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Real Time Traffic Density And Vehicle Count Using Image Processing Technique

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ABSTRACT

Monitoring Indian trafic and calculation of peak hours and density count in a day helps to develop necessary travel and traffic volume estimates, required to satisfy the needs in the are of road planning, construction, maintenance and overall administration of the state. An algorithm for advance Traffic Surveillance by vehicle counting and classification, based on the image processing theory is proposed. Vehicle counting is done by Background subtraction and finding the centroid. Classification is done by thresholding method and the rush or peak hour implies the high time in which the traffic increases to maximum which would certainly lead to road blocks. Video sequences have been captured and tested with the proposed algorithm. The results can be used for planning of new roads or any other diversion of vehicles need to be taken during the peak time. An image-based technique differs from other roadway sensors, such as radar or inductive loops, which provide data only regarding traffic flow and density, and do not provide information about the type of vehicle in real time.

Keywords:
Vehicle counting, Classification, Centroid, Background subtraction, Peak hour Density count.

INTRODUCTION

1.1 Problem Statement :

The goal of this work is to develop an image-based solution for detection, counting and classification by vehicle type of road traffic. An image-based technique differs from other roadway sensors, such as radar or inductive loops, which provide data only regarding traffic flow and density, and do not provide information about the type of vehicle in real time. By leveraging advancements in computer vision algorithms and machine learning techniques, a novel algorithm to perform the detection, counting, and classification of vehicles may be accomplished by using streaming video input from the infrastructure of networked traffic surveillance cameras that already exist in most metropolitan areas. The proposed system can lead to lower implementation costs as compared to systems requiring additional sensor technologies.

The data generated by the proposed system, in the form of vehicle types, may be used to identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. So, the goal is to develop a real time system for counting, classification and monitoring of Indian traffic rod.

1.2 Peak Hour Factor :

Traffic engineers focus on the peak-hour traffic volume in evaluating capacity and other parameters because it represents the most critical time period. And, as any motorist who travels during the morning or evening rush hours knows, it's the period during which traffic volume is at its highest. The analysis of level of service is based on peak rates of flow occurring within the peak hour because substantial short-term fluctuations typically occur during an hour.

Common practice is to use a peak 15-minute rate of flow. Flow rates are usually expressed in vehicles per hour. If this peak hour is known vehicles can be diverted at this particular period of time.

1.3 Traffic Surveillance :

In recent years, video monitoring and surveillance systems have been widely used in traffic management. Extracting useful information such as traffic density and vehicle types from these camera systems has become a hassle due to the high number of cameras in use. Manual analysis of these camera systems is now unapplicable. Development of intelligent systems that extract traffic density and vehicle classification information from traffic surveillance systems is crucial in traffic management. It is important to know the traffic density of the roads real time especially in mega cities for signal control and effective traffic management. Time estimation of reaching from one location to another and recommendation of different route alternatives using real time traffic density information are very valuable for mega city residents. In addition, vehicle classification (big: truck, middle: van, or small: car) is also important for traffic control centers.

For example, the effects of banning big vehicles from a road can be analyzed using vehicle classification information in a simulation program. This presents an automatic traffic density estimation and vehicle classification method for traffic surveillance system using neural networks. Several other vehicle detectors such as loop, radar, infrared, ultrasonic, and microwave detectors exist in the literature. These sensors are expensive with limited capacity and involve installation, maintenance, and implementation difficulties. For example, loop sensor might need maintenance due to road ground deformation or metal barrier near the road might prevent effective detection using radar sensors. In recent years, video processing techniques have attracted researchers for vehicle detection.

One of the most important and basic in auto controlling traffic is detection and classification. These process cause to extract a lot of parameters of traffic. One of the hardest matter in computer vision is vehicle classification which need to a complicated algorithm and high accuracy. So far diverse works have considered for this classification. These process mostly are finding about separation and classify of vehicles.

The quest for better traffic information, and thus, an increasing reliance on tra c surveillance, has resulted in a need for better vehicle detection such as wide-area detectors; while the high costs and safety risks associated with lane closures has directed the search towards non-invasive detectors mounted beyond the edge of the pavement. One promising approach is vehicle tracking via video image processing, which can yield traditional traffic parameters such as flow and velocity, as well as new parameters such as lane changes and vehicle trajectories.

2. PROPOSED SYSTEM

This section describes the logic and reasoning behind the development of the computer vision vehicle detector and classification by length. It is separated into two distinct processes: background extraction and vehicle detection. A description of the various additional program features follows the discussion of the specific algorithms implemented in the design. The proposed system consists of the following stages:

2.1 Preprocessing :

Image pre-processing is the term for operations on images at the lowest level of abstraction. These operations do not increase image information content but they decrease it if entropy is an information measure. The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features relevant for further processing and analysis task. Image preprocessing uses the redundancy in images. Neighboring pixels corresponding to one real object have the same or similar brightness value. If a distorted pixel can be 98 picked out from the image, it can be restored as an average value of neighboring pixels. Image pre-processing methods can be classified into categories according to the size of the pixel neighborhood that is used for the calculation of new pixel brightness.

To some degree, every piece of video will need some preprocessing, but the amount is wholly dependent on both the source video and the format you are creating. There are basic things like scaling and changing the frame rate that will often be required, but color and luma changes should be used judiciously in order to avoid taking away from the intent of the content

2.2 Frame Extraction

The first step of pre processing involves conversion of video into frames which are the still shots or images that are part of the video. When these frames are projected or displayed at a certain rate (which is called frame rate) the video plays. The processing is done on each individual frame by looping and fetching a frame from the video.

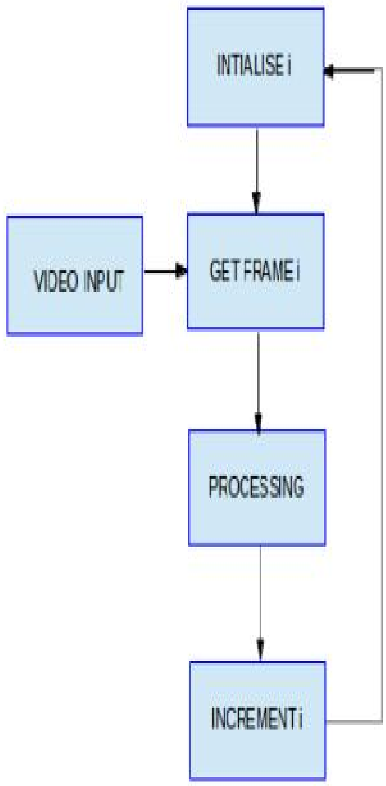

Figure [1]. Frame extraction by iteration

Each frame could be treated as an image.An image is a matrix with X rows and Y columns. It is represented as function say f(x, y) of intensity values for each color over a 2D plane. 2D points, pixel coordinates in an image, can be denoted using a pair of values. The image is stored as a small squared regions or number of picture elements called **pixels** as shown in the following figure:

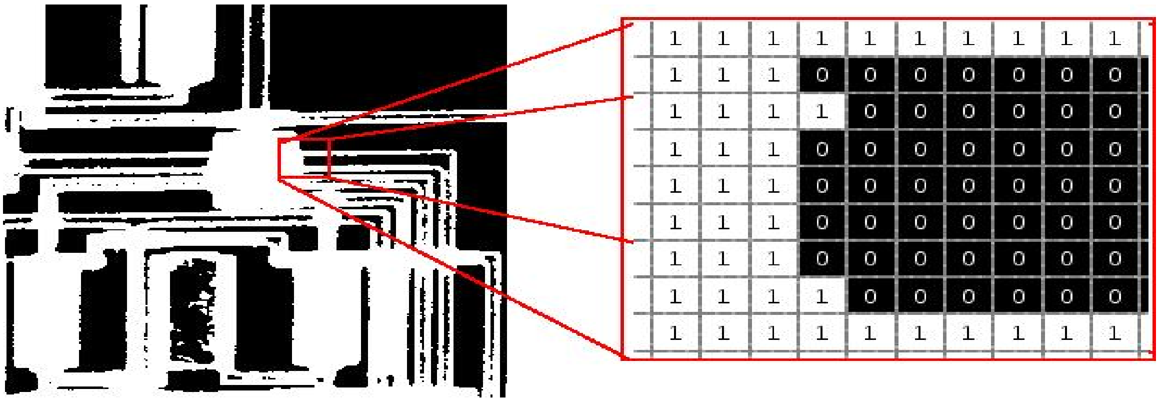

Figure [2]. Pixel representation of image

2.3 RGB2GRAY Conversion:

A true color image is an image in which each pixel is specified by three values one each for the red, blue, and green components of the pixel scalar. M by-n-by-3 array of class uint8, uint16, single, or double whose pixel values specify intensity values. For single or double arrays, values range from [0, 1]. For uint8, values range from [0, 255]. For uint16, values range from [0, 65535].

A grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Image involving only intensity are called gray scale images. Images of this sort, also known as black-and-white, are composed exclusively of shades of grey, varying from black at the weakest intensity to white at the strongest.Array of class uint8, uint16, int16, single, or double whose pixel values specify intensity values. For single or double arrays, values range from [0, 1]. For uint8, values range from [0,255]. For uint16, values range from [0, 65535]. For int16, values range from [-32768, 32767].

Figure[3].[Original RGB image]

Figure[4].[Gray image**]**

2.3 Background subtraction:

Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing 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, etc.) in its foreground. 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 mostly done if the image in question is a part of a video stream. Background subtraction provides important cues for numerous applications in computer vision, for example surveillance tracking or human poses estimation. However, 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. In a same way, due to wind, rain or illumination changes brought by weather, static backgrounds methods have difficulties with outdoor scenes.

A robust background subtraction algorithm should be able to handle lighting changes, repetitive motions from clutter and long-term scene changes. So, frame differencing is used here.

RESULTS :

The algorithm output is examined using an example video under ideal conditions: lighting is sufficient and vehicles are presented directly below the camera field of view.The classification results are shown below along with their count.Fig 5 shows the count before the auto passed the virtual line and fig 6 shows the count after the auto has passed, at the same time classifying it.

Figure[5].[count before the auto passed the virtual line]

Figure[6].[count after the auto passed the virtual line]

```
  General Settings:
    Duration = 25.1585
    Name = a.avi
    Path = C:\Users\test\Desktop\proj
    Tag =
    Type = VideoReader
    UserData = []

  Video Settings:
    BitsPerPixel = 24
    FrameRate = 29.9701
    Height = 480
    NumberOfFrames = 754
    VideoFormat = RGB24
    Width = 854

max =

   14.2123

peak_time =

    2.0333
```

Figure[7].[Peak Time]

```
density =

    2.8000    2.8000    2.8000    1.8000    1.8000

densitycar =

    0.6000    0.6000    0.6000    0.4000    0.4000

densitybike =

    1.8000    1.8000    1.8000    1.0000    1.0000

densityheavy =

    0.4000    0.4000    0.4000    0.4000    0.4000

count =

     5
```

The peak time observed for the test video is at 2.033 sec with 14% density. It is shown in fig14

CONCLUSION:

In this project work, a simple way of counting objects in the images and determining the correct value of density has been implemented. The number of objects and the density values are determined and verified for cell, people and vehicle counting applications. In cell count, the problem of counting many cells automatically as well as determining the accurate value of density has been solved. In people counting based on faces, even if too much skin is shown by a person in the image the algorithm can detect faces correctly. This provides an accurate count and density. Finally in vehicle counting, the algorithm used can detect the number of vehicles accurately including two wheelers without use of any hardware components.

In future, the same algorithm can be extended too many otherapplications other than the three applications covered in this project. Also, the present mat lab code used in cell count can be extended to find the correct count even if cells tend to overlap in the image. In people counting, if the two faces touch each other then inaccurate counts can be obtained. Hence methods to segment such images can be developed. In vehicle count, the same method can be extended to classify vehicles on the road such as car, truck, bike etc. Finally, the same counting applications can be shown in a simpler manner using otherimage processing software such as Python, ImageJ etc.

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REFERENCES

[1] R. Chellappa "Vehicle detection and trackingusing acoustic and video sensors", 2004

[2] Sensor Line, Classax, Traffic Data AcquisitionSystem, Germany,www.sensorline.de

[3] S. Gupte, "Detection and Classification of Vehicles", University of Minnesota 2002.

[4] E. Atkociunas, "Image Processing in RoadTraffic Analysis", Vilnius University, 2005

[5] B. Coifman "A Real-Time Computer VisionSystem for Vehicle Tracking and Traffic Surveillance" University of California, 1998

[6] C. Zhang "Adaptive Background Learning forVehicle Detection and Spatio-Temporal Tracking", IEEE, 2003

[7] Ryan P. Avery, Yinhai Wang, and G. Scott Rutherford," Length-Based Vehicle Classification Using Images from Un-calibrated Video Cameras", Intelligent Transportation Systems, 2004 Proceedings.The 7th International IEEE Conference

[8] Guohui Zhang, Ryan P. Avery, Yinhai Wang, "A Video-based Vehicle Detection and Classification System for Real-time Traffic Data Collection Using Uncalibrated Video Cameras", National Research Council, Washington, DC , 2007

[9] Kun Wu, Haiying Zhang, Tianmao Xu, Ju Song, "Overview of Video-Based Vehicle Detection Technologies", The 6th International Conference on Computer Science & Education (ICCSE 2011) August 3-5, 2011. SuperStar Virgo, Singapore.

[10] Yang Wang,, "Real-Time Moving Vehicle Detection With Cast Shadow Removal in Video Based on Conditional Random Field", IEEE transactions on circuits and systems for video technology, vol. 19, no. 3, March 2009.