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Vehicle Detection by Image Processing Using MATLAB: A Colour Based Approach

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Abstract—Due to increasing traffic in the modern times it is imperative to design a system effective in maintaining a record of vehicles passing through a lane or a road. This will help to decrease human interference with the system and result in avoidance of faulty data. Our method would try to focus on detecting cars based on color , so that a proper information about transiting vehicles can be maintained.with the development of color based tracking mechanism tracking of car will become more easier and will lead to further control over the vehicular accident. it has observed that drivers tend to get lethargic and lose focus in such scenarios lead to occurrences of accidents in modern times. hence our mechanism will help to predict the course of vehicle movement and lead to further help so that driver mishaps can be kept in check for road traffic safety and pedestrian protection in the lanes.

Keywords—*vehicle movement detection, color based tracking,algorithm,result &analysis,intention & advantages*

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I. INTRODUCTION

From the past few years the traffic control has become a serious issue for human beings. A variety of issues ranging from traffic congestion, lack of vehicle parking, pollution etc has started harassing human. Major inventions have been done in this regard to minimize the issues and one of them being vehicle detection and tracking. The scope is vast due to variety of feature that vehicles possess ranging from edges, colors, shadows, corners, textures etc. In this paper we will aim to detect cars through color based detection and our method would totally focus on creating an image from which the background will be subtracted and grey image would be obtained. Thereby analyzing the subsequent edges from the processed images.

Our major aim would be to continuously track a particular vehicle and create a bounding box over it . A camera will be installed and through MATLAB code , continuous surveillance would be done. It is one of the basic steps in our endeavor to streamline traffic although other necessary steps would make the process much effective.

II. METHODS

There are majorly two steps for our tracking mechanism:-

A. Vehicle Synchronization:

There would be numerous vehicles in the typical day to day life .For this we can synchronize the traffic based on color so that the tracking process becomes more efficient .There may be presence of noise due to irregularity between the background image and the object. Also there may not be distinct boundary around an object . Median filters are employed to create a rank on the basis of pixels contained in the particular object image .The major idea of using filters is to create smooth boundaries for the object .Let the image be termed as image1.

B. Vehicle Counter:

The image developed in the above step acts as an input for the next procedure. The entire image is scrutinized from top half to bottom half to accommodate all the spaces .Based on the requirement we will provide two variables, first is count 1 which will track the number of vehicles and the second would be a register count2 designed to keep count of the number of vehicles passing through at a particular instant. When a new object is detected on a first sight, it will check in the buffer and if it is found to be new, it will register it and the counter will be incremented..

Our article is organized into types of differentiation that can be done to the vehicle that the properties it possess. These could be lines, edges , symmetry, color etc . We further zero in on the technique of color based approach as it helps further easier detection and observation.

METHODOLOGY OF DETECTING VEHICLES

The basis of vehicle detection can be based on
1. Texture
2. Color
3. Vertices
4. Shadows
5. Corners
6. Symmetry

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We will discuss some techniques before discussing our own method.

A. Based on texture

In this mode we are going to look for certain features in the vehicle to help the detection much easier.There exits the intricacies of the texture on which a vehicle is based.The texture denotes the significance of the vehicle and the subsequent possibility of making identification easier. Some techniques readily available in the technological domain is the dual tree complex wavelet technique that works on the principle of texture segmentation to remove the background while the vehicle remains in the forefront. Certain use of denoising process makes the vehicle segmentation more crucial as compared to other techniques. The dynamics of the vehicle in the 3d space allows a learner to inculcate more spatial arrangements in terms of (x,y,z) leading to a generation of better images.

B. Based on edge detection

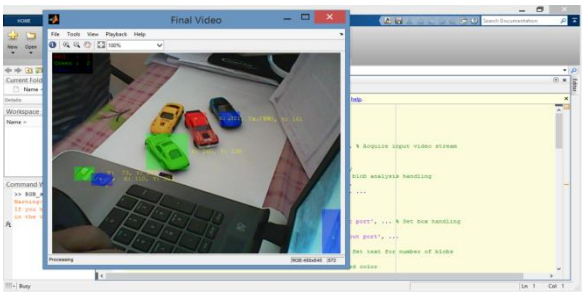
This technique relies upon the properties of discontinuities in the brightness.The world of distinct edges is very large when the dynamics of cars are concerned .There is certain amount of traction that comes to this scenario.Despite the recurring challenges of low image and video qualities found at the stations or surveillance spots edge detection comes to the rescue which help in better recognition and tracking.Edge based algorithms depend on the discontinuity in the illumination found in the real time world. For real time applications to succeed a way of employ robustness to the system is evidently possible through edge based mechanisms.

C. Based on symmetry

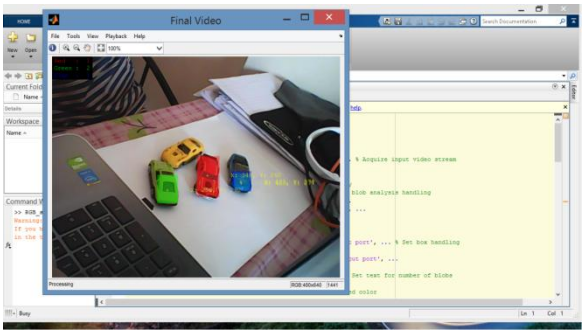
It is quite helpful to detect where images poses symmetry among themselves hence resulting in quicker detection. In the real time cases the contour cue is the symmetric cases and hence employing symmetry based techniques is efficient in the manner.Two types of criteria is taken into force while seeing the results.First it is crucial to know the aspect ratio and then the area ratio. The idea behind during such a task is to create an object space where a vehicle presence is possible or not. A snake model is sometimes employed to find a contour curve and know the efficiency of vehicle surveillance. Hence in the today's heavy traffic scenarios contour extraction is a very novel method for clustered and dynamic image analysis.the skeleton of the corresponding vehicle images provides a scope for generation of the bounding box over the desired vehicles. The possibility of finding the susceptible vehicle increases many fold after the use of symmetrical supervised technique.

D. Based on color

It is quite imperative that we find a solution based on distinctive features rather than going into complex information. Hence color based detection would help and rescue traffic pedestrians in the endeavor.When one needs to track a single entity out of of a variety of multiple sources then it is possible on various parameters. One such parameter is color. This is one distinctive feature that separates a vehicle from others. Hence the prerequisite is a proper algorithm for proper differentiation that leads to easier detection and tracking.The video input can be captured using the camera possibly a webcam that will lead to image acquisition. After that video segmentation is done to differentiate the background image from the foreground. After proper image analysis based on a series of parameters such as camera id, camera configuration , pixel input and others we find the time duration of the video frames which we can set by the possible MATLAB commands which will track the subsequent movement of the vehicle.A bounding box will be made over the tracked vehicle which is desired to be tracked. This will leave behind the others that are not crucial as per the requirement of the investigation or surveillance.



Screenshot of toy car detection



Tracking multiple cars through webcam and image acquisition

One needs to interface a possible video camera or a webcam to the system to track the moving entities. At the same time it needs to be interfaced with the MATLAB. It provides a series of addons which help a person to spread the applications to a wider oriented approach. Our method do tracks the vehicle on this approach but the areas of applications are endless.

Even presence of human interface is minimized to an extent to make the system reliable and trustworthy.The importance is based on the subsequent rgb image subtraction.

The original image is continuously extracted from the video frames which are further converted into grey scale images .Out of the grey scale ,image frames corresponding to the color required is selected for tracking. The bounding box commands would be made using MATLAB functions.
As shown above , our main target would be to find a solution in place where human interaction would be less and maintaining data is of utmost importance.This leads to using

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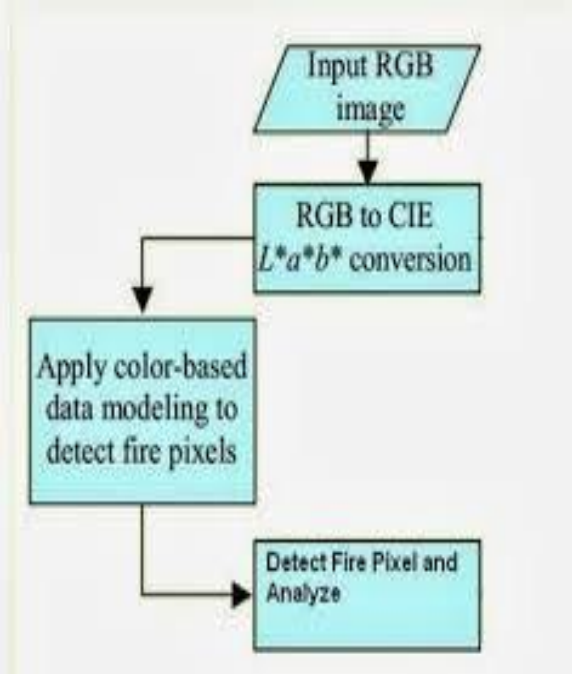
the designed system in places such as toll places , highway points, traffic zones etc. The further uses could be tracking of a car in the hit and run cases, negligent driving etc. The installed camera automatically capture the involved vehicle and separates it from the others . Hence the subsequent tracking becomes easier and efficient .



Flow chart For Colour Conversion

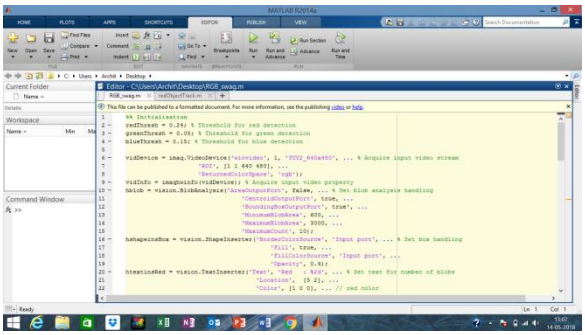
ALGORITHM OF COLOR BASED TRACKING

The main task is to understand the background concept of the code and its implication
1.initialization
2.Setting threshold for all the three colors
3.Acquiring image and its parameters such as camera id and pixels
4.Acquiring rgb frame the video
5.Extract red layer matrix from the rgb frame
6.Get grey image of rgb frame
7.Subtract grey frame from red frame.
8.Filter out unwanted noises using median filter
9.Now convert the diffFrame into corresponding binary image using proper threshold value

RESULT AND ANALYSIS

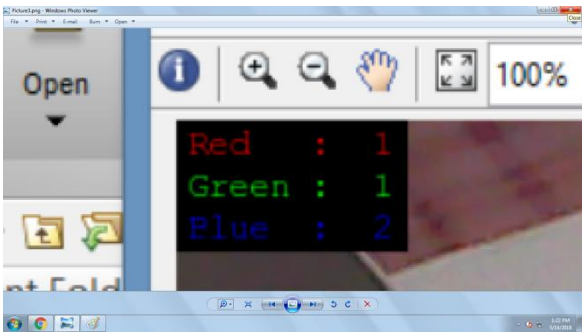
The result can be understood by the following pictures taken from the experiment and their further inference. The primary objective was to detect moving vehicles and to track the numbers using a blob analysis method and analysis.Blob analysis technique are a part of dip to illustrate the digital image that differs in properties, such as brightness, hue etc.

INTENTION AND ADVANTAGES



Sequential tracking of multiple colored vehicle

The main intention our project is to track a moving vehicle based on color without or minimal use of human interaction . This will lead to better tracking of vehicles in areas where human interaction is less or not possible. This will further enhance us to keep data of the objects that we want to track. A basic demographic benefit would be to maintain statistics when needed. The government can use the data to find out the number of cars as all cars have a color associated with them . This assist in maintaining a data then prove essential in time to come. Applications can be wide range depending on the requirement of field we are dealing with . Military , communication, weather data , reporting and various other fields are profoundly present where these applications can be utilised .



vehicle counter at the top left corner of the screen

From the above diagram we can understand that to maintain a particular track of the vehicles we have a vehicle counter to collect data.The counter is present in the upper left corner of the matlab screen . It calculates the various vehicles that are present in the scenario . In our project we used the toy cars of different colors to find the necessary colors. We applied the rgb color code tracking to find the different blocks . It can be seen through the image that a bounding box is generated depending upon the type of color we want to track.

The vehicle in yellow can be seen to be undetected due to the program's approach to track a particular color and avoiding others leading to no formation of box over yellow color. That's the main reason why the program is not tracking the yellow color . However by making few changes to the system code we can make yellow detectable. We need to make

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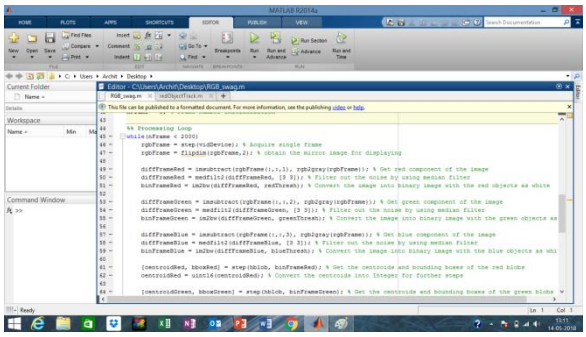
changes in the matrix corresponding to it . As yellow is the intersection of two colors that is red and green, by deciding the matrix value of [1,1,0] we can initialize yellow color tracking.Here the above matrix denotes a row matrix.The 1 present in the matrix correspond to the particular color we want to combine. The color combined here is red and green to generate a third color yellow.



Threshold and image conversion

Now let us talk about the advantages the color based tracking provides over other technique

(a) any object in real world possess a color hence by using various software tools we can track that object

(b)if a task arises to find the a lost object from a heap of other colored objects then our task becomes more easy by color based approach. In this context we don't have to use other techniques such as edge and texture based. This proves a greater benefit for our approach.

(c) Color representation of an object is robust hence application is wide range

(d)cost of equipment setup is low, leading to economy

(e) lower resolution of image

(f)image processing is faster hence real time use is greater.

CONCLUSION

In the system too it will create a sequence of lanes to in which it will register the vehicles and help to maintain a count as already mentioned a general data would be maintained and the available buffer will be increment if it finds a new car that was earlier absent in its memory ,hence it would be an effective measure in vehicular control approach .In general by using a MATLAB generated code it is possible to keep track of the particular oriented color so that the vehicle under observation can be continuously tracked .

Therefore with the combined effort of background image subtraction and color detection , we will track a vehicle by a bounding box over it to ensure better visibility and detection.This system in the coming time can lead to much better improvements over the existing systems. In the coming time where pedestrian security and efficient traffic management would be crucial issues such system will play a pivotal role.This vast multitude of detection with advantages and uniqueness of their own poses a an array of exciting opportunities for further improvement and research. The aim lies in proper synchronization of vehicles which is a challenging task for the coming times . The effects are far reaching and channeling them is the key.

FINAL IMAGE OUTPUT

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