Smart Traffic Management System Using AI

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Abstract- *Traffic congestion is becoming one of the critical issues with increasing population and automobiles in cities. Traffic jams not only cause extra delay and stress for the drivers, but also increase fuel consumption and air pollution. Although it seems to pervade everywhere, megacities are the ones most affected by it. And its ever-increasing nature makes it necessary to calculate the road traffic density in real-time for better signal control and effective traffic management. The traffic controller is one of the critical factors affecting traffic flow. Therefore, the need for optimizing traffic control to better accommodate this increasing demand arises. The proposed system aims to utilize live images from the cameras at traffic junctions for traffic density calculation using image processing and AI. It also focuses on the Artificial Neural Network Algorithm for switching the traffic lights based on the vehicle density to reduce congestion, thereby providing faster transit to people, and reducing pollution. This Adaptive Traffic Signal Timer uses live images from the cameras at traffic junctions for traffic density calculation using YOLO object detection and sets the signal timers accordingly, thus reducing the traffic congestion on roads, providing faster transit to people, and reducing fuel consumption.*

Keywords- Traffic light cycle,Traffic density count,Object detection and counting, Real time traffic monitoring, AI based traffic model, Traffic prediction, Traffic classification.

I. INTRODUCTION

Now-a-days vehicles are increasing rapidly. This is one of the reasons for traffic congestion. People are able to use different transportation facilities such as automotive vehicles, subways, and bicycles. However, among all these transportation facilities, automotive vehicles are still the most adopted due to this comfort and practically. In this way, assuming a continuous population growth, the number of vehicles in large cities will increase as well, but much faster than transportation infrastructure; consequently, traffic congestion will become a pressing issue. It creates several negative concerns for the environment and society such as increasing number of traffic accidents, economic development, increase in greenhouse gas emission, time spent and health issues. This innovative software projects is an effective traffic signal management project that allows for managing 4 way traffic signal management system. The system consists of 4 signals corresponding to each road. A density-based traffic signal scheduling algorithm is proposed . The system is designed to manage traffic signal timings based on the density of traffic on its corresponding road. The system represents the traffic strength of a road graphically using traffic judgments. By measuring the traffic lined up on a particular road the signal timings are adjusted to let that particular way clear out and then the next populated one. The entire system works according to an algorithm that allows for smooth and efficient traffic flow across all four ways. It also consists of an emergency override that allows traffic authorities to remotely let go a particular signal in case an ambulance or important vehicle arrives on that way.

II. LITERATURE REVIEW

According to the literature study, the majority of researchers have used different neural networks and algorithms for their data collecting systems. [1]From "Intelligent Traffic Signal Control Using Wireless Sensor Networks", It is observed that the use of wireless sensor networks to sense presence of traffic near junctions and hence route the traffic based on traffic density in the desired direction. This system does not require any system in vehicles so can be implemented in any traffic system easily. This system uses wireless sensor networks technology to sense vehicles and a microcontroller based routing algorithm for traffic management. [2] From "Intelligent Traffic Signal Control System Using Embedded System" The ITSC system consist of high-performance, low power AVR_32 microcontroller with 32kbytes of in-system programmable flash memory and in-built 8-channel, 10- bitADC which is required to process the IR input from sensor network. The ITSC system will able to deal two basic problem of traditional traffic light system: I) Detection of traffic volume by using genetic algorithm. ii) Emergence vehicle detection such as ambulance, police etc by using wireless sensor network (IR) embedded at the signal intersection. [3] From "Intelligent Traffic Light Controller This makes the use of Sensor Networks along with Embedded Technology. The timings of Red, Green lights at each crossing of road will be intelligently decided based on the total traffic on all adjacent roads. Thus, optimization of traffic light switching increases road capacity and traffic flow, and can prevent traffic congestions. GSM cell phone interface is also provided for users those who wish to

obtain the latest position of traffic on congested roads. This is a unique feature of this research which is very useful to car drivers to take an alternate route in case of congestion. The various performance evaluation criteria are average waiting time, average distance travelled by vehicles, switching frequency of green light at a junction, efficient emergency mode operation and satisfactory operation of SMS using GSM Mobile.

III. METHODS

The software system implementation is partitioned into 5 sections. The initial segment is to process the video signal and image acquisition from fixed camera. The second part is to select the target where the vehicles could be available by utilizing image trimming procedure. The third part is the object recognition which is performed by enhancing features of the image. The Fourth part is the density count including in which we are counting the quantity of vehicles. At last, the last part is allocating time to open the sign as per the density count.

A. Video signal and Image Acquisition proessing:

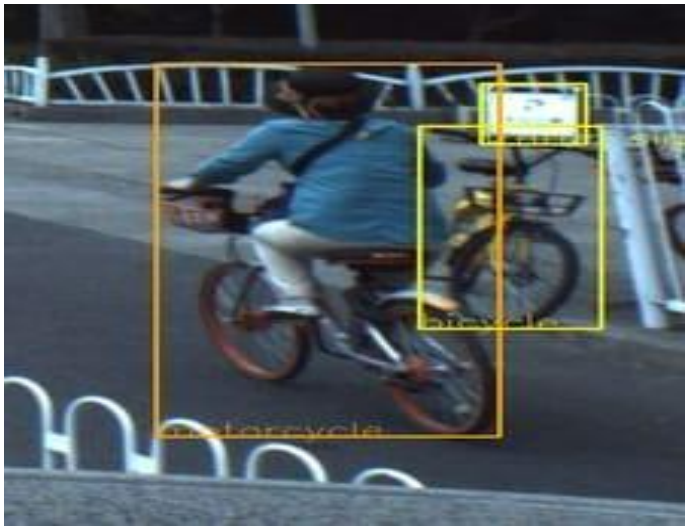
The work begins with processing the live video using camera is stationary, which is to extricate thecasings constantly from the ongoing video originating from the stationary camera. This raw digital data is further processed by converting the images from RGB (Red-Green-Blue) to grayscale picture of an empty street when there is no vehicle present; this picture is reference picture which is caught from the live video at the point when the street is vacant.

B. Image Cropping:

The subsequent advance is to choose the focused on zone by planning.The motivation behind editing is to distinguish the street area where the vehicles are introduce and reject the pointless foundation data is fixed in each casing of the live video on the grounds that the camera is stationary. To crop the necessary region, we utilized the reference image, First we made a paired picture of having at that point concealed white the street territory, and concealed dark the extra locale intrigue. At long last, we duplicated the reference acquire the last wanted objective methodology of article identification.

C. Object Detection:

The third step is the article or vehicle identifying vehicles which are available in the focused on zone appeared in discovery, first we extricated the edge from the continuous video arrangement. The subsequent stage is to change over the two images; the reference image and the ongoing image into grayscale and then we determined the absolute difference of two images. Since the dimensions of the road are fixed therefore the difference image only highlights of the vehicles in the desired target area. The next step is to convert each images; the reference image and also the real time image, and so, we tend to determine absolutely the distinction of 2 dimensions of the road are fastened therefore the distinction image solely highlights the topographic point. The distinction image is illustrated in shows the presence of vehicles within the desired topographic point, however, the visibility of the vehicles are not clearer therein image. To boost the visibility of the distinction image to a b into grayscale, and so, we tend to determine the scale of the road are fastened so the distinction image solely highlights the vehicles within the desired target.



Object Detected

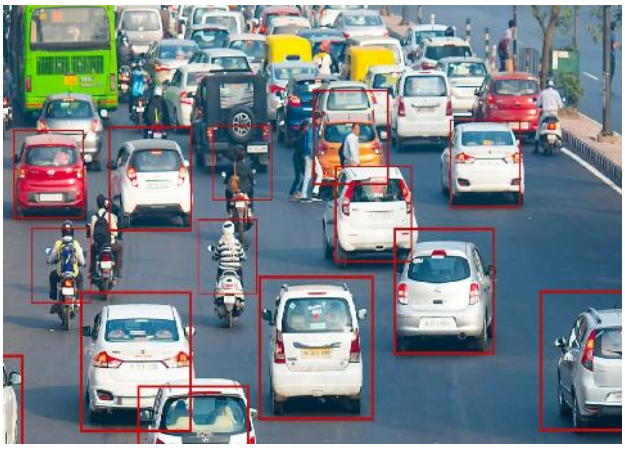
D. Traffic Density:

The subsequent stage is to ascertain the traffic density in the ideal objective territory. To decide the traffic density, first we marked the vehicles and afterward checked their number. So as to count the quantity of vehicles, we scanned for connecting pixels. Soto think about an associated district as a vehicle, we characterized a threshold. Nonetheless, it is conceivable that more than one area of a vehicle is recognized utilizing the above criteria. To defeat this issue, we find the covering jumping boxes of the chose districts and accordingly sifted through littler and exceptionally covering locale. To count the objects present in the image the nearby limits of the articles are distinguished. The exterior boundaries of the objects as well as the boundaries of holes inside these objects in the binary image

are tallied to recognize the vehicles which are available in the focused on territory.

IV. WORKING OF SYSTEM:

The analysis is disbursed to cut back the tie up by hard the traffic density in a very explicit direction of the road by victimization image process algorithms. The system starts with a picture acquisitions method within which the live video is processed by the stationary camera, mounted on any pole. Then one frame per second endlessly extracts from the live video and processed every frame by changing it into grayscale. For the reference image we to tend to designate associate empty road image once there's no traffic on the road. The second step is the image cropping within which we to tend to primarily designate the targeted space wherever the vehicles square measure gift and filtrate redundant close info. Then we to tend to determine the presence of objects in live video by taking absolutely the distinction of every extracted frame with the reference image. Then the presence of objects is increased by binarization of the distinction image then the ultimate step is to calculate the traffic density within the desired topographic point by reckoning the quantity of vehicles in this region. To perform this, 1st we tend to outline the vehicles within the targeted region by scanning all the connected objects, and filtering out smaller and overlapping objects. To subsume noise added thanks to completely different lighting conditions at different times of the day, we tend to capture and hold on many reference pictures at completely different time slots of the day. The system cycles through these reference pictures according this time of the day.



Detected and counted vehicles

ADVANTAGES:

- A modernized way of controlling traffic
- Number of road accidents can be reduced to a large extent. Easy traffic regulation in busy cities such as Delhi, Mumbai etc.
- Help the traffic police in easy control of traffic

V. THEORY OF OPERATION

We propose a system in which the traffic signal operates based on vehicle density data. The vehicle density data is obtained by continuous monitoring and update of traffic at regular intervals. The vehicle density data obtained is stored in the server of control room. Then this data is transferred to signals. Each signal will have a main controller and pole controllers. The main control selects the pole to be operated based on the data and sends command to the pole controller. The pole controller adjusts the timing based on the vehicle density which is pre-estimated by surveying. This system automates the traffic control system and wires are eliminated. Intelligent traffic management system holds good even in emergency situations or during unusual traffic as a control is provided at control room which can be used to modify or configure the unusual traffic. We also provide a Wi-Fi operated keypad to system at junction which is used to control the unusual traffic.

FUTURE EXTRACTION:

The current system utilizes a solitary camera for checking traffic at a crossing point. By utilizing a different camera for every street at a crossing point will permit the system to utilize video processing which can improve the system efficiency further. The vehicle objects can likewise be ordered into different classes relying on the geometrical shape of vehicle for obstructing the entry of enormous vehicles e.g., trucks during day times. The crisis mode can be refined further by introducing a beneficiary in rescue vehicle with the goal that the base station will monitor the emergency vehicle area consistently and clear the street at whatever point will be required. Also to detect emergency service vehicle and let them go first by opening the signal for more time.

VI. RESULT

The exploration is completed so as to diminish the traffic clog by ascertaining the traffic thickness a specific way of the street by utilizing picture handling calculations. The system begins with a picture procurement process in which the live video is handled by the fixed camera, mounted on any shaft. At that point one casing for each second ceaselessly removes from the live video and handled each edge by changing over it into grayscale. For the reference picture an

unfilled street picture was chosen, when there is no traffic out and about.

The subsequent advance is the picture trimming in which, the focused on region is chosen, the region where the vehicles are available and sifted through pointless encompassing data. Next stage, decides the nearness of articles in live video by taking the supreme contrast of each extricated outline with the reference picture. At that point the nearness of articles is improved by binarization of the distinction picture.

At that point the last advance is to compute the traffic thickness in the ideal target zone by including the quantity of vehicles in that area. To play out this, first, the vehicles are set apart in the focused on district by checking all the associated protests, and sifting through littler and covering objects.Traffic light timing in real-time: The smart traffic management system helps traffic light to operate in real-time conditions. Traffic operates based on traffic congestion automatically. Safety from road accidents: Due to the deployment of this system, the chances of road accidents can be minimized. The proposed work focuses on Smart Traffic management System using AI which will eliminate the drawbacks of the existing system such as high implementation cost, dependency on the environmental conditions, etc. The proposed system aims at effective management of traffic congestion. It is also cost effective than the existing system.

s.no	Traffic density Count (NO. of Vehicles (N))	Traffic light cycle (in seconds)
1	N<=20	10
2	N<=40	20
3	N<=60	30
4	N>=60	40

RESULTANT TRAFFIC LIGHT TIMER DEMONSTRATION.

VII. CONCLUSION

In this project, a technique for estimating the traffic victimization Image process is conferred. This is often done by victimization the camera pictures captured from the road and videos taken are born-again to the image sequences. Every image is processed on an individual basis, and therefore, the variety of vehicles has been counted. The benefits of this new methodology embody such benefits as use of image process over sensors, low cost, simple setup and comparatively sensible accuracy and speed. As a result of this methodology has been enforced victimization Image process, andcomputer code, production prices are low whereas, achieving high speed and accuracy

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