not wait in the traffic signals and can cross the signal despite the congestion.

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