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Multicue Background Subtraction for Robust Vehicle Counting and Classification

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Abstract:

In this paper, we present a robust vision-based system for vehicle tracking and classification devised for traffic flow surveillance. The system performs in real time, achieving good results, even in challenging situations, such as with moving casted shadows on sunny days, headlight reflections on the road, rainy days, and traffic jams, using only a single standard camera. We propose a robust adaptive multicue segmentation strategy that detects foreground pixels corresponding to moving and stopped vehicles, even with noisy images due to compression.

First, the approach adaptively thresholds a combination of luminance and chromaticity disparity maps between the learned background and the current frame. It then adds extra features derived from gradient differences to improve the segmentation of dark vehicles with casted shadows and removes headlight reflections on the road.

The segmentation is further used by a two-step tracking approach, which combines the simplicity of a linear 2-D Kalman filter and the complexity of a 3-D volume estimation using Markov chain Monte Carlo (MCMC) methods. Experimental results show that our method can count and classify vehicles in real time with a high level of performance under different environmental situations comparable with those of inductive loop detectors.

Index Terms:
Computer vision, tracking, traffic image analysis, traffic information systems, 3-D reconstruction.

INTRODUCTION:

The most sophisticated vision-based approaches for traffic flow surveillance combine information from cameras with other technologies, such as tags installed in vehicles, laser scanners that reconstruct the 3-D shape of the vehicles, or the Global Positioning System (GPS), to estimate the direction of the casted shadows [1]. Nevertheless,most vehicles do not have tags installed and can be "tricked,"and laser scanners increase the cost of systems and are sensitive to weather conditions, analogous to GPS, whose calibration complexity makes satisfactory results more costly to obtain.

In the event that shadows exist, the moving shadows will be misclassified into moving questions or parts of moving articles. As such, if the feature succession contains any shadows in the located zone, the shadows will result in resulting examination lives up to expectations, e.g. checking the quantity of articles, assessing the areas of items, breaking down the practices of articles, perceiving the articles, and so forth., to fizzle.

To take care of the issues created by shadows, Tao et al. [4] proposed a pyramid model and a fluffy neural system methodology to kill the shadows. Moreover, Onoguchi [5] utilized two cams to dispense with the shadows of passerby like moving items focused around the data of article statures. Also, Stauder et al. [6] utilized a few principles to recognize moving cast shadows in an obliged indoor scene as indicated by distinctive judgments of edge sorts.

On the other hand, the judgment of edge sorts is not steady under pragmatic conditions and just the cast shadows can be uprooted. In addition, Ivanov et al. [7] proposed a technique for uprooting impediment shadows focused around a divergence show that is invariant to discretionarily fast changes in brightening. In any case, keeping in mind the end goal to overcome quick changes in light, no less than three cams are needed.

Hence, a straightforward, solid and exact system is critical to be accessible for disposing of item shadows in a reconnaissance framework.

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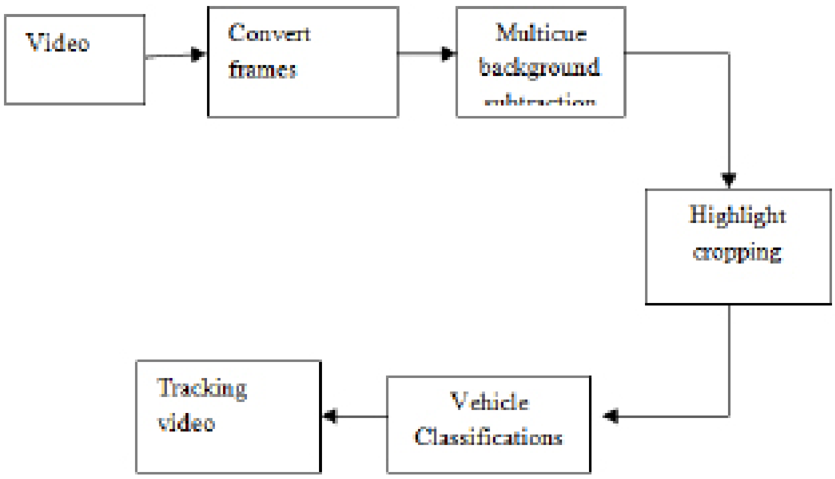
1.1 A Robust Algorithm for Shadow Removal of Foreground Detection in Video Surveillance :

The examination paper [1] portrays the accompanying things. Identifying moving protests in feature successions is vital in visual reconnaissance. The presence of cast-shadows would change the shape and size of the moving articles. Since the shadows generally move along the moving protests so they may cause false order, which can result in different undesirable conduct, for example, article shape contortion and item blending. when the feature pictures are caught with a settled cam, foundation subtraction is an ordinarily utilized procedure to portion moving articles.The forefront items are recognized on the off chance that they vary altogether from the foundation. In any case, the distinguishing consequences of moving articles are generally affected by thrown shadows... Consequently, it is basic to identify and portion cast-shadows so as to portray moving question effectively in visual observation and observing frameworks.

PROPOSED METHOD:

The piece graph of multicue foundation subtraction.



3.1. Perusing of edge from a feature arrangement :

Firstly I taken a feature and after that read all the casing in the feature by the matlab capacity Aviread.the methodology of this is clarified beneath.

a)access Video with MMREADER :

The mmreader capacity builds a media peruser question that can read feature information from Multimedia document. I utilized the accompanying capacity to peruse all my features.

This capacity is extremely Useful as it can read the feature record with distinctive organizations which are not been perused by basic Function like AVIREAD. mmreader backs the accompanying configurations: AVI, MPG, MPEG, WMV, ASF, and ASX videofile = mmreader(PATH);

b) Reading of the edge from the article made by mmreader :

After the item made by mmreader .The article is utilized for perusing the feature document with the goal that edge can be concentrated from it and the handling is possible on each of the casing. The capacity for the same is depicted underneath : Movie= aviread(videofile,frameno); The capacity aviread is utilized to concentrate an edge from the feature, where moviefile is the way of the film record and frameno is the quantity of casing to be concentrated. The capacity will extricate the whole casing and will store it into the Movie.

C) Getting number of edges:

To get number of edge from a feature I utilize the accompanying capacity.numframes = get(videofile, 'numberofframes'); The above capacity will separate the quantity of casing in the feature record and will store it into the variable name numberofframes.

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MULTICUE BACKGROUND SUBTRACTION:

The algorithm of multicue background subtraction as shown in fig.2.

- *Initializing the current image I and B is the mean Background luminance and chromaticity co-ordinates for Each pixel xy in color space*
- *Initializing the offset values Ol , Oc , Os , Ow*
- *Assigning the constant values Kl, Kc*
- *Calculating the Dl value per pixel* $\rightarrow |I_{xy}-B_{xy}| - kl.(\Sigma l)_{xy}$
- *Calculating the Dc value* $\sqrt{(\hat{I}x-Bx)^2 + (\hat{I}y-By)^2} - Kc \cdot (\Sigma c)_{xy}$
- $Tl = \min(Dl + Ol)$
- $Tc = \min(Dc + Oc)$
- *If* $Dl > Tl$ *and* $Dc > Tc$ *then*

If $B_{xy} > I_{xy}$ *or* $|B_{xy}-I_{xy}| < Os$ *then the Mask = Shadow*

- *Else if* $B_{xy} > I_{xy}$ *or* $|B_{xy}-I_{xy}| \geq Os$ *then the Mask = Black*
- *Else if* $I_{xy}-B_{xy} > Oh$ *or* $I_{xy} \leq Ow$ *then the Mask = Highlight*
- *Else if* $I_{xy} > Ow$ *then the Mask = White*
- *Else Mask = Foreground*
- *If image(mask) = Shadow or Black and* $(Dc)_{xy} > Tc$ *and* $|(Dl)_{xy} - Tl < (Dc)_{xy} - Tc$

then mask = foreground else mask = background

- *For I = 1:n (frames)*
- *End*

4.1. algorithm of multicue background subtraction technique:

HIGHLIGHT CROPPING:

We will overlook darker areas to fabricate vehicle blob competitors for the following stage, however highlighted districts oblige further handling to evacuate those produced by sudden light changes originating from climate varieties or headlights.

VEHICLE COUNTING AND CLASSIFICATIONS:

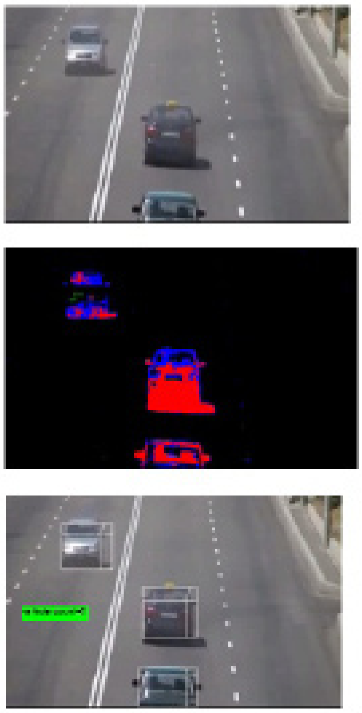
In this work, the caught vehicle districts will be named auto, truck, or transport. The characteristics utilized for order ae perspective degree A and minimization C which ae separately characterized as:

$$A = \frac{H_l}{W_l}, C = \frac{A_v}{W_l \times H_l}$$

Where Av is the range of the vehicle. Since the stature of truck and transport will be bigger than the one of auto, it will have bigger viewpoint degree. Likewise, the discovered vehicle with perspective proportion littler than a edge Ta will be firstly named as auto. For further characterizing between transport and truck, we examine the closer view veils of transport and truck. Since the transport will be general a arched article, the divided frontal area will be more minimal that the one of truck Accordingly, the region with compactness larger than a threshold Tc is classified as the bus. In a word, the classification rule of a detected vehicle is expressed as:

$$\begin{cases} \text{car} & \text{if} \quad A < T_a \\ \text{bus} & \text{if} \quad A >= T_a \text{ and } C >= T_c \\ \text{truck} & \text{otherwise} \end{cases}$$

EXPERIMENTAL RESULTS:



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CONCLUSION:

In this paper, we have displayed a novel machine vision framework contrived to track and characterize vehicles with the point of supplanting Ilds, especially on roadways.The framework has been tried with various types of climate conditions (counting blustery and sunny days that make passing vehicles cast shadows), acquiring comparable results to Ilds.

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