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Intelligent traffic light control system

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ABSTRACT

Traffic congestion is a serious problem in many cities around the world so it is time to switch to more manual mode or timer-timer mode to a more automated decision-making system. The current traffic signals system is based on a fixed time which may cause malfunction if one route works better than the other. To address this issue we have developed a smart traffic management system framework. Sometimes high traffic congestion on one side of the junction requires a longer green time compared to the allotted time. Therefore, we suggest here the way in which the time of green light and red light is allocated on the basis of existing traffic congestion. at that time. This is achieved by using an ultrasonic sensor. When the density is calculated, the bright time of the green light is allocated with the help of a microcontroller (Arduino). Sensors located on the side of the road will detect the presence of vehicles and send information to the microcontroller where it will determine how long the flank will be open or when to switch on signal lights. In the following sections, we have described in detail the process of this framework.

Keywords: *Accident, Traffic Signal, Traffic Congestion, Ultrasonic Sensor, Arduino, Microcontroller, Intelligent Traffic Control System*

1. INTRODUCTION

In today's highspeed life, traffic congestion becomes a serious issue in our day-to-day activities. It reduces the productivity of the individual as well as the community as it is wasting many working hours on signals. Too much traffic, inadequate infrastructure, and unreasonable distribution of sign systems are a major cause of this chaotic traffic. It can indirectly increase the level of pollution as engines are still in operation most of the time, a large number of natural resources such as petrol and diesel are used without any harmful effects. Therefore, in order to eliminate these problems or at least bring them down to a critical level, new schemes need to be implemented by introducing a sensory-based automation approach to the field of traffic signing system.

To develop the country, it is necessary to reduce congestion. The problems occur due to traffic congestion are:

1 Heavy traffic jam Because of heavy traffic jam it wastes time as well as fuel also and it happened at the main junctions when people have emergency such as before office hour, morning and after office hours, in the evening.
2 No traffic jams but still need to wait Sometimes there are no congestion at certain intersections, and people have to wait. Because the traffic light is always red at this time, road users have to wait until the light turns green. If they use a red light, they have to pay penalty.

Our project aims to eliminate road delays by reducing overcrowding through a focused system. Determines traffic on each road through sensors. And automatically manage the signal time of each roads according to the density of roads determined by the sensors. On each road we place Ultrasonic sensors, which detect the vehicle and give current traffic information on each road. Signal time is adjusted automatically according to the level of traffic on each route. The road whose traffic level is more than

other road, then this road will assign green signal and for others red signal is assigned. In our project we focus on the efficient use of city traffic light controller using an ultrasonic sensor and an improved system using the Arduino mega microcontroller. We are launching this program because it reduces traffic congestion which leads to longer waiting times until green, fuel and money losses.

2. OBJECTIVE

Objective of this project is to reduce Traffic Congestion by building an intelligent traffic management system which will help in conduction of free flow of traffic.

3. METHODOLOGY

In this system Ultrasonic sensors are used to measure the density of the vehicles which are fixed within a fixed distance. All the sensors which are interfaced with the microcontroller controls the traffic signal system according to density detected by the sensors. In this system, when the traffic density on each road is usual, the time delay in traffic signal for all roads are equal, that means each road is open for the same delay time. But whenever the traffic density become high above the normal traffic in any road, then more priority is given to that road, the road which assign high priority have been open for more time than others. Mechanism of determining density of roads:

In this system ultrasonic sensors are used to detect the road density, now let's understand the working of ultrasonic sensor. Ultrasonic sensors work by emitting ultrasonic sound waves. Then they wait for the reflected sound, after that it counts the distance based on the time required. This is similar to the way the radar measures the time it takes for a radio wave to return after hitting an object.

Now, for determining density, two ultrasonic sensors are installed on each road, now if any vehicle is standing on the road, then the sensor detects its presence, but the density of roads considered to be high only when both the sensors detects vehicles in front of them, since these sensors is installed at a distance of 10-15meter from the crossroads, and both are separated by 5meter from each other, hence if the both the sensors detects vehicles in front of them, then we can conclude that vehicles are standing due to jam not for any other reasons and the road are considered to be in traffic jam. Working of the system is divided into the following cases:

- **1st Case**- when traffics density are same in all the roads**,** in this case same delay time is assigned to each road, as no road has higher priority.so each road is open one by one for same delay time.
- **2nd Case**- when one of the roads have higher traffic density and other roads have normal traffic, in this case, the roads having higher traffic have given more priority than others by assigning delay time to this road signal for 3x more than other roads. Here, in this case, this road is remained open for some time to reduce the density and then signals of all roads are open one by one by assigning more delay time to this road.
- **3rd Case**- two of the roads have higher traffic than other two road, in this case the two roads having more traffic have given equal priority but more than the other two roads, so the two roads of higher priority is assigned more delay time than other two. Here, in this case, these two roads open one by one while skipping other two roads for some time to reduce density of these two roads and then all 4 roads will open one by one by assigning more delay time to those two roads.
- **4th Case**- three roads have high traffic and one road have less traffic, in this case, the roads having low traffic density have given low priority than other three roads, so this road is assigned low delay time than other two. Here, in this case three roads having higher density is open only by one while skipping one road having less density for some time and after that, all roads will open one by one by assigning less delay time to that one road having less density.

3.1 Circuit Diagram

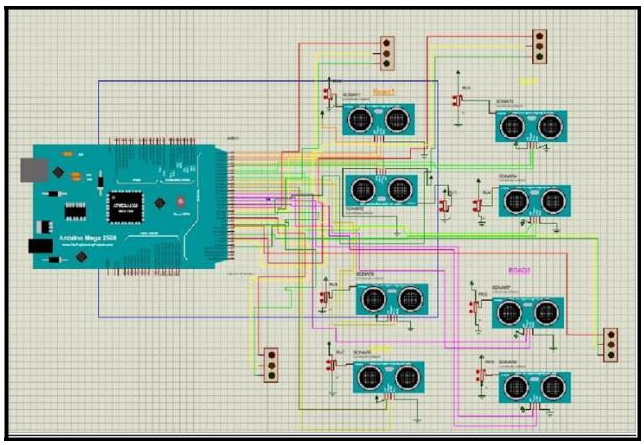

Fig. 1: Circuit Diagram

4. RESULT

We have successfully build the project and had tested all the cases, it worked according to our expectations. The pictures of our build model are given below.

Fig. 2

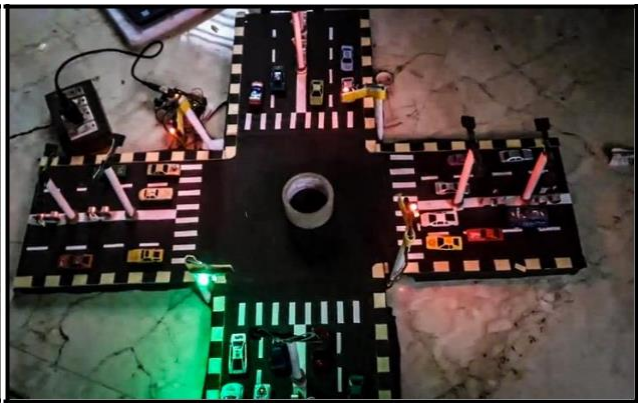

Fig. 3

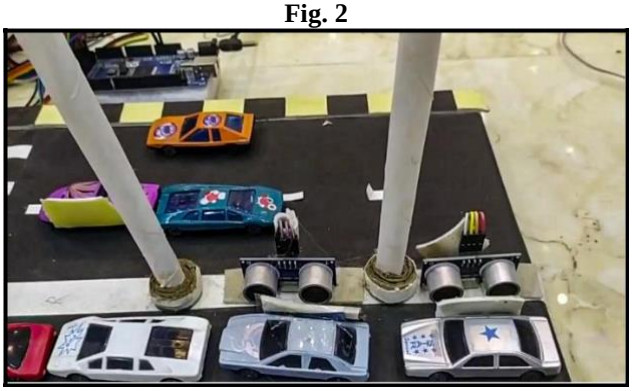

Fig 4

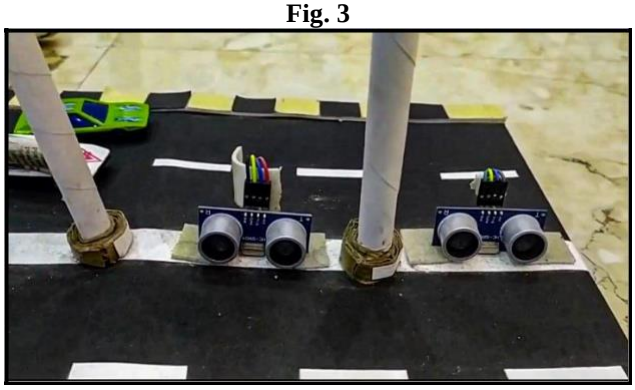

Fig. 5

5. SCOPE FOR FUTURE DEVELOPMENT

Due to the ever-increasing population of the world, it is a great challenge for the next generation to manage the traffic system. Much improvement will come in the future. Managing a regular transportation system we must think of a smart and automated way to manage the system. Because the population grows, so does the wide variety of vehicles. Controlling a large number of vehicles should be used in smarter ways. For future purposes we can use the image sensor or the photographer. It does the job by producing a picture of the streets. Create an image by converting the diminished light reduction into a signal that transmits the image. Photographers have used both digital and analog electronic devices.

6. CONCLUSION

There is an urgent need for an effective traffic control system in our country, as India experiences 384 road accidents daily. To reduce this congestion and unnecessary time delays in traffic an improved system has been developed here for this project. With the use of the platform for this technology, the madness of traffic can be effectively propagated by distributing time spaces based on the suitability of the car load in between certain lanes of multi junction crossing. We have successfully designed the prototype with remarkable outcome. The next step forward is to implement this schema in real life scenario for first hand results, before implementing it on the largest scale. We consider that this may bring a progressive trade in site visitors management device on its utility in real area surroundings.

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