Automatic vehicle detection and counting UsingMATLAB Generate VHDL code in Simulink

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Abstract - the project is dedicated to the presentation of a vision-based system for road vehicle detection and counting. The system is able to achieve counting with a very good accuracy even in difficult scenarios linked to occlusions and/or presence of shades. The principle of the system is to use already installed cameras in road networks without any additional calibration method. We propose a robust segmentation process that identifies foreground pixels corresponding to moving vehicles. First, the method models each pixel of the background with an adaptive Gaussian distribution. This model is coupled with a motion recognition method, which allows correctly location of moving vehicles in space and time. The nature of trials carried out, including peak periods and several vehicle types, leads to an increase of occlusions between cars. A specific method for severe obstruction detection, based on the notion of solidity, has been carried out and tested. Vehicle detection and counting can give exact data about the vehicle density on a particular city road or highway which helps in advanced traffic monitoring and management. Various image processing techniques like frame differentiation, segmentation, filtering, morphological operations, blob recognition, etc. are used using MATLAB software. The final count of the number of vehicles passed through the path of choice will be displayed and count throughout the day.

Keywords*— DKS, BLE, UWB, NFC, SE, ECU, AoA, ToF*

1. INTRODUCTION

Traffic managing and information system mostly depend on sensors for estimating traffic parameters. As of now magnetic loop detectors are used to count vehicles transient over them. Vision based systems have a number of advantages. Along with counting vehicles, a large set of constraints can be derived. Cameras are much less troublesome to install than magnetic sensors [1]. The output from the camera based system can give information about the traffic density on a particular road and can notify about traffic congestion if it arises. This project is mostly aimed at vehicle detection and counting vehicles at highway from dynamic data obtained from the camera. In case of dense traffic in a lane the vehicles can be redirected and this would maintain a better traffic flow. The types of vehicles passing in each lane can be counted and classified based on the belongings (length, width) obtained from images of vehicles. This method is low-priced and requires little or almost no human interference.

The system uses a camera for the live video running of the traffic. The taken video is then converted into frames at a rate of 25 frames per second .The frames thus obtained are exposed to adaptive background subtraction against an background image. The result of background subtraction gives us an image with only the vehicles in it which in turn can be counted with the blob finding approach, which gives us the vehicle count for a precise frame. For each blob that is obtained, the blob constraints (height, length, width, outline, area) are determined, which can be used to count a vehicle. The obtained vehicle count for each category is continuously updated on a graphical user interface.

2. LITERATURE SURVEY

Robust background subtraction, shadows management, and occlusion care are the three main scientific contributions of work.In reference [3], a system for detection and ordering of vehicles is described. It uses a self-adaptive background subtraction technique to separate vehicles from the background. The resulting connected regions are then tracked over a sequence of images using a spatial corresponding method. The tracked regions are assembled together to form vehicles. In reference [4] also uses adaptive background finding method to identify vehicles. The vehicles are traced based on contour extraction. Prewitt filter kernel is used for edge recognition. The contour relating method used for connecting separated edge parts of the creative object into one closed contour. A contour marking method is used to mark and determine vehicles within frames. In reference [5], feature based chasing algorithm has been used. Offline camera calibration has been carried out to detect the constraints such as line correspondences for a projective plotting, detection region and multiple fiducially points for camera steadiness. Here, projective transformation is necessary as the features are tracked in world directs to exploit known physical constraints on vehicle motion. The revolution is used to compute distance based measures such as position, velocity and density. In reference [6], adaptive

background learning for vehicle detection and spatio-temporal chasing is described. A framework is planned to analyze the traffic video sequence using unverified vehicle detection and patio-temporal tracking that includes an image/video segmentation method, a background subtraction method and an object tracing algorithm. In reference [7], a system on vehicle recognition under day and night illumination is described. Vehicle detection at day time is done by using consecutive three frame subtraction method by identifying moving points. The moving points are categorised and labelled as vehicles. Vehicle detection at night time is done by recognizing vehicles in terms of pair of headlights. To detect only the objects related headlights, the system perform detection via morphological analysis, by taking into account aspects like shape, size and minimal distance concerning vehicles. Finally, the verification is established on the correlation between headlights belonging to the same pair. In reference [8], a system for fast vehicle detection with probabilistic feature grouping and its application to vehicle tracking is labelled. The images were obtained from three cameras installed on a roof of a 30-story building alongside a freeway in order to avoid overlying of vehicles. System introduces a new vehicle tracking approach based on a model-based 3-D vehicle detection and explanation algorithm. The proposed algorithm uses a probabilistic “line” feature alignment method to detect vehicles. The tracking is performed based on the zero-mean cross correlation corresponding technique. System detects vehicles at the entrance area and track the identified vehicles based on their intensity profiles. Finally, the tracking algorithm establishes the correspondences between the vehicles detected in each frames of the sequence, permitting the estimation of their paths as well as the finding of new entries and exits. The tracking algorithm is strongly based on the BMA (block matching algorithm). It consider the BMA output as the basic tracking information related with each block and combine this information with the already available block- level tracing as a grouped output in order to achieve the preferred result.

3. METHODOLOGY

. The system uses a camera for the live video streaming of the traffic. The captured video is then converted into frames at a rate of 18-25 frames per second .The frames thus obtained are subjected to adaptive background subtraction against an background image. The result of background subtraction provides us an image with only the vehicles in it which in turn can be counted with the blob detection approach, which gives us the vehicle count for a particular frame. For each blob that is obtained, the blob constraints (height, length, width, profile, area) are determined, which can be used to detect and count a vehicle to the respective category. The obtained vehicle count for each category is persistently updated on a graphical user interface.

A. Background Subtraction

Background subtraction is a method of locating the foreground mask from an image after removing the stationary background. recommend to use adaptive background subtraction for the same. Most researchers have abandoned nonadoptive methods of background subtraction because of the need for manual initialization. Without re-initialization, errors in the background gather over time, making this method useful only in highly-supervised, short-term tracking applications without significant changes in the scene. A standard method of adaptive background subtraction is be an average of the images over time, creating a background approximation which is similar to the current static scene except where motion occurs. While this is effective in situations where objects move incessantly and the background is visible a significant portion of the time, it is not robust to scenes with many moving objects particularly if they move slowly. It also cannot handle bimodal backgrounds, recovers slowly when the background is revealed, and has a single, predetermined threshold for the entire scene [9]. First initialize the camera by set its adaptor name, ID and format

- Then set the camera possessions i.e. set its returned colour space

.• set the trigger repeat to limitlessness so that it keeps taking video

.• Then by the help of a loop ,to decide how many frames need and inside the loop we capture the images from the video.

- perform the subsequent operations on the acquired frame.

. B. Image Segmentation

Image segmentation is the process of segregating a digital image into multiple segments (sets of pixels). The goal of segmentation is to simplify or change the representation of an image into something that is more significant and easier to analyse. Image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain belongings [10]. perform thresholding of image acquired to convert the image in a binary image. A simple method to obtain binary image is by equating the intensity of the pixel against a particular value and changing them to 0 or 1 based on the result.

C. Blob Detection and Tracking

Blob detection recognizes the number of objects in the threshold image. Connected component cataloguing (alternatively connected-component enquiry, blob extraction, region labeling, and blob detection or region extraction) is an algorithmic application of graph theory where the subsets of connected components are uniquely categorized. Connected component labelling is used in computer vision to notice the connected regions in binary digital images, and although colour images and data with higher dimensionality can also be processed [12] [13]. When integrated into an image recognition system

Or human-computer interaction interface, connected component category can operate on a variety of information [11]. Blob extraction is usually performed on the resulting binary image from a thresholding phase. Blobs may be counted,

Filtered, and tracked. Connected constituent labelling can be performed by two algorithms, 4 point labeling or 8 point labeling. In 4 point labeling only the instant edges are considered and in 8 point labeling, the corners along with the edges are considered.

track the same blobs in consequent images, a flag will be associated with each blob which will be set to 1 as a blob is visited and thus avoid recounting of the same vehicle. If a new vehicle is identified, check the flag associated with it, if the vehicle is unregistered the flag is incremented and otherwise ignored. Occasionally due to occlusions two vehicles are merged together and treated as a single entity. Sometimes while image subtraction and thresholding, a vehicle may get converted to more than one blob, in that case, the vehicle constraint of the respective blobs in proximity are calculated and based on that morphological operations can be used to reconnect the blobs of the same vehicle for further handling.

D. Counting

For counting the vehicles a counting register is continued. and calculate the number of centroids of all the blobs available, the number of centroids of the moving vehicles will give information about the number of vehicles that have passed that precise path.

E. Vehicle tracking

Frequent techniques have been developed to track moving objects in tracking regions such as tracking points, tracking centroids, tracking rectangles etc. In this work, the bottom coordinates of the identified objects have been used to track moving vehicles in the designated area.

I. ALOGERITHM

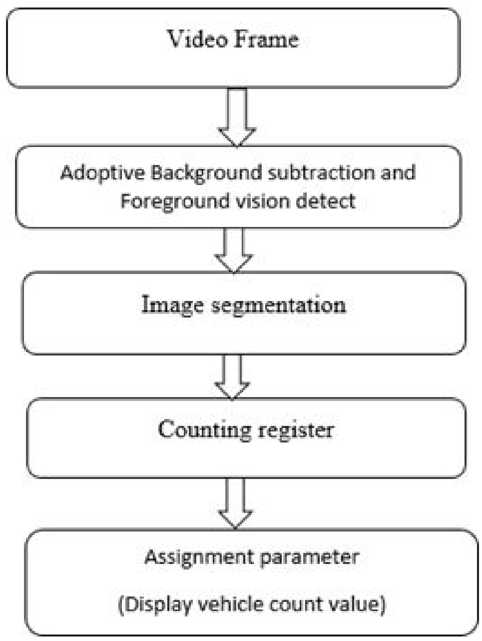

Fig.1 Flow chart

4. BLOCK DIAGRAM

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In above fig2 block diagram taken from automatic vehicle counting system for traffic monitoring [14].

Principle of the system is to use previously installed cameras in road networks without any additional standardization procedure. We propose a robust segmentation process that detects Foreground pixels equivalent to moving vehicles. First, the method models each pixel of the background with an adaptive Gaussian sharing. This model is coupled with a motion recognition method, which allows correctly location of moving vehicles in space and time. The nature of trials supported out, including peak periods and various vehicle types, leads to an increase of occlusions between cars. A specific method for severe occlusion recognition, based on the notion of solidity, has been carried out and tested. Furthermore, the method settled in this work is capable of handling shadows with high resolution. The related algorithm has been tested and compared to a standard method. In above fig2 block diagram taken from automatic vehicle counting system for traffic monitoring [14].Principle of the system is to use previously installed cameras in road networks without any additional standardization procedure. We propose a robust segmentation process that detects Foreground pixels equivalent to moving vehicles. First, the method models each pixel of the background with an adaptive Gaussian sharing. This model is coupled with a motion recognition method, which allows correctly location of moving vehicles in space and time. The nature of trials supported out, including peak periods and various vehicle types, leads to an increase of occlusions between cars. A specific method for severe occlusion recognition, based on the notion of solidity, has been carried out and tested. Furthermore, the method settled in this work is capable of handling shadows with high resolution. The related algorithm has been tested and compared to a standard method.

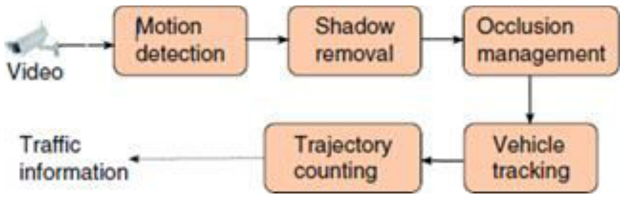

FIG.2: BLOCK DIAGRAM

5. RESULTS

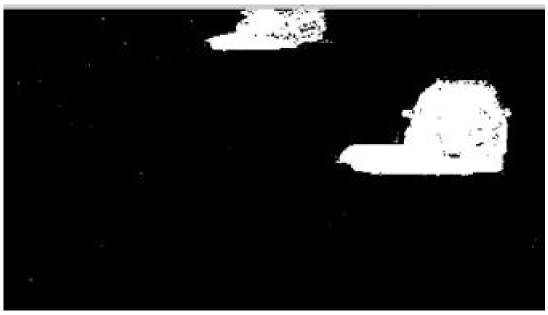

Fig 3: blob are identified

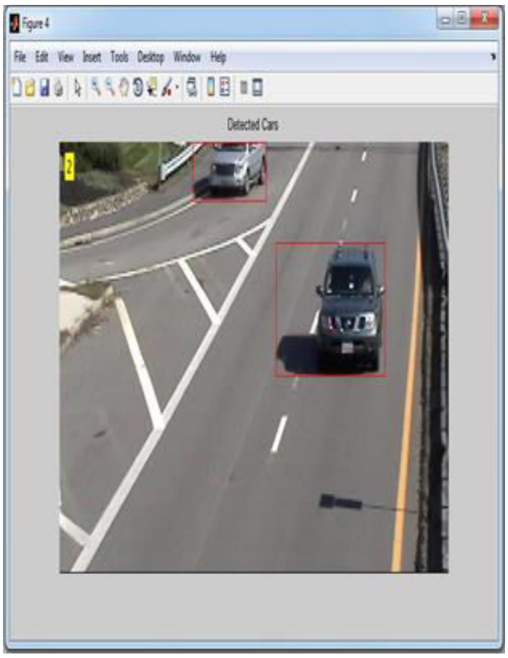

Fig4: detected car and count vehicle

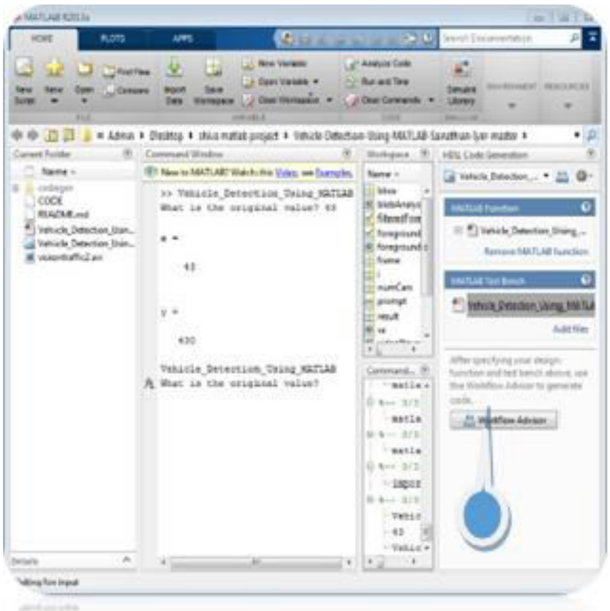

Fig5: Workflow advisor in MATLAB generate VHDL codein Simulink MATLAB

5. CONCLUSIONS

Preliminary results for developing an automated system for detection and counting of vehicles in motion, based on image processing techniques were presented in this paper. The developed system was able to track vehicles and count them with a reasonable accuracy. In order to monitor traffic.The system is capable of handling video clips of traffic scenes with 25 frames per second in real time. The results obtained through the developed system show that with further improvements it can be used in real-time to detect and count vehicles on busy traffic routes. Especially, if an obstructed view of the traffic movement can be acquired, the system can perform quite accurately.

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