Smart Traffic Management System

Siddhant Dawkhare
Electronics and Telcommunication
Dhole Patil college of Enginerring
Pune, India
siddhantdawkhare4488@gmail.com

Amrish Jadhav
Electronics and Telcommunication
Dhole Patil college of Enginerring
Pune, India
jadhavamrish6@gmail.com

Yash Jariwala
Electronics and Telcommunication
Dhole Patil college of Enginerring
Pune, India
yash.jariwala1498@gmail.com

Professor Palak Desai
Electronics and Telcommunication
Dhole Patil college of Enginerring
Pune, India
palakdesai@dpcoepune.edu.in

Abstract— Now a days in our country where the number of vehicles continuously increases faster than the available resources ,it is becoming difficult to handle this issue, and it becomes even worse in case of accidents. This problem affects many aspects as society including economic development, traffic accidents, and increase in pollution, time spent and health issues. In this model, people can depend on traffic management system to minimize traffic and effects. To address this effect, we can use smart traffic management system that addresses the traffic and the problems faced by people. This system focus on the empty space in order to reduce the time spends in traffic signals, detect it, and prevent traffic. The paper describes a review of the system and the paper also present the result of the system.
Keywords: - Raspberry pi , Opencv , traffic management

I. INTRODUCTION

Now a days vehicles are increasing rapidly. This is one of the reasons for traffic congestion ,now many facilities in public transportation are available so people are easily using different transportation.People have also became adaptive to this comfortably so in the big cities number of vehicles are increases .It creates several negative concerns for the environment and society such as increasing number of vehicles increases pollution and also effects on the people's health.
By considering all of this points and terms our proposed system control traffic signal using Raspberry pi and image processing technique .The camera on top viewing angle monitors the four junction at a time and this method performs from image realize the identification of vehicles the Raspberry pi calculates flexible green light duration based on the measured empty spaces on the road. Based on the number of vehicles the green time is decided and is deployed into the traffic signal systems for the particular junction. The green time is decided based on this technique. This technique allows the traffic to be under control and the maximum wait time of any junction is not more than 90 seconds. Another traffic light system is called vehicle actuated controllers. It calculates the green signal time according to the road density. This method does not consider the traffic density in any other junctions.

II. BLOCK DIAGRAM

Various components are used to execute this project like LED system , Raspberry pi ,Webcam .Raspberry pi here controls the instructions of turning on and off the inputs and ouput.

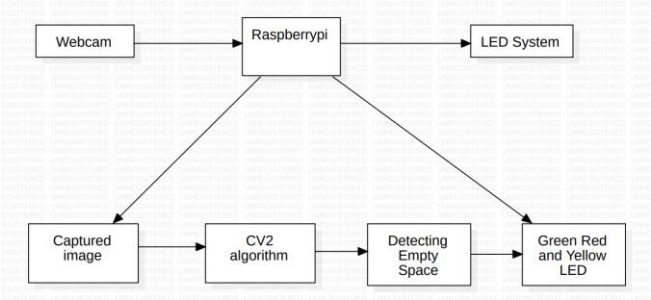

Fig 1. Block diagram of Smart traffic management system

As we can see in Fig 1, Raspberry pi is used as the main controlling unit. All devices like Webcam , Led system are connected to Raspberry pi.Image captured are processed in Raspberry pi OS and they are sent to Opencv algorithm to detect the empty spaces on the road.
After comparing the empty spaces in all the lanes , our algorithm will change the signal timing and will allocate more green time to less empty spaced area.

III. FLOWCHART

The flowchart of the implemented traffic system is shown Fig2 .The Raspberry Pi calculates the green time value based on the calaculated white space . The Raspberry Pi will calculate the green time. If the time value exceeds the threshold value, the Raspberry Pi will control the traffic using the normal green light time where the yellow light will be activated. This method identifies and detects empty space between vehicles waiting in one or more traffic lanes. The space detected on a route determines the optimal green time duration for maximizing traffic flow across the junction using algorithm. The Raspberry Pi displays the green light based on the calculated time value. The yellow light will work after the green light period has ended. The Raspberry Pi repeats the time this process for the next round of green light.

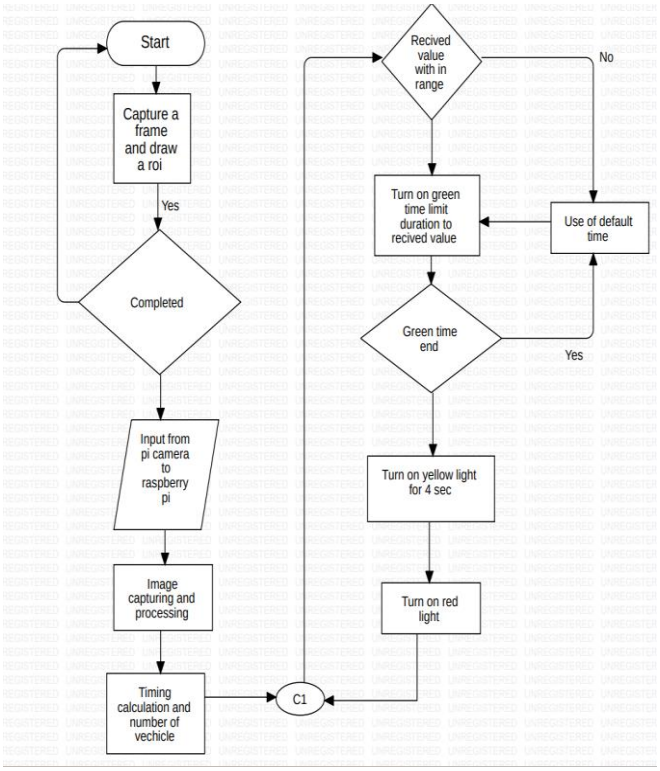

Fig 2. System Flowchart

Steps in Flowchart:

1. Image are captured through camera
2. Cv2 is used to detect empty spaces on the road.
3. Comparing empty spaces on all the lanes ,the green time signal is calculated.
4. Using time scheduling algorithm specific time is allocated to all signal.
5. Connector c1 is used for further decision making
6. Traffic signal timer is updated

IV. WORKING

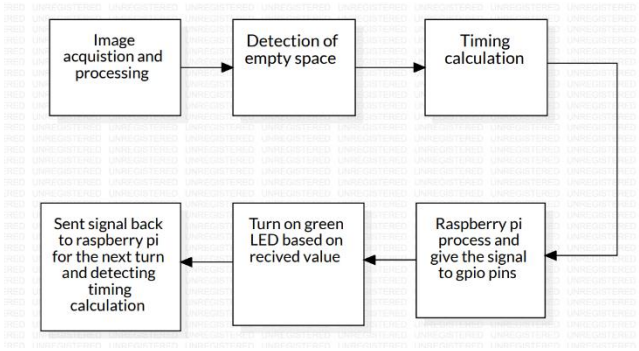

Fig 3. Working flow of Proposed System

Our smart traffic management system uses Raspberry pi and Opencv library to determine the gree time signal for each lane based on the images captured through camera. The system is developed by considering the scenarios like accuracy , performance of system , cost ,time delay. The system uses a Raspberry pi camera module to captured the image of each lanes that can be rotated after green time is concluded for a particular lane and has to be estimated for next lane.The master controller unit which is Raspberry pi is powerful enough to run time scheduling algorithm and image processing that can be subjected to input images obtained form the Raspberrry pi module .The entire system works in real time can have a very minimal delay . The Opencv library is used to determine the empty space at each lane form the obtained images and the green time is scheduled accordingly concerning minimum and maximum red , green , yellow time for each lane. The above principle is continously repeating to ensure smooth traffic flow at intersections.

Gray level slicing using Open cv:

After images are captured at traffic interesection , they are sent to the Open cv algorithm to detect the empty space on the road. Here we are using gray level slicing technique to detect empty space. Gray level slicing is used to highlight a specific range of gray levels in a image.It is somewhat similar to thresholding concept. As it is mostly used for highlighting special feature in an image , we are highlighting empty space.

After applying appropiate minimum and maximum pixel value we can get following results.

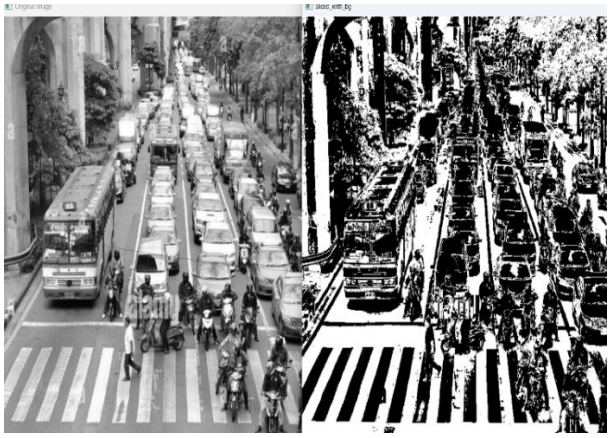

Fig 4. Detection of empty space from junction 1

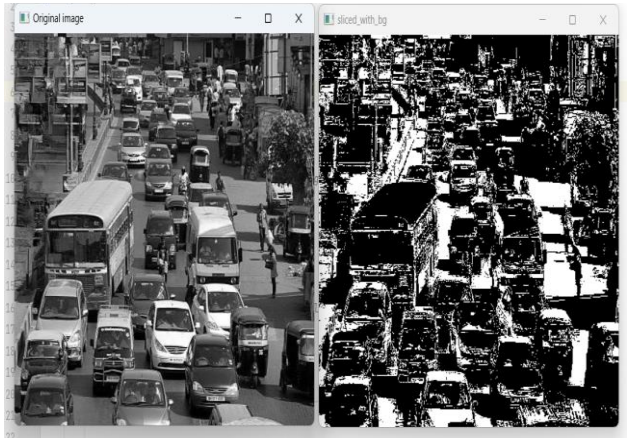

Fig 5. Detection of empty space from junction 2

From Fig 4 and Fig 5 we can see two different images ,first one gray image and second one is grayscale image.We can see white spaces in second image and can measure the no of pixels from the image.So the system will calculate the maximum white spaces in all the lanes and will accordingly change the signal timing.Less white pixels is proportional to more green signal timer.

V.CHALLENGES

Our system works fine in ideal condition. System may face challenges during different types of lightning .During rainy seasons or bad light the camera may face problems to capture the image.It can also face issues at night time when some vehicles have bright headlights.Camera or algorithm may fail to differentiate between the color of road and vehicle which can lead too fault errors and incorrect calculations.

ACKNOWLEDGEMENT

We express our gratitude to our guide Prof.Palak Desai, and HOD (E&TC Engineering) Dr. Omprakash Rajankar. He has been much focused and has aided for all the essential material needed for completing this project successfully in organized manner.We are also thankful to Prof. Shivam Agrawal, project coordinator for extending necessary help and time to time valuable guidance. Also all those including department staff members and classmates who directly or indirectly encouraged us, helped us, in accomplishment of the present work.

REFERENCES

[1] Zammeri Abd Rahman, Zulkifli Abd Rahman "Raspberry pi – Based Intelligent Traffic Signal Control at Intersections", Conference:3rd international conference on control instrumentation and Mechatronics Engineering(CIM2022) , March 2020

[2] Mihir M. Gandhi, Devansh S. Solanki , Rutwij S. Daptardar and Nirmala Shinde Baloorkar, "Smart Control of Traffic light Using Artificial Intelligence", 5th International Conference on Recent Advances and Innovations in Engineering, (ICRAIE) , February 2021

[3] Sunayana Jadhav, Siddharth Vaghela, Shubham Arora, Shubham Tawde, Rashmi Bharambe, Stuti Mangalvedhe "Traffic Signal Management using Machine Learning", international journal of engineering research and Technology(IJERT) , Volume 9, Issue 6, June 2020, ISSN 2278-0181

[4] Arakatla Mamatha "Automated Traffic Light System Based on Image Processing and Machine Learning Technique" , International Research Journal Of Innovation in Engineering and Technology(IRJIET) , Volume 2 , Issue 8 , October 2018, ISSN 2581-3048

[5] Hassan Bashir , Habibu Rabiu "Intelligent Traffic Light System For Green Traffic Management " , 1st International Conference on Green Engineering for Sustainable Development IC-GESD 2015 December 2015