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SMART TRAFFIC SIGNAL MANAGEMENT

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Abstract: *Robust and reliable traffic surveillance system is an urgent need to improve traffic control and management. Vehicle flow detection appears to be an important part in surveillance system. The traffic flow shows the traffic state in fixed time interval and helps to manage and control especially when there as a traffic jam. In this project, we propose a traffic surveillance system for vehicle counting. The proposed algorithm is composed of five steps: background subtraction, blob detection, blob analysis, blob tracking and vehicle counting. A vehicle is modelled as a rectangular patch and classified via blob analysis. By analyzing the blob of vehicles, the meaningful features are extracted. The experimental results show that the proposed system can provide real-time and useful information for traffic surveillance.*

Keywords: *Blob detection, Background detection, Smart Traffic signal system, Traffic signal system using image processing*.

I INTRODUCTION

Increase in the number of vehicle cause traffic congestion at intersection. It suffers the people time, they are either stuck or delay to destination causes heavy lose. The Traffic Management System is responsible for managing traffic on the roads, efficiently. Improvements in this system are necessary because of change in the volume of traffic with time. The increasing amount of vehicles and vehicular congestion are a cause of worry as they lead to the wastage of valuable resources like time and money.

The number of vehicles present at the intersection varies from time to time because of which Static Traffic Control may prove to be unreliable. Moreover it has also been observed that Periodic Signal Control is unable to perform up to its potential in case of very busy intersections. Here, the role of Intelligent Traffic system comes into action to evacuate from such conditions and to provide a traffic management System that responsible for managing traffic on the roads efficiently.

For controlling traffic problem so we are developing smart traffic system with using image processing in techniques Background Subtraction, Blob Detection Blob Tracking with this help of algorithm we can detect blob for vehicles. Open cv 2.4.0 Technology through we have to possible to build this system which give result to control traffic. Vehicle detected and number of vehicles. This method through We are controlling traffic system.

II GOALS AND OBJECTIVES

1. To study and develop a traffic signalling system using Blob detection and blob tracking algorithm to reduce the traffic problems and minimize the high signals in high traffic areas.
2. Save user's time in doing some productive task which are useful to him/her.

III SOFTWARE REQUIREMENTS

1. Operating System: **Windows**

Windows or win is an operating environment created by Microsoft that provides an interface, known as a Graphical User Interface (GUI), for computers.

2. Platform: .Net

.Net allows you to access number of libraries that are specially intended with windows. The Common Language Runtime (CLR) is the component of the .NET Framework that allows you to compile and execute applications written in either C# or Visual Basic .NET.

3. OpenCV2.4.0

OpenCV(Open Source Computer Vision) is the library of computer functions that aimed to real time

computer vision. It is developed by Intel now maintained by Itseez. This OpenCV library is cross platform and opens for use under the open source license.

4. Visual Studio 2012

Microsoft Visual Studio is an IDE from Microsoft which is used to develop computer programs for Microsoft Windows, as well as web sites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code

IV HARDWARE REQUIREMENT

1. Operating System: Windows.
2. Expected Hard Disk : 250 GBMin
3. Expected RAM: 4GBMin
4. WSN network
5. Standard Input/Output Devices

For developing this system we require a system which is having Windows Operating system to start the application. To synchronize the data between application and Traffic cameras we require a WSN network. To start the application we require a system of Minimum hard disk of 250GB and RAM of 4GB is required.

V PROBLEM STATEMENT

To study and develop a traffic signalling system using Blob detection and blob tracking algorithm to reduce the traffic problems and minimize the high signals in high traffic areas.

VI ALGORITHMS USED

Blob Detection

In computer vision, blob detection methods are aimed at detecting regions in a digital image that differ in properties, such as brightness or colour, compared to surrounding regions. Informally, a blob is a region of an image in which some properties are constant or approximately constant; all the points in a blob can be considered in some sense to be similar to each other. The most common method for blob detection is convolution.

There are several motivations for studying and developing blob detectors. One main reason is to provide complementary information about regions, which is not obtained from edge detectors or corner detectors. In early work in the area, blob detection was used to obtain regions of interest for further processing. These regions could signal the presence of objects or parts of objects in the image domain with application to object recognition and/or object tracking. In other domains, such as histogram analysis, blob descriptors can also be used for peak detection with application to segmentation. Another common use of blob descriptors is as main primitives for texture analysis and texture recognition. In more recent work, blob descriptors have found increasingly popular use as interest points for wide baseline stereo matching and to signal the presence of informative image features for appearance-based object recognition based on local image statistics. There is also the related notion of ridge detection to signal the presence of elongated objects.

Blob detectors is based on the Laplacian of the Gaussian (LoG). Given an input image f(x,y), this image is convolved by a Gaussian kernel.

Background Subtraction:

Background subtraction (BS) is a common and widely used technique for generating a foreground mask (namely, a binary image containing the pixels belonging to moving objects in the scene) by using static cameras.

As the name suggests, BS calculates the foreground mask performing a subtraction between the current frame and a background model, containing the static part of the scene or, more in general, everything that can be considered as background given the characteristics of the observed scene.

Background modelling consists of two main steps:

a) Background Initialization.

b) Background Update.

In the first step, an initial model of the background is computed, while in the second step that model is updated in order to adapt to possible changes in the scene.

A motion detection algorithm begins with the segmentation part where foreground or moving objects are segmented from the background. The simplest way to implement this is to take an image as background and take the frames obtained at the time t, denoted by I(t) to compare with the background image denoted by B. Here using simple arithmetic calculations, we can segment out the objects simply by using image subtraction technique of computer vision meaning for each pixels in I(t), take the pixel value denoted by P[I(t)] and subtract it with the corresponding pixels at the same position on the background image denoted as P[B].

Mathematical equation to represent it is :

$$P[F(t)] = P[I(t)] - P[B]$$

The background is assumed to be the frame at time *t*. This difference image would only show some intensity for the pixel locations which have changed in the two frames. Though we have seemingly removed the background, this approach will only work for cases where all foreground pixels are moving and all background pixels are static.

A threshold "Threshold" is put on this difference image to improve the subtraction

$$|P[F(t)] - P[F(t+1)]| > \text{Threshold}$$

This means that the difference image's pixels' intensities are 'threshold' or filtered on the basis of value of Threshold.

The accuracy of this approach is dependent on speed of movement in the scene. Faster movements may require higher thresholds.

VII SYSTEM ARCHITECTURE

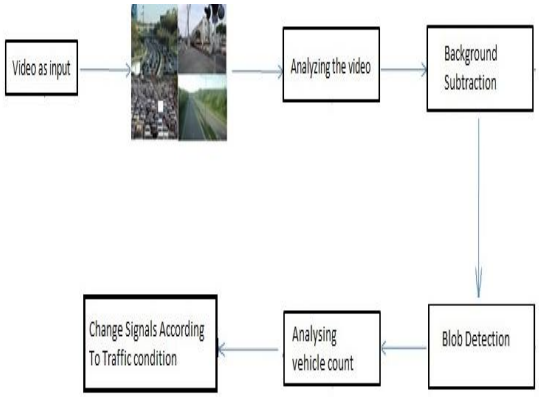

Figure 1: System Architecture

The Above diagram shows the architecture of design of smart traffic signal management. Firstly user has to select four videos as input for the analysis of the traffic data. The condition of the traffic is identified by using Blob Detection and Blob tracking algorithm.

If the traffic condition is high then the threshold condition will be get activated and the signal time is set for the particular threshold.

If the traffic condition is normal means vehicle count is less then according to the traffic condition the signal time will be get changed by the result given by the Blob detection and blob tracking algorithm.

The result of the algorithm is passed to the system GUI to change the traffic signals. In Real time traffic signal the result of the system is passed to traffic signal to implement the result of analysis.

VIII WATERFALL MODEL.

The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use.

In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model is basically used for the for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.

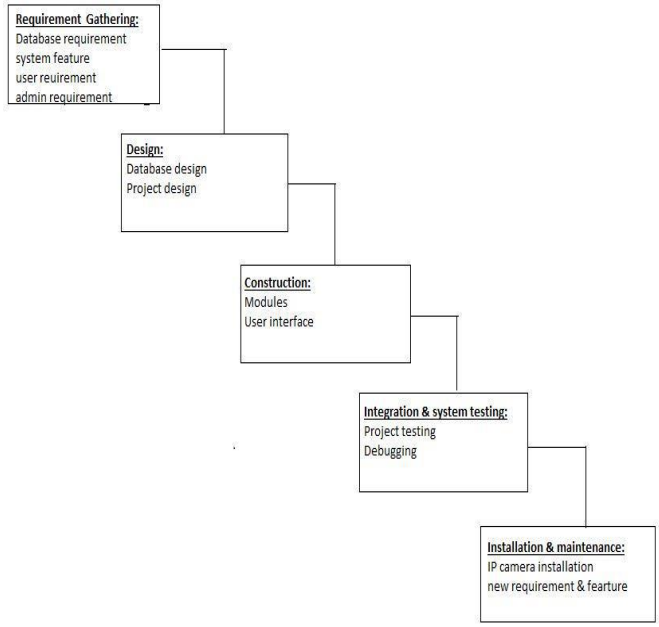

Figure 2: Waterfall Model

IX. RESULT

Figure 3 : Output generated by system

In the above developed system, the input is given in the form of traffic videos through the system. The video's are then processed with several operations like background detection, Blob detection and it gives the count of vehicle as a output.

As per the traffic vehicle count the signal timing has been changed.

X CONCLUSION

Through the current traffic signal system is hardcoded and can only change the signal timing by the pre-coded instructions. By using our system application we are able to control the traffic flow. Also we can monitor the traffic condition. By using this application we can reduce the travelling time by controlling the signal on real time basis.

In this system we have used Background subtraction algorithm to remove background image and focus only on the

moving pixel, Blob Detection algorithm to count the number of moving objects, and Template matching algorithms to check whether there is any emergency service vehicles are travelling.

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