Experimental Setup for Handling Traffic Jam

Himanshu Saini, Rohit Rastogi, Parv Singhal, Pratyusha, Shreya Rai, Aarti Goel

Abstract: ***The motive of this research paper is to design a way which can be a proposed solution regarding heavy traffic. In our day to day life traffic jam are becoming common and we can also observe road rage, accidents and chaos because of traffic jam. Traffic jam is basically defined as streak of slow-moving vehicles caused by an accident or heavy congestion. Traffic jam can be usually observed at traffic lights. Traffic Lights is a mechanism which consist of automatically operated colored lights, which control the traffic. Red light indicates to STOP, Yellow Light to WAIT, and GREEN Light to GO. Generally, uniform time is given to all the lanes for Red, Yellow and Green Lights. Huge line of stationary vehicles is seen even if traffic lights are working properly and sometimes because of these huge lines of vehicles chaos and fights can be observed. To handle such situation currently we have only few solutions like constructing flyovers, bridges, underpasses, diversions etc.As we are developing, we are constructing many gadgets which help us to encounter any problem. Modern technology such as Sensors and Micro-Controllers play a key role to identify huge line of traffic and to clear that line by increasing free time. Our research work focuses on handling this traffic which is encountered near traffic lights with the help of new technology like Sensors and Micro-Controllers. By, our work we have designed a solution which is proposed solution to handle huge amount of traffic caused near traffic lights in an efficient way and to make sure that no chaos or fight would happen.***

Keywords: ***Traffic Light, Traffic Jam, Sensors, Microcontrollers.***

I. INTRODUCTION

In today's time the major and common problem we all come across day to day is the TRAFFIC JAM. The main solution to dissolve this problem is the proper functioning of traffic lights [1][10][12][13][14]. Some main elements are discussed below:

Traffic Light

It is use to control the traffic and it is very efficient as there is no use of manual power for controlling the traffic. Its constituents are-

- *Red Light:* It specifies the rider to STOP.
- *Yellow Light:* It specifies the rider to WAIT.
- *Green Light:* It specifies the rider to GO!!!

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Fig. 1 A sample Traffic Light

Usually a particular time has been set for every lane for every form of light. It could also can be set on the basis of the traffic which is huge in amount and move in a particular direction. This system can also be used in computer software, like as macOSuser interface, and as pieces of artwork, and the Traffic Light tree is used in London, UK [2][10][12][13][14].

Traffic Jam – A Curse to our Society

When there is slow moving of stationary vehicle then there is traffic jam, but the main cause of this is the unexpected accident or the congested roads which may cause the drastic fights such as road-rage and other accidents. The main problem of traffic jam can be seen in metropolitan cities like Delhi, Mumbai, Kolkata, Bengaluru, etc. on a huge scale and mainly in front of the traffic signal. Nowadays the effective measure to resolve this problem is by constructing flyovers, underpass over the region which appears to be crowded [3][10] [12][13][14].

Fig. 2 Example of Traffic Jam caused because of Traffic

Sensors—A Revolutionary Solution

This device or a module is basically used as it detects the unusual happenings in its nearby surrounding and sends that particular information to the monitoring systems [4][10] [12][13][14].

The optical sensors are used in the device which are movable and whose motion can be easily detectable and it works according to it. It mainly constitutes of technologies like Infrared and microwave which detects every object which came in front of it and also measure the real time kinetic and physical movement.

Micro-Controller

It is a signal integrated circuit in the form of a small computer, which control the other devices rather developing separate microprocessor for each device by reducing its size and cost [5].

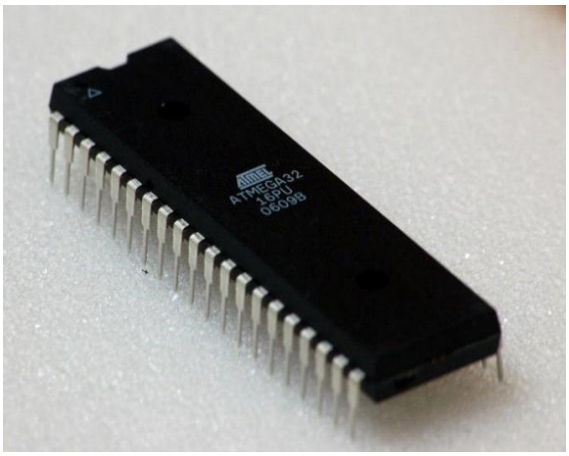

Fig. 3 A sample Micro Controller

Machine Learning

Machine Learning is a type of algorithm which improves the performance of the task by making your computer/device/software talented enough to learn and analyze the data according to its previous experiences. It makes the machine/software capable to analyze, predict and categorize large amount of Data.

Machine Learning emphases on the growth/development of the computer programs which are able to access the data and after analyzing learn it for themselves as it is an application of Artificial Intelligence (AI) which provides it that ability without any explicit programming.

Importance of Machine Learning

Earlier the algorithms that we have are in large quantity but we have insufficient data to put that algorithms on, and check and help the user. But today we have a lot of data that a human cannot handle by its own and the algorithms we are using earlier can be perfectly implied now. It increases the effectiveness, preciseness and efficiency of the user. It also helps the user to get more information and data in case he is surfing something from the Internet.

II. PROBLEMS DUE TO TRAFFIC MANAGEMENT

As we see the data analysis of all the problem and destruction that is caused by traffic jam, we will be highly amused by seeing the results as, the number of accidents is caused due to traffic jams and about 2 million people were killed in road accidents because of the jams. And this is not only where it gets stopped out of these 2 million around 0.2 million people died by standing in the long queue of jam, these maybe because of heart attacks or due to other serious issue and even ambulances get stuck in these jams, some lost their loved ones. About 0.8 million people died because of the rash driving in jams. Some people (0.3 million) died as of crossing the roads, because everyone is in hurry they don't even care about other's life. 5 Million accidents are happened at large extent because of standing in long queue [6][10] [12][13][14].

Overall, 5 Million Accidents have been encountered because of standing for hours in huge lanes.

- Top Three Cities Having Highest Number of Accidents
- Delhi
- Chennai
- Mumbai

These cities are Country's leading Metropolitan Cities, and the survey reveals the altitude of the problem.

III. POSSIBLE SOLUTION

To resolve this problem we need a solution, we have designed a product which is self-regulating and it determine the level of traffic and subsequent time will be the magnitude of free time. To maintain the records, it can also be connected wirelessly.

Product Overview

The installation of product will be as described in fig.4. It works as the sensor will determine the depth of traffic and send the particular and important information to microcontroller whose function is to provide the free time accordingly.

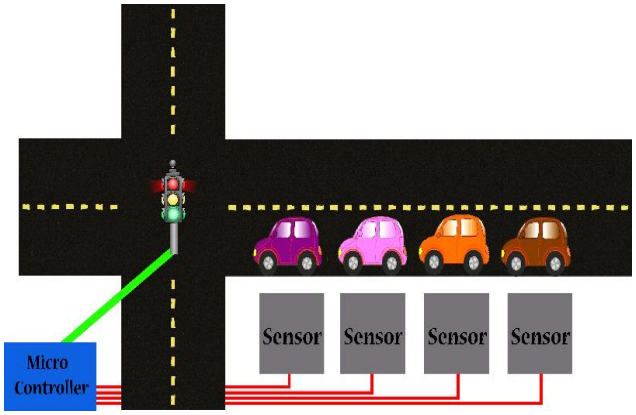

Fig. 4 Flow Chart Explaining the Product Working

IV. EXPERIMENT

To clear a lane of 100m which is full of traffic the average time taken is 98 sec. During Research, we conclude that clearing Lane full of 1m, 2m, 40m traffic time is calculated successively. The real time figures of free time are being calculated using the data which is present till date. A hypothesis is included which claims that limit of 30m is taken as the maximum distance for which 30 sec is allotted, if the traffic is present beyond 30m then also 30 sec will be allotted as the free time. And for this research we use toy cars running at full speed non-uniformly.

V. RESULTS

The results are obtained for three cases:

Best Case

The study table for the best case is based on the assumption that the intensity of the traffic present in the lane is less than the time allotted as free time on ideal Traffic Light. The plotted graph using Machine Learning is presented in Fig. 5.

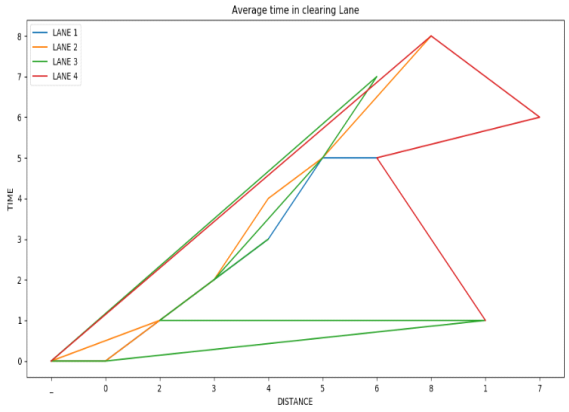

Fig. 5 Mean Time in clearing Lanes for Best case

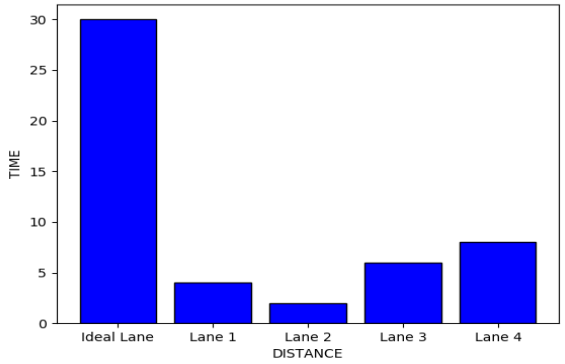

Fig. 6 Comparison between present model and our model for Best case

Average Case

Average case study table is established on the hypothesis that the intensity of the traffic present in the lane is slightly more than the time allotted as free time on ideal Traffic Light. Additional traffic observed is cleared by providing extra time particular lanes, and after one complete rotation the average case is converted into best case. The plotted graph using Machine Learning is presented in Fig. 7.

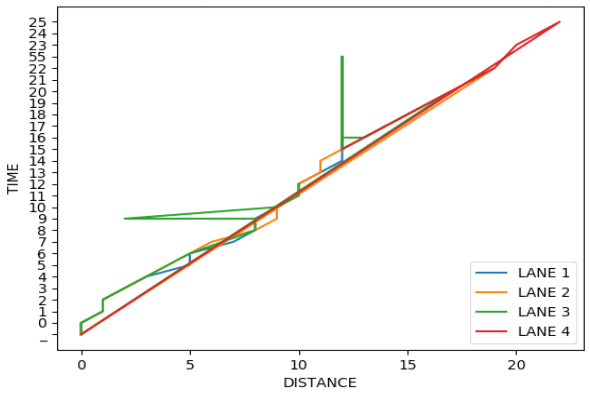

Fig. 7 Mean Time in clearing Lanes for Average case

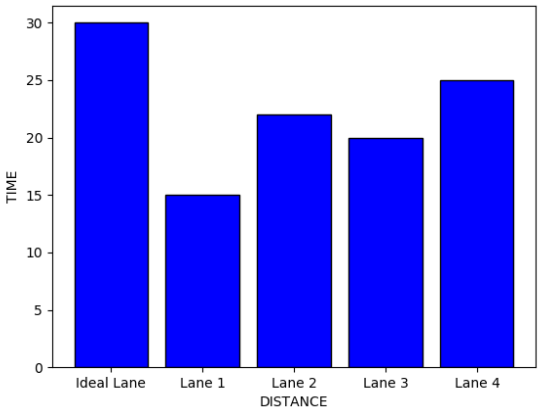

Fig. 8 Comparison between present model and our model for Average case

Worst Case

The study plot of worst case is framaed on the inference that the intensity of the traffic present in the lane is too high as compared to the free time of ideal Traffic Light. In this case, the calculated time is much more than the permisible limit, so the maximum time is given as free time for the clearance of traffic. Also, after a couple of rotation, the worst case will be converted into average case and then into best case. The plotted graph using Machine Learning is presented in Fig 9.

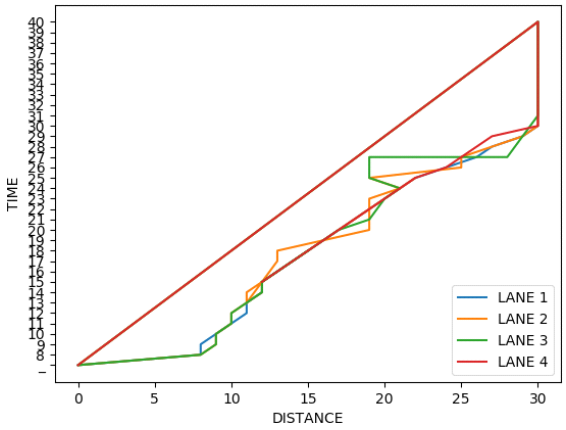

Fig. 9 Mean Time in clearing Lanes for Best cases

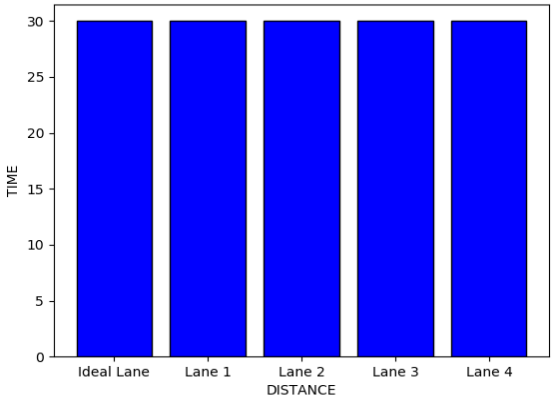

Fig. 10 Comparison between present model and our model for Worst Case

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VI. CONCLUSION

The experiment is conducted in supervision of experts. Each value present in table I is the mean of number of values recorded in Fig 6, 7 and 8. The results from Table IV can be scaled to real life figures by multiplying with a factor of 10.

Table. 1 Average time in clearing the whole congested lane vs the average distance of congested area

Distance (in m)	Average time in clearing the last vehicle (in secs)
1	2
2	3
3	3
4	5
5	6
6	7
7	7
8	8
9	10
10	12
11	14
12	15
13	16
14	17
15	18
16	19
17	20
18	21
19	22
20	23
21	24
22	25
23	26
24	27
25	27
26	28
27	29
28	30
29	30
30	30

VII. GDP REVENUE AND EFFECT

Oil Crisis

We all are aware about the shortage of Coal, Petroleum in today's world. And if talk about automobiles these vehicles run because of the Petrol and Diesel. And the amount of fuel which get wasted while the vehicles are standing in traffic jam is very surprising and havoc that is around the fuel of Rs. 60,000 croresapprox [8].

Pollution

Pollution is a curse for everyone as it is harming us and our environment. And nevertheless, one of the main reasons for pollution is the vehicles which are stationary or slowly moving and releasing harmful gases at large extent. The product that we designed will help in reducing pollution by giving time to each vehicle to reach its destination as soon as possible.

Life Safety and Accidents

The main motive of our product is to resolve the accidental and life-threatening issues by the traffic. While standing for long time in the queue the people get irritated and which results in fight and road-rage. And in hurry to reach the destination without any delay people try to jump the traffic light and lost their lives because of this [7].

VIII. RECOMMENDATIONS

We are considered as a developing nation and we are trying to improve the technologies day by day and making our future better and bright. And an innovative idea to handle traffic is demonstrated under our research paper. We keep our hopes high and expect that the traffic police departments of all the states will look forward to our product and realize its importance. The appraisals, propositions and recommendations offered in the preceding chapter, therefore, are intended to improvise the mechanism of smart traffic lights [10][12][13][14] .

IX. NOVAL APPROACH

We designed our product in such a way that it effectively deals with the huge amount of traffic which happens near the traffic lights mainly in the metropolitan cities. Our idea is based on reducing depth and number of stationary vehicles by allowing more time as free time for lane having more traffic than normal. So, if this project is implemented, we could see that if there is a huge amount of traffic in front of traffic light, it would be clear in no time and many problems such as accident and fight won't happen [10][12][13][14]

X. FUTURE SCOPE

We provided an innovative and easy concept by which we can handle traffic caused near traffic lights instead of making flyovers, underpasses etc. (which consume much time and destruction and pollution). The problem is traffic jam which is caused right in front of Traffic Light. If these recommendations would be taken care of and applied now or in future, then it there might be chances that the whole scenario on which traffic light works will be effectively changed and renewed. This will not only save huge amount of money which is spent to build flyovers, underpasses etc. but also will also save the time spent to build them. The approach which is stated in the former part of this paper is to take effective measure to control large extent of traffic that can be scaled for many cities. So, this concept is useful and is a proposed model to handle traffic jam caused right in front of Traffic Light even after the Green light.

XI. LIMITATIONS

The explanations we have recommended above have two limitations, they are: -

Accident caused near Traffic Light

When an accident is caused right in the middle of road, then the proposed model will not be useful to handle the traffic.

Highly Sensitive Equipment's

The backbone of any model is its structure. If a single piece is damaged than the whole piece is nothing more than a scrap.

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