ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 11, April 2018

Implementation of Intelligent Traffic Light Scheduling Algorithm Through Object Detection

S.M. Mehzabeen[1], M. Mithun[2], M. Farhan[2], M. Rayyan Husain[2]
[1,2]Department of Electronics and Communication
Sri Venkateswara College of Engineering
Sriperumbudur, Tamil Nadu, 602117, India

Abstract - Traffic signals are essential to guarantee safe driving at road intersections. However, they disturb and reduce the traffic fluency due to the queue delay at each traffic lane. In this work, we introduce an Intelligent Traffic Light Controlling (ITLC) algorithm. This algorithm considers the real-time traffic characteristics of each traffic lane that intends to cross the road intersection of interest, whilst scheduling the time phases of each traffic light. The introduced algorithm aims at increasing the traffic fluency by decreasing the waiting time of traveling vehicles at the signalized road intersections. This is performed by calculating the density of vehicles in each lane of the four-way intersection. Moreover, it aims to increase the number of vehicles crossing the road intersection per second.

Keywords –

1. Introduction

There is rapid increase in the vehicles perhaps traffic congestion on the road is also increases. Now, it is a very serious problem because on road, more number of vehicles are present and due to that the congestion in traffic increased along with the increase in pollution and more time is waste on road traffic every day. Therefore, traffic state estimation is one of the most recent issue in ITS which plays a major role to reduce the travel time, improve the traffic efficiency.

During rush timei.e. morning and afternoon the traffic on the road is highest, which in turn cause the traffic jam/congestion for long period.

Manymethods have been developed to minimize the congestion level onthe road but most of them either costly or less efficiency. Mostlyused traffic system are static traffic light and vehicle actuatedlights.

Some of the existing control system are:

i. Vehicle actuated control, the drawback in this system is thecontrol algorithm does not take consideration of the number ofvehicle waiting at red, only consider the vehicle on green.

ii. Manual controlling which need manpower i.e. traffic policeto control the traffic.

iii. Automatic traffic light, which is sensor based system. Thelights are automatic depending on the predefined time that isset for ON or OFF. In this method waste of time is more dueto predefined procedure of how traffic light will work.

iv. Clustering Method:

The algorithm is composed of the following steps:

- Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 11, April 2018

- Assign each object to the group that has the closest centroid.
- When all objects have been assigned, recalculate the positions of the K centroids.
- Repeat Steps 2 and 3 until thecentroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

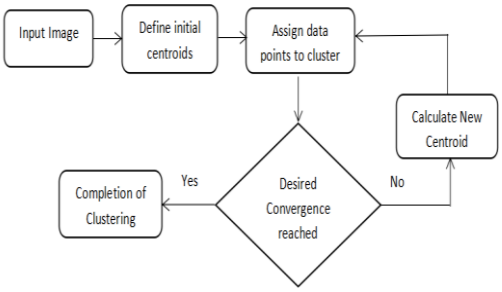


Figure 1

Figure 1 shows the block diagram for the algorithm.

There are a number of problems with clustering. Among them:

- current clustering techniques do not address all the requirements adequately (and concurrently);
- dealing with large number of dimensions and large number of data items can be problematic because of time complexity;
- the effectiveness of the method depends on the definition of "distance" (for distance-based clustering);
- if an obvious distance measure doesn't exist we must "define" it, which is not always easy, especially in multi-dimensional spaces;
- the result of the clustering algorithm (that in many cases can be arbitrary itself) can be interpreted in different ways.

3. Proposed System

Our model is also an automatic control traffic light which overcomesthe above mentioned drawbacks. At present the traffic light signalin India works in a process of certain time for each road in a fourway junction irrespective of the number of vehicles in differentroad, which is not the optimum solution to the traffic congestion.
The proposed system will measure the real-time traffic density and control the traffic congestion on road using dynamic management of traffic signals.
So, seeing the present condition we are motivated to develop a smart traffic control system which sense the load on the road for certain duration of time and takes the best fitted decision according to the highest traffic on the road. In this paper we propose a design of a smart and fully automatic system which detect traffic congestion in real time and management of the congestion efficiently to ensure smooth traffic flow with the use of active optical detection technology. Our designed traffic system, acts according to the traffic load on each side of the four-way junction.

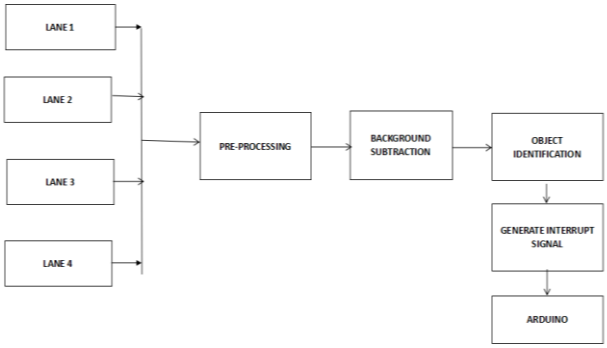


figure 2

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

Pre-processing

Pre-processing is a common name for operations with images at the lowest level of abstraction -- both input and output are intensity images.The aim of pre-processing is an improvement ofthe image data that suppresses unwanted distortions or enhances someimage features important for furtherprocessing.

Background Subtraction

Background subtraction, also known as foreground detection, is a technique in the fields of imageprocessing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include image denoising, post processing like morphology etc.) object localisation is required which may make use of this technique.

Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. The rationale in the approach is that of detecting the moving objects from the difference between the current frame and a reference frame, often called "background image", or "background model". Background subtraction is generally based on a static background hypothesis which is often not applicable in real environments. With indoor scenes, reflections or animated images on screens lead to background changes. Similarly, due to wind, rain or illumination changes brought by weather, static backgrounds methods have difficulties with outdoor scenes.

Mean filter

For calculating the image containing only the background, a series of preceding images are averaged. For calculating the background image at the instant t,

$$B(x,y,t) = \frac{1}{N}\sum_{i=1}^{N} V(x,y,t-i)$$

Where N is the number of preceding images taken for averaging. This averaging refers to averaging corresponding pixels in the given images. N would depend on the video speed (number of images per second in the video) and the amount of movement in the video.

After calculating the background $B(x,y,t)$ we can then subtract it from the image $V(x,y,t)$ at time t = t and threshold it. Thus the foreground is:

$$|V(x,y,t) - B(x,y,t)| > \mathrm{Th}$$

where Th is threshold. Similarly we can also use median instead of mean in the above calculation of $B(x,y,t)$.

Moving Object Detection

Moving object detection is to extract the region of variation out of background image in video sequential images, and the pixel of moving regions in image is only considered due to subsequent processing, such as object tracking, object recognition and classification, object characteristic extraction.

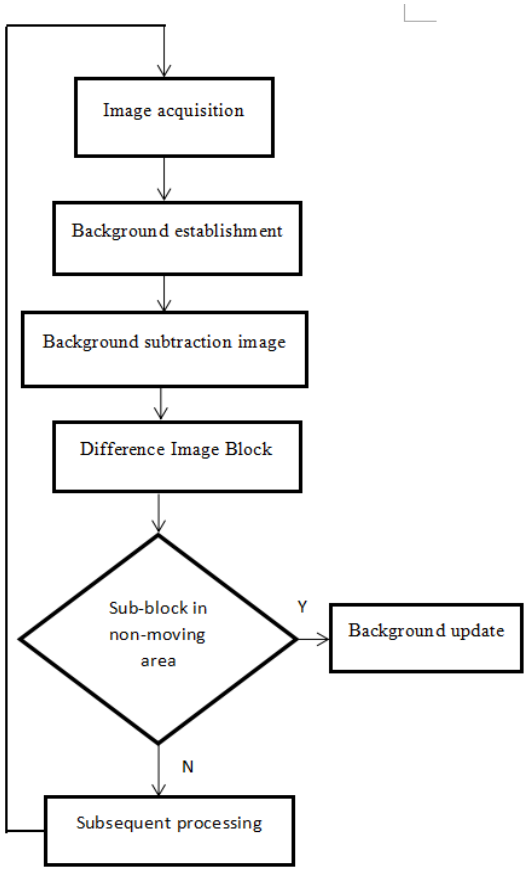
Therefore, it is very important to acquire accurate moving object.Background subtraction is the method that compares the current frame with background reference model in image sequence to detect the moving object.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 11, April 2018

In object detection based on background subtraction, the accuracy of modelling and simulation of background image can directly affect the detective effectiveness. No matter what moving object detection algorithm, the processing requirements of any image scenes should be met as much as possible. But it is difficult for modelling and simulation of background due to the complexity and unpredictability of scene, and the existence of interference and noise of various environments such as the sudden change of light, fluctuation of some objects in real background image, the shake of camera, and influence of moving object going in and out scene to original scene. Background subtraction, which is easy to be realized, detects the moving object quickly and accurately, and the key is to acquire the background image. In practical application, static background is not easy to be acquired directly, and background needs to be estimated and restored,namely background reconstruction, through the frame information of video sequence due to the dynamic change of background image, therefore, background should be updated selectively.

The common method of background modelling can be divided into pixel-based method and block background-based method. Pixel-based method can acquire more detailed shape of moving object, however, the distributed information of pixel on the space is not fully used.



As a matter of fact, for the area without object, the structure of image has stability, which will result in redundancy to the analysis of single pixel, while the efficiency of background modelling will be improved naturally by processing multiple pixels integrally in adjacent areas. Therefore, a background modelling algorithm of fragmental image processing can be used.When the camera is fixed, the simplest background selection method is to adopt some fixed frame images as background, but this method is greatly affected by external scene, and not suitable for the changing environment with complex background.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

s in Engineering and Technology (IJARTET)

Threshold value T is of major importance. If the value is too large, some moving object pixels may be mistaken to be background pixels. If the value is too small, then the background pixels may be mistaken to be moving object pixels. With method based on block, the sum of pixels is smaller than threshold value even some pixels are larger than threshold value. So, background block will not be mistaken to be foreground block.

During video moving object detection, background image usually changes due to uncertain factors, for instance, the ambient light and slight disturbance of background pixel in scene, this change has two situations: one is slow, the changing trend of entire background is the same, and the other one is sudden, pixel value will change drastically in short time, and the changing trend is different than the overall changing trend. In view of the above two situations, to realize the accurate detection of moving object, background needs to be updated during moving object detection.

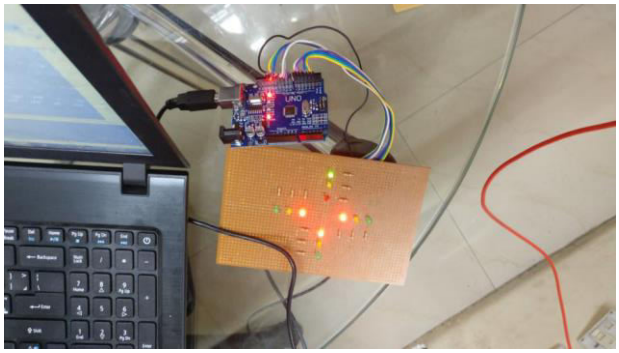
Hardware Implementation Result

Figure 3

Figure 3.1

Figure 3 and 3.1 show the K means simulation output. In Figure 3.1 vehicles in the frame are detected but due to the algorithm's ability to recognise objects in clusters, the vehicles are read as one when there are about ten vehicles in the cluster. Due to this the K means algorithm is considered inefficient and inaccurate.

Figure 4 shows the implementation of the traffic signal using Arduino. Figure 4.1 shows the input (traffic lanes) and Figure 4.2 shows the background subtracted output.



ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)

The Figure 4.1 is a 4 lane intersection which is given as the input. The video is processed and the algorithm is applied.

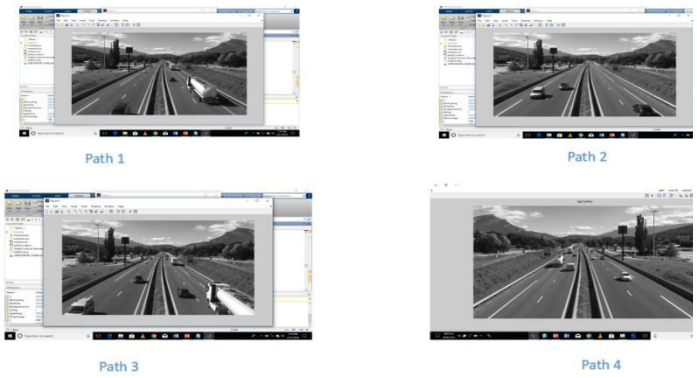


Figure 4.1 - Input

The Figure 4.2 is the background subtracted output. The video input is processed and the lane with the highest density of traffic is calculated. This lane is given priority and it is given the highest time at green light.

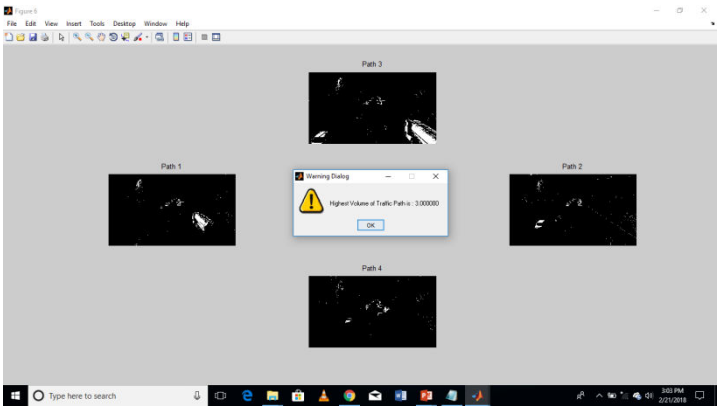


Figure 4.2 - Background subtracted

Conclusion

In this modern era as the population is increased rapidly the usage of vehicles has also increased tremendously. The cause of it is heavy traffic. In order to avoid this problem it is better that we flow new communication methods such as image processing based intelligent traffic controlling and monitoring system using ARDUINO. By using this method we can get the details about information about vehicles in particular junctions through internet access. This is more beneficial for the emergency travelling.

We have implemented the system both in software as well as hardware. The hardware simulation has been carried out in MATLAB to validate the performance of the proposed system. TheArduino UNO used is a simple prototype model which works more efficiently.

The system has been implemented in real hardware with low cost and high efficiency to control the traffic congestion in Indian roadways. A security camera has also been installed at the junction. However there can be further more up-gradation in this system which would minimize the traffic congestion further. Some of the possible ways are use of wireless sensor network, radio frequency identification which can be used to complement our existing model involving video analysis.

ISSN2394-3777 (Print)
ISSN2394-3785 (Online)
Available online atwww.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 5, Special Issue 11, April 2018

References

[1] ”Network Simulator nss-2,” http://www.isi.edu/nsnam/ns/

[2] M. Bani Younes and A. Boukerche, Efficient traffic congestion detection protocol for next generation VANETs, Communications (ICC), 2013 IEEE International Conference on , vol., no., Pages 3764-3768, 9-13 June 2013.

[3] F. Webster, Traffic Signal Settings, Road Research Laboratory Technical Report, HMSO, London.

[4] Roxanne Hawi, George Okeyo and Michael Kimwele,“Techniques for Smart Traffic Control: An In-depth review”.International Journal of Computer Applications Technologyand Research, Vol. 4, Issue 7, pp. 566 - 573, 2015.

[5] D. Krajzewicz, J. Erdmann, M. Behrisch, and L. Bieker, Recent Development and Applications of SUMO Simulation of Urban Mobility. International Journal On Advances in Systems and Measurements.

[6] Muhammad Hassam Malhi, Muhammad HassanAslam, “Vision Based Intelligent Traffic ManagementSystem” IEEE Computer Society 2011 Frontiers ofInformation Technology.

[7] H.R.Kashani and G.N.Saridis “Intelligent Control forUrban Traffic Systems” International Federation of AutomaticControl Automatica, vol.19.