International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

UNMANNED TRAFFIC SIGNAL MONITORING SYSTEM

Nivedhitha P[1], Pavithra K[2], Reshma A[3], Sunitha K[4]

[1,2,3,4]*UG Students, Department of IT, SRM Valliammai Engineering College, Tamilnadu, India*

Abstract - *One of the predominant causes of traffic congestion is due to the population of the city and the increasing number of vehicles. This problem affects many aspects of the modern society, traffic accidents, time spent, health damages and the resources provided by the current infrastructures are limited, which leads to ineffectual traffic -management system. The current traffic light controllers are the use of predefined hardware, which does not have flexibility of modification as it functions according to the program. It needs an initiation of emerging technology and a better perspective to improve the current traffic condition. This proposed framework encompasses a shift towards image processing integrated with real time traffic density calculation. The images of road feed from the cameras (PC Camera) at traffic junctions for density calculations in order to switch the traffic lights according to vehicle density. In general sensors are embedded in the pavement but they require high maintenance and high installation cost so in this proposed system the camera will be placed alongside the traffic light. Image processing is a technique which is used to control the state change of the traffic light. This decreases the traffic congestion and reduces the time being wasted on empty road. The red signal becomes the green signal when the ambulance arrives by using ZigBee. With the help of ZigBee the all the red signals will be turned to green in order to provide a clear way for emergency vehicles (Ambulance). In addition the template of the particular vehicle violating the traffic rules gets captured and relevant actions will be taken. Thus, the proposed system is an enhancement of conventional timer based operations of traffic lights.*

Key Words*: *Traffic Density Calculation, Image Processing, Zigbee, Traffic Light Control, Traffic Congestion, Computer Vision

1. INTRODUCTION

Economic development of any nation depends upon the growth of transport mediums. A well-developed transportation is implemented in all developed nations. Traffic jam is a very big problem in developing cities, the root cause of this can be of different situations like congestion in traffic like insufficient road width, damages of road due to weather conditions, excess time delay of red signal etc. Hence traffic congestion leads to long waiting hours along with fuel and money wastage. The Automation is introduced to improve the traffic flow and the safety of the transport system. Therefore, the need for simulating and enhancing traffic control to persuade increasing demand. Image processing is used to achieve traffic density estimation.

1.1. OBJECTIVE

To develop an intelligent traffic system for ensuring the road safety by avoiding vehicle collision and developing an automatic control of traffic signal. The system prioritizes traffic according to real time changes in traffic conditions.

1.2. BENEFITS

Automatically changes the red light to green light when the ambulance approaches the signal and provides a clear way. It also minimizes the fuel consumption and provides a way to reach the destination quicker than before, thereby reducing the manpower in controlling the traffic. Avoids congestion by reducing the time being wasted by a green light on an empty road.

1.3. CHALLENGES

Most of the traditional traffic systems have a major challenge in providing a way for the emergency vehicles. Poor visibility of cameras during bad weather conditions reduces the efficiency of traffic monitoring and control.

2. LITERATURE SURVEY

The recent technologies help in monitoring and tracking the traffic systems. The enhanced IoT technology paved a way to monitor traffic signals in the contemporary world. The following works provide in depth understanding of the concepts of Traffic signal monitoring in IoT.

[1] Jess Tyron G. Nodado, Hans Christian P. Morales, Ma Angelica P. Abugan, Jerick L. Olisea, Angelo C. Aralar,"INTELLIGENT TRAFFIC LIGHT SYSTEM USING COMPUTER VISION WITH ANDROID MONITORING AND CONTROL", IEEE Region 10 Conference (Jeju, Korea, 28-31 October 2018)

Jess Tyron G. Nodado et.al proposed a method in developing Traffic signalling system capable of prioritizing congested lanes based on real time traffic density data and

integrated with an automated and manual control ported in a mobile android based application "e-Trapiko" that aided traffic enforcers in their supervision of traffic flow operation present in intersection. The developed system achieved a vehicle detection rate of 92.84% and 85.75% for daytime and night time operations respectively.

[2] Prashant Jadhav, Pratiksha Kelkar, Kunal Patil, Snehal Thorat," SMART TRAFFIC CONTROL SYSTEM USING IMAGE PROCESSING", International Research Journal of Engineering and Technology (IRJET) , Volume: 03 , Issue: 03, Mar-2016

Prashant Jadhav proposed the method for traffic congestion by using Mat lab software. Moreover, for implementing this project image processing technique is used. The proposed techniques used here are Blob Detection, Optical Character Recognition (OCR). According to the processed data from mat lab, the controller will send the command will send the command to the traffic LEDs to show particular time on the signal to manage traffic.

[3] Swathy S Pillai, Radhakrishnan B, "DETECTING TAIL LIGHTS FOR ANALYZING TRAFFIC DURING NIGHT USING IMAGE PROCESSING TECHNIQUES", International Conference on Emerging Technological Trends, 2016.

The IoT application categorisation as proposed in this paper has forward facing colour camera used in automatic cruise control (ACC) systems which are implemented with active sensors. The camera configuration is done in such a way that the appearance of rear lamps is suitable for segmentation. This paper focuses on night time vehicle detection by tail lights using image processing techniques.

[4] Shabnam Sayyed, Prajakta Date, Richa Gautam, Gayatri Bhandari," DESIGN OF DYNAMIC TRAFFIC SIGNAL CONTROL SYSTEM", International Journal of Engineering Research and Technology (IJERT), Volume 3, Issue 1, Jan 2014.

Shabnam Sayyed proposed the technique 'Dynamic Traffic Signal Controller'. In this proposed method it has two parts, the first part is designing of program which consists of data collection, sorting, calculation of percentage and automatic evaluation of signal time. The second part is web application designed to provide traffic alerts for road users and take measures to avoid congestion.

[5] Pezhman Niksaz, "TRAFFIC ESTIMATION USING IMAGE PROCESSING", International Conference on Image, Vision and Computing (ICIVC), Volume: 05, 2012

Pezhman Niksaz proposed a system that estimates the size of traffic in highways by using image processing and as a result a message is shown to inform the number of cars in highways. The software Mat lab is used. RGB to Grayscale conversion on received images. Gamma correction and vehicle tracking based on contour extraction is considered for analyzing the vehicles.

3. MODULE DESCRIPTION

The modules of the proposed system are based on the three cases,

a. Image processing using Open CV.
b. Traffic Signal Processing.
c. Zigbee Transmission.

a. Image processing using Open CV

The images are captured using camera and Open CV reads the RGB image and store the image in BGR format. For accurate image recognition BGR channel is converted into grayscale. After grayscale conversion background subtraction which isolates the moving part by segmenting the image into foreground and background. The image goes through a series of phases such as pre-processing, background modelling, foreground detection and data validation. The boundaries of the objects are identified using edge detection.

b. Traffic Signal Processing

The system receives live camera images from the traffic junction. After processing the image, the training process using CNN required for vehicle detection needs a large dataset under different environment. The trained vehicle dataset are tested and efficient results are obtained. The images pass through various convolutional layers for detection purpose. K-means clustering is implemented for grouping the features the vehicle by forming the boundary box around each vehicle. In the fig-3 b, the minimum and maximum feature point co-ordinate for each vehicle are Xmin, Ymin, Xmax, and Ymax**.** Bounding Box = [Xmin Ymin (Xmax - Xmin) (Ymax - Ymin)].

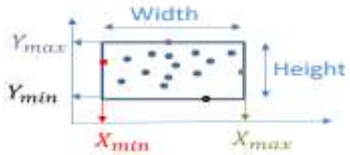

Fig -3 b Boundary box

The vehicles are counted by connecting the pixels. Based on the comparison of traffic density between two roads, the road having the higher density will be given priority.

c. ZigBee transmission

Zigbee transmitter and receiver is used to find the arrival of ambulance in a particular path. The transmitter is installed in the ambulance that transmits the signal to the receiver that was interfaced with the microcontroller. The microcontroller changes the signal to green for that particular lane and changes the signal of other lane to red.

4. SYSTEM DESIGN

The model consists of Arduino UNO, traffic lights, Zigbee transmitter and receiver.

4.1 ARCHITECTURAL DESIGN

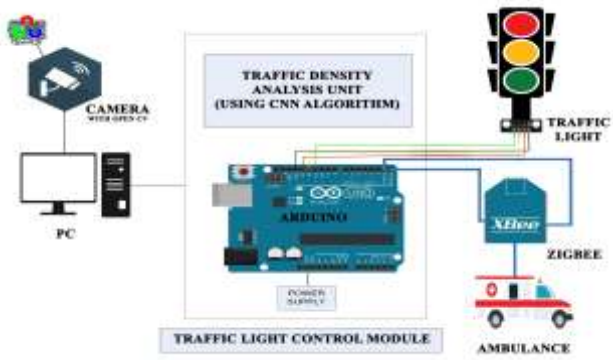

Fig -4.1 Architecture diagram

The proposed framework encompasses a shift towards image processing integrated with real time traffic density calculation. The images of the road are feed from the camera (PC camera) at traffic junctions for density calculation in order to switch the traffic lights according to vehicle density on the road. Single camera is connected with PC for every direction. Lights in each signal are connected to GPIO pins of Arduino. The power supply should be given to Arduino. Power supply is being provided by means of relay switches. The fig-4.1 shows that the traffic junctions are constantly being monitored by the deployed surveillance cameras. The Arduino, Zigbee transmitter and receiver, surveillance cameras, LEDs are part of the system. These LEDs and Zigbee transmitter are connected to the microcontroller board (Arduino) which is the core part of the system. The Zigbee receiver is placed on Ambulance which was used in case of emergency situations. The Arduino board is booted with programs to control the functions of each signal (LED). The Arduino is powered either using an external power supply or using battery. The vehicles are detected by capturing images instead of embedding the sensors in the pavement. The surveillance camera is positioned alongside the traffic signal. It will capture images sequences and detect the presence of vehicles using Open CV. The red signal becomes green signal when the ambulance arrives by using ZigBee.

5. CONCLUSION

In the traditional traffic monitoring system where the traffic system is very much hectic and chaotic, it's very important to implant some intelligent solutions to prevent them. This is done by the use of capturing images from the camera, each image is processed separately and the number of cars has been counted and the traffic density is calculated. Traffic density estimation integrated with an intelligent traffic light system by means of computer vision. Each vehicle will be detected and counted based upon the trained dataset specifying dimensions of cars. By comparing the traffic density between the roads, the road having the higher density will be given a green signal. It also provides a clear way for the emergency vehicles by means of Zigbee interfaced with the Arduino. The advantages of this method include the benefits such as, non-use of sensors and low-cost setup. The proposed system aims at saving a large amount of waiting hours caused by traffic deadlocks, where control can save time and property.

5.1 FUTURE WORK

In future for a more reliable and less complex system the controller section can be swapped with other Advanced Microcontrollers. The image capturing can be further enhanced by using the satellite images of the vehicles. When the ambulance arrives near the junction, the driver has to manually send a signal to the system to interrupt it. In the future, it has the scope to be improved so that the camera can intelligently detect the ambulance in all situations and return to the regular signaling flow immediately after the ambulance has passed. In future, auto penalty system can also be added for the vehicles violating the traffic rules. Additionally, mobile applications can be developed to view the parameters that are yet to come.

REFERENCES

[1] Ashwin S, Sanket S Hiremath, Akshay Vasist, Lakshmi H R R, "Automatic Control of Road Traffic using Video Processing", International Conference On Smart Technology for Smart Nation, IEEE, 2017.

[2] Prashant Jadhav, Pratiksha Kelkar , Kunal Patil , Snehal Thorat ," SMART TRAFFIC CONTROL SYSTEM USING IMAGE PROCESSING", International Research Journal of Engineering and Technology (IRJET) ,Volume: 03 ,Issue: 03 |,Mar-2016

[3] Jess Tyron G. Nodado, Hans Christian P. Morales , Ma Angelica P. Abugan , Jerick L. Olisea , Angelo C. Aralar ,"INTELLIGENT TRAFFIC LIGHT SYSTEM USING COMPUTER VISION WITH ANDROID MONITORING AND CONTROL", IEEE Region 10 Conference (Jeju, Korea, 28-31 October 2018)

[4] Swathy S Pillai, Radhakrishnan B, "DETECTING TAIL LIGHTS FOR ANALYZING TRAFFIC DURING NIGHT USING IMAGE PROCESSING TECHNIQUES", International Conference on Emerging Technological Trends, 2016.

[5] Shabnam Sayyed, Prajakta Date, Richa Gautam, Gayatri Bhandari,"DESIGN OF DYNAMIC TRAFFIC SIGNAL CONTROL SYSTEM", International Journal of Engineering Research and Technology(IJERT),Volume 3 , Issue 1, Jan 2014.

[6] Pezhman Niksaz,"TRAFFIC ESTIMATION USING IMAGE PROCESSING" , International Conference on Image, Vision and Computing (ICIVC), Volume: 05 ,2012.