

INTELLIGENT TRAFFIC SIGNAL CONTROL SYSTEM USING ANN

Rishika Jain H^{S1}, Pranatha R Rao², Ranga Hrushikesh R³, Prajwal P⁴, Srividhya S⁵

¹Rishika Jain H S, Department of Information Science and Engineering, BNM Institute of Technology, Bengaluru.

²Pranatha R Rao, Department of Information Science and Engineering, BNM Institute of Technology, Bengaluru.

³Ranga Hrushikesh R, Department of Information Science and Engineering, BNM Institute of Technology, Bengaluru

⁴Prajwal P, Department of Information Science and Engineering, BNM Institute of Technology, Bengaluru.

⁵Srividhya S, Assistant Professor, Department of Information Science and Engineering, BNM Institute of Technology, Bengaluru.

Abstract - Currently the traffic control system in our country is non-flexible to the ever growing number of vehicles on the road. Traffic light is the basic element in traffic flow control through specified waiting and going time, fixed traffic light time systems is a bad control way. Intelligent traffic system includes smart way to control traffic light time based on number of vehicles in each lane, this paper develops an automatic algorithm to control traffic light time based on artificial intelligent techniques and image processing, this algorithm is validated by comparing its results with manual results. In this project there are four phases: the image that comes from the sensor (camera) is prepared. The preparation of the image happens by converting the images from RGB to gray scale. Next, the segmentation is applied on the prepared image and then for each segment the artificial neural networks will predict if it is a positive segment (a vehicle) or not. A counter will count the positive segments. Finally, the fuzzy logic controller is used to find the suitable periods for each light color in the traffic light.

Key Words: Image Processing, Artificial Neural Network, Segmentation, Fuzzy Logic, Smart Traffic.

1. INTRODUCTION

Intelligent Traffic Signal control system has become a wide range area of research, due to increase in number of vehicles especially in big cities, and increase in number of accidents. Thus, improving traffic signal control system will increase safety, reliability, and traffic flow speed and reduce average travelling and waiting time for passengers. There are many ways to control traffic light time, they are mainly divided into two parts. Manual controlling which needs a skilled person to monitor vehicles and control their flow, and hence man power is required leading to non-accurate controlling process. The other part is automatic controlling, generally two ways; sensor based and image processing based.

Sensor based method depends on sensor network such as infrared radar sensor, magnetic loop detectors buried under road, this is a costly process and need special infrastructure, also these sensors need periodic

maintenance to keep its results correct. Image processing based method depends on images extracted from videos which is recorded using cameras fitted on traffic lights, in which number of vehicles on each lane is computed, then traffic light is controlled depending on this number, this method is the most efficient and reliable method.

1.1 PROBLEM STATEMENT

As traffic is the major problem in day to day life, in order to overcome this problem we propose an intelligent traffic control system which makes use of Artificial Neural Network and Fuzzy Logic controller to regulate the traffic signal based on the traffic density thereby reducing the waiting time.

1.2 LITERATURE SURVEY

Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System: Bangladesh Perspective. Mohammad Shahab Uddin et.al. this paper described a method of real time area based traffic density estimation using image processing for intelligent traffic control system. Area occupied by the edges of vehicles will be considered to estimate vehicles density using Canny edge detection mechanism. Calculating the areas of different live roads, the system will automatically estimate the traffic density of each road which will help to determine the duration of each traffic light. [1]

Implementation of Image Processing in Real Time Traffic Light Control. Pallavi Choudekar et.al., proposed a system for controlling the traffic light using image processing. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light. It will capture image sequences. Setting image of an empty road as reference image, the captured images are sequentially matched using image matching. For this purpose edge detection has been carried out using Prewitt edge detection operator and according to percentage of matching, traffic light durations can be controlled. [2]

A View of Artificial Neural Network. Manish Mishra et.al., presented a paper that explained the concept of Artificial Neural network. The concept of ANN is basically introduced from the subject of biology where neural network plays an important and key role in human body. An Artificial Neuron is basically an engineering approach of biological neuron. It has device with many inputs and one output. [3]

Density Based Traffic Light Control System Using Image Processing. D.Prakash et.al., proposed a system that contains camera and microcontroller to process image and measures density of traffic and the traffic controller changes signal timing automatically based on the traffic density at junction. The traffic density is measured using image processing by Matlab and ARM processor to control the traffic signal. A microcontroller, LPC2148 ARM processor is used to control the traffic signal. [4]

Smart Traffic Optimization Using Image Processing. Pranav Maheshwari et.al., proposed a system that uses cameras installed at the red lights and intersections to monitor the traffic dynamically. It then processes this information using image processing, computes the volume of the real time traffic, sets the timer of the signal accordingly. Simultaneously, it monitors if there is any scope of congestion at the intersection and adjusts the timer to prevent it. [5]

Traffic Signals Control of Urban Traffic Intersections Group Based on Fuzzy Control. HaiBo Mu.et.al., proposed a distributed control system, which comprises some local fuzzy controllers and a special case controller. Each local fuzzy controller control s the traffic flow at its designated intersection according to the traffic flows of related intersections in addition to its own. When the current traffic situation is beyond the ability of local traffic controller, the special case controller will be activated. By adopting the designed simulated annealing algorithm, the special case controller optimizes the green time extension of all the intersections in the road network. [6]

Real Time Traffic Signal Control using Fuzzy Logic Controller. Sweta Pandey .et.al., proposed a paper in which, controlling the traffic signal system is the main objective making the road traffic decent, safe, less waiting time and fuel consumption. This paper provides overview of fuzzy logic control system used for better control of flow of traffic at every road intersection. FLC light movement contains sensors which help in tally vehicles at specific intersection. These sensors gives the controller movement densities in every intersections which permits better evaluation of changing activity designs. [7]

2. IMPLEMENTATION

The procedure of controlling the traffic light has mainly four parts-

Step 1: The image that comes from the sensor (camera) is prepared. The image is prepared by converting it into gray scale.

Step 2: Next, the segmentation is applied on the prepared image.

Step 3: Then for each segment the artificial neural networks will predict if it is a positive segment (a vehicle) or not. A counter will count the positive segments.

Step 4: Finally, the fuzzy logic controller is used to find the suitable periods for each light colour in the traffic light.

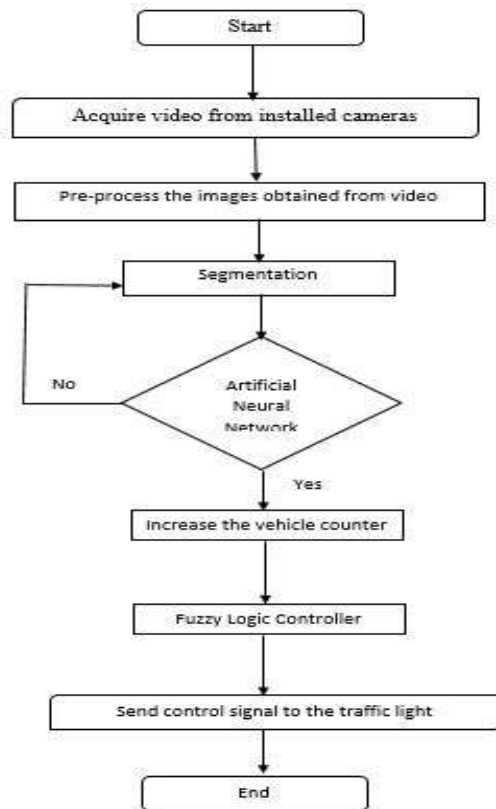


Fig – 1: Flow chart of the Proposed System.

3. RESULTS



Fig -2: Output Window

The fuzzy logic controller will decide the suitable period for the red and green lights in the traffic light depending on the number of cars in the road; as the number of cars increase, the period of the green light will increase at the expense of the period of the red light. The Output of the vehicle detection is shown in Fig -2. The proposed system has a training accuracy of 94.42%.

4. CONCLUSION

The aim of the project is to design an efficient automatic authorized traffic control system by using image processing and there by obtaining higher efficiency. This project is implemented based on the paper Smart Controlling for Traffic Light Time which is taken as the base paper. It has been found that the process used in this study is very useful and can improve the traffic light job with less cost than the other methods that were implemented earlier.

REFERENCES

- [1] Mohammad Shahab Uddin, Ayon Kumar Das and Md. Abu Taleb "Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System" 2nd Int'l Conf. on Electrical Engineering and Information & Communication Technology (ICEEICT) 2015.
- [2] Pallavi Choudekar, Sayanti Banerjee, M. K. Muju "Implementation of image processing in real time traffic light control" 2011 3rd International Conference on Electronics Computer Technology in IEEE 2011.
- [3] Manish Mishra and Monika Srivastava "A View of Artificial Neural Network" IEEE International

Conference on Advances in Engineering & Technology Research (ICAETR - 2014).

- [4] D.Prakash, B.Sandhya Devi, R.Naveen Kumar, S.Thiyagarajan and P.Shabarinath "Density Based Traffic Light Control System Using Image Processing" published on March 2017.
- [5] Pranav Maheshwari, Deepanshu Suneja, Praneet Singh and Yogeshwar Mutneja "Smart Traffic Optimization Using Image Processing" 2015 IEEE 3rd International Conference on MOOCs, Innovation and Technology in Education (MITE).
- [6] HaiBo Mu, JianNing Yu and LinZhong Liu "Traffic Signals Control of Urban Traffic Intersections Group Based on Fuzzy Control" Department of Traffic and Transportation Engineering Lanzhou Jiaotong University Lanzhou, China ,2010 Seventh International Conference on Fuzzy Systems and Knowledge Discovery (FSKD 2010).
- [7] Sweta Pandey, Dr. Pratistha Mathur and Tejashri Patil "Real Time Traffic Signal Control using Fuzzy Logic Controller" Department of Computer Science and Engineering 2017 IEEE.