International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.488 |

||Volume 8, Issue 7, July 2020||

Automated Traffic Control System Using Traffic Video Analysis

Shobha B S[1], Vivek Bharadwaj K[2], Rakshith C[3] , Kavana B[4] , Alisha Macanza M[5]

Assistant Professor, Department of CS&E, Maharaja Institute of Technology, Mysore, Karnataka, India[1]

UG student, Department of CS&E, Maharaja Institute of Technology, Mysore, Karnataka, India[2]

UG student, Department of CS&E, Maharaja Institute of Technology, Mysore, Karnataka, India[3]

UG student, Department of CS&E, Maharaja Institute of Technology, Mysore, Karnataka, India[4]

UG student, Department of CS&E, Maharaja Institute of Technology, Mysore, Karnataka, India[5]

ABSTRACT: Software Requirement Specification (SRS) is a fundamental document, which forms the foundation of the software development process. SRS not only lists the requirements of a system but also has a description of its major features. A system requirement is one of the main steps involved in the development process. The result of the requirement specification document states the intention of the software, properties and constraints of the desired system.

This application requires a real-time, high quality and a fast video processing technique. All the modules used in this application should be capable of generating accurate and quick results for the entire application to work smoothly. This application should be reliable, available, secure, portable and easily maintainable.

I.INTRODUCTION

The basic mode of transportation for limited distances is mostly through road ways. As the problem of urban traffic overcrowding spreads, there is a pressing need for the introduction of advanced technology and equipment to obtain a state-of-the-art traffic control system.

Traffic flow monitoring and traffic analysis based on computer visualization techniques, and specially traffic analysis and monitoring in a real-time mode raise valuable and complicated demands to computer algorithms and technological solutions. Most realistic applications are in vehicle tracking, and the critical issue is initiating a track automatically. Traffic analysis then leads to reports of speed violations, traffic congestions, accidents, or against the law actions of road users.

A variety of approaches to these tasks were suggested by many scientists and researchers. The approach in our proposed project focuses on methods of image processing, pattern recognition and computer vision algorithms. One of the most important aspects is to modify these algorithms to fit to real-time road monitoring processes. Technically this scheme is based on stationary video cameras as well as computers linked to wide area network. The video is broken into frames. Then, the vehicle is detected in the image and tracked. Based on the density of vehicles, the traffic signal is altered.

Green Corridor is a new concept where all the roads in the path of an emergency vehicle are cleared prior to the arrival of the emergency vehicle so that the emergency vehicle can move rapidly through the roads. The proposed approach also aims at creating an automated green corridor on detecting an emergency vehicle at the traffic junction. Thus, reducing the large manpower used to create Green Corridor manually.

II.RELATED WORK

1. Omkar Ramdas Gaikwad and others:- ““**Image Processing Based Traffic Light Control**” The approach described in this paper does not actually measure the number of vehicles present on the road, but measures the area covered by vehicles on the road. Moreover, for implementing the approach described in this paper, following steps must be considered: 1) image acquisition 2) RGB to grayscale transformation 3) image enhancement. This technique makes the use of Image processing. In this technique there will be drawing of green color lines at an arbitrary distance. The reason for plotting only green colored lines or strips is that these strips have to be detected through camera and there are very

less number of vehicles that are painted in green. Camera would be placed at the signal which would be focusing on the lines drawn. If the specified lines get cut for a specific interval of time then green pixel area of the image reduces. Accordingly traffic density at a particular signal is done. If all three lines are visible then it means that there is very low traffic on the road and thus the timer is adjusted to show less time say 20 seconds. Now if two lines are visible then number of vehicles on the road is increased as compared to initial situation and timer is now adjusted to show some more time say 25 seconds. If no strip is visible then it means that traffic is more and controllers have to increase traffic timer.

2. Joseph Redmon:- "**YouOnlyLookOnce Unified, Real-Time Object Detection**" According to this paper, Prior work on object detection repurposes classifiers to perform detection. Instead, YOLO approach will frame object detection as a regression problem to spatially separated bounding boxes and associated class probabilities. A single neural network predicts bounding boxes and class probabilities directly from full images in one evaluation. Since the whole detection pipeline is a single network, it can be optimized end-to-end directly on detection performance. YOLO outperforms DPM (deformable parts model) and R-CNN (Region Convolutional Neural Network) achieving double mAP compared to them in Real-Time Object Detection. YOLO makes less than half the number of background errors compared to fast R-CNN. YOLO is a fast, accurate object detector, making it ideal for computer vision applications. YOLO can be connected to a webcam and verify that it maintains real-time performance, including the time to fetch images from the camera and display the detections. The resulting system is interactive and engaging. While YOLO processes images individually, when attached to a webcam it functions like a tracking system, detecting objects as they move around and change in appearance.

3. Nazia Aslam, and others "**Foreground Detection of Moving Object Using Gaussian Mixture Model**" They educated us about "Gaussian Mixture model" for background subtraction/foreground detection that has been applied which computes a foreground mask on a moving object. The blob (binary large object) analyzer has also been used to identify region in a binary image. The result shows that the proposed algorithm can detect the moving object effectively while occluded by the box. The Background Subtraction method is chosen for the real time segmentation of a moving object because it is one of the important/popular method. The detection of a moving object is obtained from the difference between the current frame & the reference frame or background image.

4. Ms.Pallavi Choudekar and others "**Real-time traffic light control using image processing**" Automatic traffic monitoring system is important for road usage and management. Traffic parameter estimation has been an active research area for the development of intelligent transportation system. Various sensors have been employed to estimate traffic parameters for updating traffic information. Parameters to determine image congestion are speed of vehicle and count of vehicles in the concerned area. This paper aims to achieve the following: distinguish the presence and absence of the vehicle in the image, signal the traffic light to display red if the road is empty and finally, signal the red traffic light if maximum time for green light has elapsed even if there are still vehicles present on the road

5. Anju Jaison and others "**Time To Cross – Traffic Light Control System using Image Processing**" According to this paper, the work is dividing into 4 parts. The first part is to process the video signal of pedestrian and vehicle captured through the existing cameras using Image Processing. The second part is to changing timer according to density of the traffic after the image processing. The third part is to send the signals to the Microcontroller for control the traffic lights. The final part of this work is to send the signal tothe speaker to notify the people about the traffic light. A system having the cameras which connected to the processor is installed on the traffic light. In a traffic light area two cameras are installed, one is to monitor the vehicles on a lane and other is for pedestrians. Camera will give the traffic images to the processor. In processor, Image Processing algorithms were there which will process the image to extract out the needful information in short span of time.

6. PrakashUthara E. "**Density Based Traffic Control System Using Image Processing**" According to this paper, a webcam is used in each stage of the traffic light controller in order to take pictures of the roads where traffic is bound to occur. Count of vehicles in these images is calculated using image processing tools in Matlab. Traffic congestion is a common problem, In order to deal with this problem, there are many solutions. This problem can be solved to a great extent by implementing this density based traffic control system using image processing. The system uses image processing techniques such as background subtraction in order to find the count of vehicles present on the road. The proposed system is implemented in Matlab with an objective to reduce the traffic based on density. Four main steps: a) image acquisition b) RGB to grayscale transformation c) image enhancement and d) morphological operations. Including there some more steps i.e.

e) Threshold f) vehicle counting g) foreground detection h) time allocation. The weather conditions are not taken into account which may affect the image quality when it becomes foggy or in heavy rains. More advancements can be made to the proposed system to check identification of vehicles that pass through.

III.METHODOLOGY

A.*BLOCK DIAGRAM*

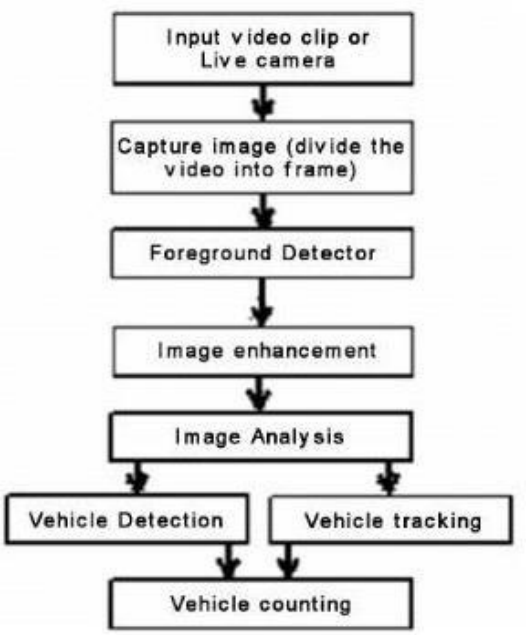

Fig 1:Methodology

1) Capturing Image:

The captured image from the live camera that can take pictures every 10 seconds. Our project also records video and divides it into frames and takes a frame every few seconds.

2) Foreground Detection:

Foreground Detection is considered as the most important functions in this project. It plays a big role in the filter and detection of the ground. Foreground is detected using Gaussian Mixture Models (GM- M). During Foreground Detection, the image is converted from "RGB" to "Grayscale" and then to "Binary" and applies filters at different levels. Converting images to binary type is done by replacing all pixels according to the specified luminance level with either white (logical 1) if the pixel is equal to or greater than the level or black (logical 0) otherwise. Specified level should be in the range [0, 1].

3) Image Enhancement :

Image enhancement is the process of altering digital images so that the results are more suitable for display or further analysis. For example, elimination noise, which will make it easier to identify the object. Image enhancement is used in image detecting and video detecting. First step is removing small connected components and objects from binary image. These objects have fewer pixels than the specified threshold Example: if the threshold is equal to 10 PIXEL then if the object's size is below 10, it is removed. Removing the noise in the image is one of the most important and most difficult task of the pre-handling techniques, but after that it will make the work easier.

Second step is the dilate process that will enlarge/smoothen the white areas and fill in black areas near borders/perimeters.

Third step is by make road process it will enlarge the black areas and eat away at the white areas.

4) Vehicle Detection :

Moving vehicle detection is in the video analysis. It can be used in many regions such as video surveillance, traffic monitoring and people tracking. There are many motion segmentation techniques, like frame difference. Frame difference method has less computational complexity, and it is easy to implement. The difference between the current

frame and the reference frame (whose threshold is considered) is used to differentiate a moving vehicle. Another method is the Optical flow method that can detect the moving vehicle even when the camera moves, but it has more computational complexity, and it is very sensitive to the noise.

5) Vehicle Tracking :

Vehicle tracking involves continuously identifying the detected vehicle in video sequence and is done by specifically marking the boundary around the detected vehicle. Vehicle tracking is a challenging task. Difficulties in tracking vehicles can arise due to abrupt vehicle motion, changing appearance patterns of the vehicle, vehicle-to-vehicle.

6) Counting Vehicle :

It is the last stage in our project, it computes the number of vehicles according to the number of boundaries (vehicles) in the image

B.MODEL SET UP

The Live video recorded from the camera installed on the traffic signal is streamed directly and continuously to the application.

The Live video is also uploaded to the cloud simultaneously.

The application first extracts the frames from the video and detect the objects in the frames.

Then the weights of the identified objects are compared with the weights stored in the database to classify the type of vehicle.

If an active emergency vehicle i.e an emergency vehicle carrying a patient is identified by the application, then the green corridor module is activated where an existing network of traffic lights are altered so that a green corridor is created for the emergency vehicle.

Else the density of vehicles at a particular lane is obtained and the traffic lights are controlled.

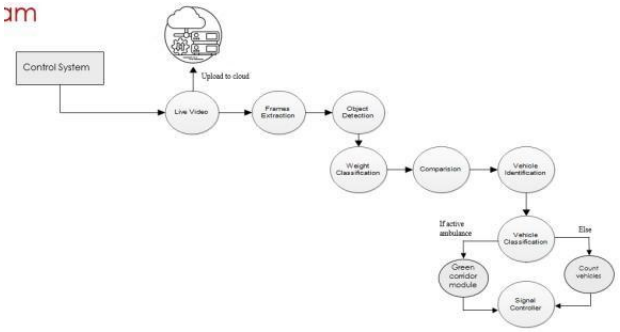

Fig 2:Activity Diagram

IV.RESULT AND DECISION

In our project the input video is initially broken down to frames and each frame is classified as either emergency vehicle or normal. If the result is emergency vehicle, then the green corridor module is activated.

The project aims to efficiently identify the vehicles at the traffic signal intersection.

The vehicle count is then obtained and if the count is greater than a pre-defined threshold value, that particular path will get a green signal.

On identifying an emergency vehicle, immediately the green corridor module is activated.

In the green corridor module, the position of the emergency vehicle is detected on the road and the next path chosen by the emergency vehicle driver is identified.

Upon identifying the next path, the traffic signals in that next path is cleared (green signal).

Thus green corridor is created for the emergency vehicle or any other emergency vehicle

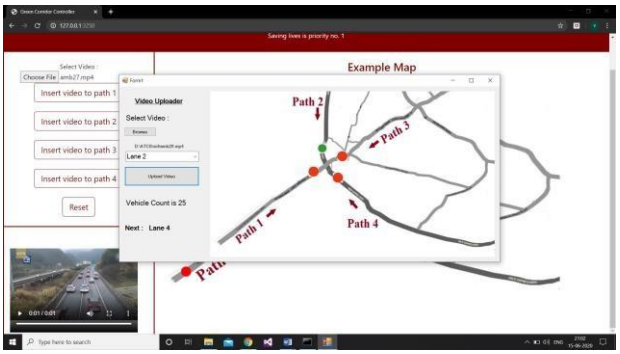

Fig 3:Traffic Video Analysis Using Traffic Video

V.CONCLUSION AND FUTURE WORK

Our motivation for the project is to develop an efficient Traffic Light Control System based on Real-Time Image Object Detection. YOLO is an efficient approach for detecting Real-Time objects. Since the current approaches used to control traffic lights such as timer based traffic light controllers, electronic sensors based traffic light controllers and Laser based traffic light control systems are not efficient approaches as they are not either real-time approaches or they are slow in their real-time processing, Our project aims to be a fast real-time object processing system to regulate and control the traffic control in an efficient manner. Traffic management at traffic intersections where traffic signals are installed is a huge task to be performed manually when there are very large number of vehicles. Mismanagement of the traffic flow at these junctions can cause severe traffic jams. Furthermore, at the intersections where a timer based traffic signals are installed commuters may face long unnecessary waiting times. This results in loss of time, fuel & money and ultimately feeds to the growing population rate. Green corridor is a new concept where an emergency vehicle will be provided with a free road without any traffic so that the emergency vehicle can move rapidly on the road and reach the required destination in as minimal time as possible. The proposed systems performs smart management of traffic at the traffic signal intersections. This system monitors the vehicles at the intersections and identifies the vehicles and obtains the count, if the count is greater than a pre-defined threshold value, that path will be given green signal. The other main aspect of this project is the green corridor creation on detecting an emergency vehicle at the traffic signal intersection. Creation of Green corridor manually requires a lot of manpower. This system creates a completely automated green corridor system whenever necessary.

REFERENCES

[1] Omkar Ramdas Gaikwad, Anil Vishwasrao, Prof. Kanchan Pujari,Tejas Talathi Image Processing Based Traffic Light Control, IJSETR, 2014.

[2] Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi, YouOnlyLookOnce: Unified, Real-Time Object Detection , Computer Vision and Pattern Recognition, 2016.

[3] Nazia Aslam, and Veena Sharma, Foreground Detection of Moving Object Using Gaussian Mixture Model International Conference on Communication and Signal Processing (ICCSP), 2017

[4] Chandrasekhar. M, Saikrishna. C, Chakradhar. B, Phaneendra Kumar. P & Sasanka. C, Traffic Control Using Digital Image Processin, IJAEE, 2013.

[5] Anju Jaison, Evita Varghese, Gopika K G, Krishnadas JTime To Cross – Traffic Light Control System using Image Processing , IJRET, 2018.

[7] Pallavi Choudekar, Ms.Sayanti Banerjee, Prof.M.K.Muju, Chirag Thakkar, Rajesh Patil, Real Time Traffic Light Control Using Image Processing

[8] Senthilkumar .K, Vijayan Ellappan and Arun A R, Traffic analysis and control using image processing, IOP Conference Series Materials Science and Engineering 263(4):042047, November 2017

[9] Prashant Jadhav, Pratiksha Kelkar, Kunal Patil, Snehal Thorat, Smart Traffic Control System Using Image Processing , IRJET, 2019.

[10] Uthara E. Prakash, Athira Thankappan, Vishnupriya K. T., Arun A. Balakrishnan, “Density Based Traffic Control System Using Image Processing”, International conference on Emerging Trends and Innovations in Engineering and Technology.

[11] Nandu Rathi, Radha M, Sugita Tu, Tarani V, V Kartekeyan, Intelligent Traffic Control System for Congestion Control, Emergency Vehicle Clearance and Stolen Vehicle Detection , Asian Journal of Applied Science and Technology (AJAST), 2017.

[12] King, Eoin, Lagler, Acoustic-Based Emergency Vehicle Detection Using Convolutional Neural Networks

[14] Yuandong Tian, Wan-Yen Lo, David Ian Franklin Ferguson, Real-time active emergency vehicle detection, Patent No: US20160252905A1.

[15] David Agnew, Stefan Lüke, Marc Fischer, Dieter Krökel, Emergency vehicle detection with digital image sensor , Patent No: US20150161458A1.