Smart Traffic control System

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***Abstract*—** Traffic light control systems are widely accustomed monitor and control the flow of automobiles through the junction of the various roads. They aim to understand smooth motion of cars within the transportation routes. However, the synchronization of multiple light systems at adjacent intersections is also a sophisticated problem given the numerous parameters involved. Conventional systems don't handle variable flows approaching the junctions. additionally, the mutual interference between adjacent light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and also the crosswalk don't seem to be implemented within the prevailing traffic system. This ends up in holdup and congestion. We propose a system supported PIC microcontroller that evaluates the traffic density using IR sensors and accomplishes dynamic timing slots with different levels. Moreover, a transportable controller device is supposed to resolve the matter of emergency vehicles stuck within the overcrowded roads. the planning of intelligent system may be a lively research topic. Researchers around the world are inventing newer approaches and innovative systems to resolve this stressful problem. Models supported mathematical equations are applied to estimate the car waiting time at a junction, the amount of cars within the waiting queue, the extension of the waiting cars along the lane, the optimal timing slots for green, yellow, and red lights that best fit the $64000 and veritable situation and also the efficient combination of routing. In fact, the mutual dependencies between nearby intersections lead to a classy formulation with cumbersome parameters. These parameters are accidental, hazardous, dependent, and also the more severe point is that the variance of these parameters with time.

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Keywords: Intelligent Transportation Systems; Computer Vision; Machine Learning; Wireless Sensors; Traffic Control; IR sensor;

I. INTRODUCTION

The growth of industrialization and concrete population causes the tremendous increase within the traffic. Traffic management has become one amongst the severe problem today. With the rise in traffic there arise variety of problems like heavy traffic jams, ,violation of traffic rules, long waiting times, loss of fuel and money etc. it's therefore necessary to own a quick, economical and efficient control system .The problems of conventional light Controller are as mentioned

A. Wastage of Time in Heavy Traffic Jams
With increasing number of vehicles on road, heavy Traffic jams are happened usually at the foremost junctions commonly within the morning, before office hour and within the evening, after office hours. the foremost effect of this is often often increased stonewalling of the people on the road. the solution for this issue is different time delay settings for red, orange and green signals at different terminal. The delay for junctions that have high volume of traffic should be set longer than the delay for the junction that has low traffic heavy.

B. Need to wait at no traffic
People must wait at certain junctions, whether or not there is not any traffic. Because the stoplight remains red for the preset quantity, the road users should wait until the sunshine turns green. the answer of this problem are visiting be obtained by developing a system which detects traffic flow on each road and set timings of the signals accordingly.

C. Emergency vehicle stuck in traffic jam
The emergency vehicle, like ambulance, fire brigade etc. get struck within the holdup. this is often because the road users sit up for the light to show green. this is often very critical problem because it can cause the emergency case to become complicated, involving life.

D. Detect the stolen vehicle
To detect the stolen vehicle is a very difficult task, the stolen vehicle can be found only by its number and it is a bit tedious task

II LITERATURE SURVEY

Traffic Congestion may be a major issue of transportation in most of all the cities of developing Countries. this is often very true for countries where population is increasing at higher rate. there's phenomenal growth in vehicle population in recent years. As a result, many of the arterial roads and intersections are operating over the capacity and average journey speeds are less than 10 Km/h at the height hour. the most challenges are management of regularly increasing vehicles, annual growth of 7–10% in traffic, roads operating at higher capacity , less travel speed at some central areas in

peak hours, insufficient or no car parking zone for vehicles, limited number of policemen. Currently a video traffic surveillance and monitoring system is employed in most of the cities. It involves a manual analysis of information by the traffic management team to see the stoplight duration in each of the junction. It will communicate the same to the local police officers for the necessary actions[1]

REVIEW OF PREVIOUS WORK

For congestion detection several technologies have been proposed such as inductive loop, magnetometer, visual camera, radar etc [2].

Inductive Loops -They are going to be placed on the roadbed work on all traffic speeds and are effective at estimating traffic speeds. They require maintenance and installation is reasonably difficult. along with these disadvantages, they're at risk of high error rate in detection and transmission of traffic information.

Visual Camera-Cameras are used as taking in sensors which collect actual time traffic condition data and analyzed these conditions to provide real time outputs. In bad weather conditions they are not working.

Conventional traffic signals- These traffic signals are programmed with a set timer. they are doing not consider the amount of the traffic on the road before taking a choice of green or red light. Hence if the amount of traffic is large, it should end in accumulation of traffic on the road and also the junctions

Micro controller Based Traffic Signals- The micro controller-based light system allocates green, red & yellow signal time for every one path. When the vehicles along one path will move , the other vehicles from the other path will stop at road intersection control. with none collision microcontroller based light system direct the movement of vehicles meeting at a road junction . When the time allocated for a specific path has been exhausted, the red light are ON meaning stop and also the subsequent line are ON (green light) which means the vehicle therein path should start moving. When the time is on the subject of be exhausted, the light are ON within the third path informing the vehicles therein path to be ready to move, and after some seconds the green light are ON.. Disadvantage of Micro controller Based traffic system is light timing is fixed.

METHODS

The works reviewed during this paper were selected and analysed supported the subsequent criteria:

a) Approaches wont to make traffic routing and lightweight signal allocation decisions. for example adaptive (learning) versus non-adaptive strategies; offline versus real time strategies; and hybrid strategies.

b) Number and types of parameters/variables (input and output) used. We review systems that use single variables (e.g. traffic quantity) and ones that use several variables (e.g. traffic quantity, waiting time, past and present traffic data knowledge) to make traffic routing decisions.

c) Traffic data collection methods used (such as sensor types) and communication methods tested (such as multi-hop or single-hop) to pass on collected data.

d) STCS that control traffic at an isolated junction or various crossing junction or both..

Relevant Algorithm

Input:
Max-red denotes the maximum time for which the signal can be red.
Min-freq-count denotes the minimum frequency of vehicles passing per second stored statically in controllers.
Act-freq-count denotes the actual frequency of the vehicles passing per second = ∑vehicles/second.

Timer denotes the actual timer count.
Algorithm:
1. When the signal turn green.
While (Timer<Max-green and Timer is not 0) do
If (Act-freq-count>Min-freq-count)
Keep the signal green.
Decrement timer count by 1.
Else if (Act-freq-count<=Min-freq-count)
Goto 2.
End
2. Make the signal red. Turn the adjacent signal green.
Go to 1.
Desired Output: Effective congestion management

SYSTEM DESGIN:

This section explains in details how the project was reached. All hardware and software components which will be used are going to be explained during this section of the report. Problems encountered and solutions to those problems won't be mentioned during this section of the report.

Project Overview

In our proposed System, four cameras at one junction of a four-way road are going to be installed. Individual camera will monitor one lane. Cameras will continuously collect the recordings. A system which is centralized for the all four cameras are going to be connected with these cameras. By using Visual C++ software and Intel's OpenCV video stream counting can be done. The analysis on the recordings (i.e. Image Processing) should be parallel and synchronized for the effective decision making. The processed output which is number of vehicles is feed to the system which would be allocating resources to each lane using proposed adaptive algorithm. Generally, the traffic system is controlled by three signal lights- green, red and yellow . The reason why traffic congestion (commonly termed as traffic jams) occurs

is increasing number of vehicles and poor management of traffic algorithms. There is no fixed infrastructure for every junction, street and road which leads to loopholes in construction of fixed timing algorithms. Previously, human administrated or automated offline softwares were used for computation of time slots given to each signal at traffic signals. But these timings used to fail at specific times of the day or particular days(festivals etc.), which led to the development of self-automated online systems which continuously sense the environment and compute the timings to be given to traffic signal at a particular instant. Our objective here is to construct such dynamic system algorithm which alleviates the traffic at traffic junctions leading to smooth movement of traffic flow.

The Research Stage

The research stage was a critical stage that provided our team with the knowledge necessary to finish the opposite stages of our project. This stage was an ongoing process that our team had to return to several times during the event process to achieve the knowledge needed to continue on with the project. Our research encompassed a large range of sources, including studies done at different universities and hobby enthusiast sources. Our research included the different form of the modules and sensors which is employed during this project .This project contain use of the aurdino uno and cameras. On Tuesday the 30 of July 2019 the primary experiment of a light regulated by 100% "connected" vehicles was carried on at University of Calabria (Unical) with the assistance of common commercial smart phones by a team of researchers working for Unical and therefore the innovative begin SOMO. Meanwhile, within the uk, lights that change to red when sensing that an reaching motorist is traveling too fast are being trialled in Swindon[2] to work out if they're more practical at reducing the amount of accidents on the road than the speed cameras that preceded them and which were removed following a council decision in 2008. These lights are more focused on encouraging motorists to obey the law but if they persuade be a hit then they may pave the way for more sophisticated systems to be introduced within the UK.

Machine Learning Framework:

Machine learning and intelligence are being practical in various ways for tackling difficult confronts in many fields including transportation, energy etc. an honest machine learning based system requires all elements like sensors and data analytics capability to come up with good results. a higher understanding of the new technology is additionally important before system implementation to attain high order performance for traffic monitoring and management. For an accurate prediction of traffic information in real time like flow, density, speed included intelligent control systems to optimize the vehicle operations.

4. APPLICATIONS

4.1 Detection and Management of traffic Congestion

In addition to the sooner method of tie up detection, yet one more method may be used. A server may be maintained which might receive certain crucial data calculated by the Controller of the signals. the most aim is to implement a system that will trace the period of time of individual cars as they pass the roadside controllers and compute a median trip time employing a rule-based system to make a decision whether the world is congested or uncongested. If congestion is sensed then system would control traffic signals / generate automatic re-routing messages to chose approaching vehicles.

4.2 Automatic detection of speed limit violation

We can use this system to calculate the speed of a motorist and to detect if he violates the prescribed/set speed limit. If the motorist violates the rule, a warning message are going to be sent to the motorist via audio and/or video combination and cost are going to be calculated within the server and billed monthly to the vehicle owner [3]..

4.3 Automatic Billing of Core Area / Toll-Charges

Automatic toll collection and automatic ―core area charge‖ collections are done using the exact framework. Controller unit are placed at toll-booth and along the motor able roads round the core area which can detect each individual vehicle uniquely within its zone by capturing their device ids and can keep records of the time during which the vehicle was seen by those Controllers within its reading zone. This information are sent to a main server. Accordingly the most server will calculate the costs and lift bills against the vehicle ids .

Methodology

Now a days traffic density on the streets increasing round the world tremendously . It causes several problems on the day to day lifetime of people. As we all know that it's the age of speed, so nobody wants to attend for a protracted time at any cost. Everybody prefers to low traffic density streets. This proposed system introduced a vehicle density-based control system to avoid above problem. This problem may be resolved by controlling the traffic density on the roads. this technique introduces a replacement method to regulate vehicle density by controlling the traffic lights using Image processing. Vehicle density is measured using predefined classifiers available in image processing. If the measured density is above the normal density (threshold value) it passes an indication to the micro controller which controls the projector and thereby we can give appropriate traffic signal to LCD display. Machine learning is an application of Artificial Intelligence (AI) that provides

systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly. Machine learning algorithms are often categorized as supervised or unsupervised. This system uses open CV as a software, and uses the concept of image processing. It is used to detecting the density of traffic on road and according to the density we are controlling the traffic. The language used here is C++ and python. Since we are using Open CV the entire cost of the project is minimized, easy setup, good accuracy and speed. There for the traffic signaling system become automatic using image processing through Open CV. Machine learning is used to teach system. Input (picture of vehicles) is given to training models. System will identify vehicles through machine learning . After identifying the vehicles , it counts the number and according to the density a dynamic timing is set.

RESULT

In our system we've got successfully implemented the vehicle detection using image processing and machine learning methods. this technique uses open CV as a software, and uses the concept of image processing. it's wont to detecting the density of traffic on road and in line with the density we are controlling the traffic. The language used here is C++ and python. Since we are using Open CV the complete cost of the project is minimized, easy setup, good accuracy and speed. There for the traffic signaling system turn into automatic using image processing through Open CV. Machine learning is employed to show system. take in (picture of vehicles) is given to training models. System will identify vehicles through machine learning . After identifying the vehicles , it counts the amount and in line with the density a dynamic timing is about. .

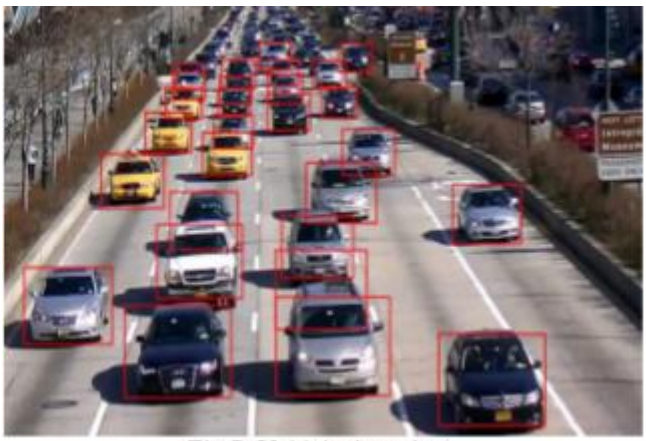

Fig 7: Vehicle detection.

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CONCLUSION AND FUTURE WORK

We divided our thesis work into two parts. At first, we've successfully detected moving vehicles from a video input. We discussed our work step by step during this paper. We briefly identify the functions which are necessary for real-time computer vision. However, because of inadequate datasets of the variant vehicles in Bangladesh, we couldn't approach the SVM method which could yield more accurate result. We managed to assemble dataset of other countries which didn't work on the video sample we used, thanks to different model of cars. the following part was about dynamic control. Number of cars in specific region will calculated by the inequality of entering and leaving vehicles. Then we calculate the density at any point by dividing the amount of cars during this lane by the length and width of the lane. We set a logic for controlling the traffic signals by setting a few rules. While working within the detection part, we noticed detecting vehicles within the dark wasn't very accurate.Our system can detect object when there's sufficient amount of sunshine. We are looking forward to repair the matter in future. Priority was given to emergency vehicles. We arrange to provide separate priority for emergency vehicles in future. so as to urge better result, our future work includes, collecting datasets and models of all kind of vehicles. Once they're collected we will train the model to present better detection capability. the longer term add this project could also be on number plate recognition, detection of speed. we will use 3Dprojecters or hologram to display the light. so we will easily identify the signal and violations in traffics may be easy identified. we will also include advertisement of holograms.

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