Smart Traffic Control System By Using Artificial Intelligence

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Abstract- *This With an increasing population and number of automobiles in a city, traffic reduction is becoming one of the most pressing challenges. A traffic gridlock is more than just an inconvenience and a source of stress. for the drivers, but it also increases fuel consumption and air pollution. Despite the fact that it appears to be ubiquitous, huge It has the greatest impact on cities. Its ever-increasing wildlife necessitates a thorough examination of the road. for good signal control and traffic density in real-time the current state of traffic management The traffic controller is a crucial position. concerns that have a direct impact on traffic flow As a result, the requirement for To better accommodate this rising population, traffic regulation needs to be improved. Demand is increasing. The goal of our proposed system is to use a live image from a camera at traffic intersections to calculate traffic density using image processing and artificial intelligence. It also focuses on the algorithm for switching traffic lights based on vehicle density to alleviate traffic congestion, allowing people to travel faster while simultaneously lowering pollution. The usage of Artificial Neural Networks (ANNs), which have been shown to be one of the most commonly used alternatives for traffic control and mobility pattern prediction. Here, we outline the steps that should be taken to ensure that Artificial Intelligence is properly implemented in the traffic system and that the problem is alleviated. Our study focuses on leveraging embedded systems to optimise traffic signal controllers in cities, as well as image processing machine learning techniques. To drive the robot, we will employ a deep learning object identification algorithm, image processing, and an embedded system.*

The traffic lights are adjusted according to the amount of traffic. This system is going to minimize traffic congestion in a cost-effective manner, and We also use a solar panel as a power source for our embedded devices system Keywords Traffic management

Keywords- Image processing, Yolo Algorithm ,Arduino

I. INTRODUCTION

The Numerous road networks are experiencing issues as a result of the growing number of vehicles in metropolitan areas. The capacity of the roadways, as well as the related Level of Service, decreases Service. Many traffic-related concerns have arisen as a result of the traffic control systems that employ fixed signals at junctions timings for signals They keep repeating the same time sequence, and it's becoming old. with no changes in duration Demand for road construction has increased.

As capacity grows, so does the need for innovative solutions. In the realm of intelligent transportation, traffic control is something that can be created. Systems of transportation. These traditional procedures have several disadvantages. The manual control mechanism necessitates a significant quantity of personnel. We are unable to do so since the traffic police force is insufficient. They can't manually regulate traffic in all zones of a city. a town or a city As a result, a better traffic management system is required There is a requirement for lighting. A traffic light with a timer for each phase is used in a static traffic light regulating system does not change in response to real-time traffic signals on that road. Electronic sensors, such as proximity sensors, are used instead. [2] The accuracy and coverage of loop detectors and loop detectors are frequently in conflict. challenge because getting high-quality data is difficult Typically, complex and costly technologies are used. As a result of the constrained funds, the number of people who may participate will be reduced facilities. Furthermore, because most sensors have a limited effective range, total coverage across a network of facilities typically necessitates in recent years, video monitoring and surveillance systems have been widely used in traffic management for safety, ramp metering, and providing information and updates to travelers in real-time signals. Video surveillance systems, which may be used to manage the timers of traffic signals in order to optimise traffic flow and avoid congestion, can also be used to approximate traffic density and vehicle categorization.

Fig 1;Hardware Implementation

Typical traffic signals with a fixed timer the fixed timers' rules these stands. The timer is supplied with a constant stream of numerical numbers. The signal lights are turned on. Changing to red and green automatically dependent on the timer values for real-time surveillance from CCTV cameras at traffic crossings the number of vehicles is used to calculate traffic density. Set the green signal time properly at the traffic signal. The vehicles are classed as a car, a motorcycle, a rickshaw, or a bicycle to receive an exact quote for a bus/truck.

II. LITERATURE SURVEY

There is a proposal for a fuzzy logic-controlled traffic signal light system that can be adjusted to current traffic circumstances.

The system includes two options for major and secondary drive ways. Each of the fuzzy controllers has three inputs and one output. A simulation was created using VISSIM and MATLAB. As a consequence, traffic conditions for low traffic density areas have improved areas.

The technology is based on a smart traffic signal system. A fuzzy controller with an artificial neural network (ANN). Images captured by cameras attached to a traffic site are displayed. This system makes use of Prior to any additional normalization, The picture has been converted to grayscale. [4] After that, segmentation is conducted using the sliding window approach to count all automobiles regardless of size, and an ANN is run over the data picture that has been segmented and the result of which is utilized in a fuzzy Using a controller, configure the timings for the red and green signal lights. output that is sharp with execution, there was an average inaccuracy of 2% 1.5 seconds has passed from a live video feed.

The photos are recorded in short frames, and the algorithm is used. Image processing is carried out with the help of the photos are transformed to grayscale images using OpenCV. Previously, SVM was used. This technology not only detects but also prevents. Red-light breaches are detected as well as traffic density.

suggests employing image processing methods and traffic density to implement adaptive light timer control. This system is made up of a microcontroller that is controlled by a traffic signal timer, high-resolution image sensors, MATLAB, and the UART concepts are used to transmit data examines a variety of traffic light approaches system is up and running This approach recognizes that each technique has a unique name. similar architecture input data selection, traffic acquisition parameters from the incoming data, process it, adjust the density, and parameters should be updated.

In the first way, vanes are used to gather information and determine the location of each car, which is then relayed to the nearest Intelligent Traffic Light through GPS.

Furthermore,[5] these ITLs will update the data and send them out to nearby automobiles in the event of an accident, the information will be provided. would be issued to the drivers, instructing them to take a different route. Attempt to avoid crowds. This method, however, is not viable due to its inefficiency. The cost of placement is rather high.

In the second way, infrared sensor-based microcontrollers are employed with a transmitter and receiver to collect the unique ID [6] of each vehicle. In the event of an emergency, the radio frequency tags on vehicles can be used to locate them in some states and let other vehicles to pass. This method detects the presence of red light. violations. This strategy, nevertheless, is not adaptable due to the fact that infrared sensors must be visible.

The third strategy is the fuzzy logic method, which employs two fuzzy logic controllers: one to optimise the traffic signal and the other to extend the signal. A road in a junction is in the green phase. [7] The sensors that were utilized to Video cameras, which are situated at various locations, are used to collect input data. Lines of communication, both incoming and outgoing After then, the controller employs to make the greatest use of the data generated by these sensors make judgments, and reduce the objective function's size.

The fourth technique employs fuzzy logic, with the number of cars and the average speed of traffic flow in each direction serving as input parameters. The number of cars and

average traffic flow speed Sensors put on the road can be used to determine this. In Photoelectric devices are employed in the fifth approach. positioned at a certain distance from one another, that captures the data and send it to the traffic cabinet, which determines the route. Set the traffic lights after determining the weightiness of each road. correspondingly. The expense of upkeep, on the other hand, will be substantial high.

Video pictures are employed to acquire data in the sixth approach. To capture a crisp image, dynamic background removal and numerous structural processes are used of the automobile [8] Every time a new car enters the vicinity of curiosity The rectangle is submerged, and the number of vehicles is zero incremented. The process is simple to follow, although it does have some drawbacks. Occlusion and shadow overlaps are not handled.

III. PROPOSED METHODOLOGY

Our suggested system uses image processing and object identification to create real-time traffic density designs utilizing images from CCTV [9] cameras at traffic intersections.

This image is sent into the YOLO-based vehicle identification algorithm. Each lane's number of vehicles, such as cars, bikes, buses, and trucks, is counted calculate the traffic density [10] The signal reversal This density, along with a few other parameters, is used by the method to Set the timer for each lane's green light. The timings of the red signal are altered as a result. The duration of the green signal is limited to a certain amount of time. To avoid famine, provide a maximum and minimum value of a certain lane A simulation is also being created. determine the system's efficiency and compare it to other systems.

For vehicle detection, the suggested system employs YOLO (You Only Look Once), which provides the requisite accuracy and processing speed. A one-of-a-kind YOLO model was created trained in vehicle detection, which can identify a variety of vehicles automobiles, bicycles, and heavy vehicles (buses and trucks) are among the several classifications. ricksha, and vehicles. the image in the sense that it only necessitates one run through the neural network for forward propagation to make an educated guess Following non-max suppression (which results in unquestionably, the object detection algorithm.

The algorithm sets the timings for all other signals in the first cycle and all signals in subsequent cycles. A second thread [11] has been launched that changes the detection of cars for each thread's direction and main thread handles, as well as the timer the currently active signal When the current green light timer expires, signal (or the following green signal's red-light timer) ranges the detecting threads take a snapshot of the screen after 5 seconds. the following step [12] After that, the data is processed, and the timer is started. It's time to issue the next green signal. All of this will take place in in the background, the main thread is ticking down to the deadline. Current green signal timer. When the current signal's green timer reaches zero, the following signal turns green for the time period determined by the algorithm.

When the time of signal that turns green next is 5 seconds, the image is taken. The machine will have a total of 10 seconds to progress the image and detect the number of people. calculate the green for each kind of car in the picture time of signal, and as a result, the time of this signal as the following signal's red signal time to locate the based on the number of cars, the best green signal timing at a signal, of each class, as well as the average speeds of those vehicles.

The average speeds of cars at start-up and their acceleration periods were utilized to calculate the average time it takes each vehicle class to accelerate. A cross s junction was discovered. The moment for the green light is now. computed with the help of When the algorithm is executed for the first time, the default time is set to the

first signal of the first cycle, and the default time is set to the first signal of the second cycle. all other signals from the first cycle and all signals from the second cycle the algorithm determine the subsequent cycles.

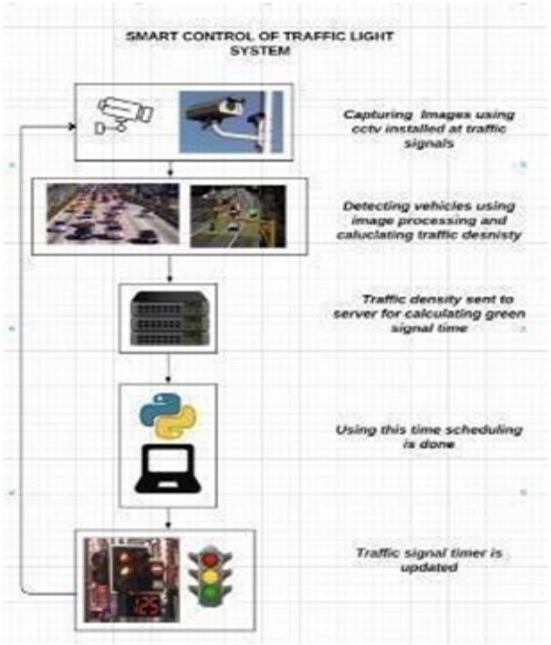

Fig 3.1.flow chart of the proposed system

Comparing it to a static system already in place.

The number of vehicles that have crossed the intersection is also displayed next to each light. Automobiles, bicycles, buses, and trucks are examples of vehicles.

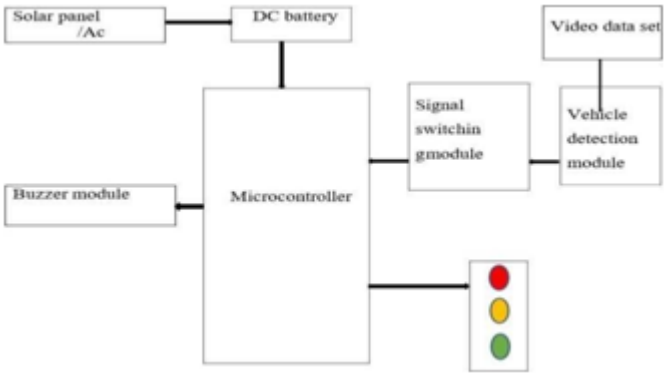

Fig3.2 Block Diagram

Some of the vehicles in the rightmost lane turn to cross the intersection to make the simulation more realistic. When the vehicle has generated, random numbers are used to determine whether the vehicle will turn or not. It also has a timer start, which is the average amount of time it takes to cross the signal.

A new thread has been started that switches the detection of vehicles in each direction, as well as the main thread handles and the current signal's timer. When the current signal's green light timer (or the following green signal's red-light timer) reaches 5 seconds, the detecting threads snap a screenshot of the next direction. After that, the data is examined, and the timer for the next green signal is set. All of this will happen in the background while the main thread counts down the current green signal's timer.

IV .CONCLUSION

Finally, the proposed system changes the green signal time based on traffic density at the traffic light, guaranteeing that the direction with the most traffic has a green signal for a longer period of time than the direction with the least traffic. This will reduce inconvenient delays and congestion, as well as waiting periods, while also reducing fuel use and emissions.

According to simulation data, the system improves the current system by roughly 23% in terms of the number of vehicles crossing the intersection, which is a significant improvement. This method can be improved even more by calibrating it using real-life CCTV data to train the model CCTV cameras from traffic signals as used, and not required additional hardware in most cases, as intersections with a heavy traffic are already prepared with such cameras. Only minor alignment may need to do performed. The maintenance cost also getting down as compared to the other traffic monitoring systems such as pressure mats that normally suffer from wear and tear due to their placement on roads where they are subjected to the immense pressure constantly. Thus, the proposed system can be integrated with the CCTV cameras in major cities order to facilitate well management of traffic. The project can be further expanded to include the following stationary for a long time in an inappropriate position such as in the middle of a road, so that parked vehicles are not included in this.

Organization of traffic signals across the multiple intersections: Synchronizing signs along a street can benefit the commuters as the once a vehicle enters a street, it may continue with the minimal stopping.

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