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A NOVEL APPROACH FOR BACKGROUND SUBTRACTION AND SHADOW REMOVAL

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ABSTRACT

The modern world demands mobility everywhere, but today's congested roads, highways and city streets don't move fast, which creates a lot of trouble to the common people. Manual systems are in-effective when the number of vehicle exceeds a certain limit. Intelligent traffic systems (ITS) apply communications and information technology to provide solutions to this congestion as well as other traffic control issues. In this paper a system is designed to detect the background by using Adaptive Background Modeling(ABM) method and removing the shadow at various illumination changes by converting the frames into the YCbCr color-space used the CamShiftAdditive(CSA) method for the correction on the Y channel, and then Reintegrating ModelBased(RMB)method for the correction of the Cb and Cr channels. The system can able to remove the shadow caused by direct light and ambient light. The experimental result shows that the proposed method can detect the background at various illumination changes.

Keywords: Intelligent Transport System(ITS), ABM, CSA, RMB, Shadow, Illumination Changes.

I INTRODUCTION

Background subtraction, otherwise called 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. Generally an image's regions of interest such as humans, cars, text etc., are objects in its foreground. Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. Background subtraction is mostly done if the image in question is a part of a video stream. Background subtraction provides various applications in computer vision, for example surveillance tracking or human poses estimation. Background can easily be detected if there exist no shadow. If there exist a shadow of an object, the shadow along with the object gets detected. In this case background subtraction has no effect and extracted results are unsatisfactory in case that shadows exist in every frame of video sequence. So, moving shadow detection is critical for accurate object detection in video streams since shadow points are often misclassified as object points, causing errors in background subtraction andtracking [1]. Background subtraction gives the most complete feature data, but it is sensitive to dynamic scene changes due to illumination changes and extraneous events [3]. Therefore, detecting and removing shadows from object regions have great practical significance and tremendous challenge in the field.

This paper is designed in the order as follows: Literature survey, module description ,Algorithms, Snapshots, Results, Conclusion and Inferences.

II LITERATURE SURVEY

Shiping Zhu* et.al, concludes that the shadows usually make the geometrical shape of moving objects distorted; sometimes even cause the losing or merging of moving objects. Therefore, detecting and removing shadows from object regions have great practical significance and tremendous challenge in the field, which have attracted a great deal of attention recently.

Harsha VarwaniHeena et.al.uses a common approach to identifying the moving objects is background subtraction, where each video frame is compared against a reference or background model. Pixels in the current frame that deviate significantly from the background are considered to be moving objects. These foreground pixels are further processed for object localization and tracking. Since background subtraction is often the first step in many computer vision applications, it is important that the extracted foreground pixels accurately correspond to the moving objects of interest.

Adesh Hardas et.al.usesFrame differencemethod where current frame is subtracted from reference image. If | frame i– background i| > threshold, then the pixel i is foreground [6]. These techniques are very fast, but the segmentation performance can be quite poor, especially when there is fluctuating in illumination. In order to manage the change in background several complex background methods have been developed.In the moving object detection process, one of the main challenges is to differentiate moving objects from their cast shadows.

Mrs. M. D. Ingole et.al.concludes that There are three main shadow attributes, firstly, shadows or moving shadows are attached to their respective obstruction object for most of the time, secondly, transparency which is that shadow always makes the region it covers darker and lastly, homogeneity which is the ratio between pixels when illuminated and the same pixels under shadows can be roughly linear.

Yinghong Li et.al.Adaptive Gaussian mixture background modelhave good analytic form and high operation efficiency. It is more suitable than single Gaussian models for high speed moving objects detection under outdoor environment where image background and illumination intensity changes slowly. However, low convergence speed is its main shortcoming especially as the illumination intensity suddenly changes. It cannot adapt to these kinds of rapid changes and often take changing background pixels as moving objects, which makes the image foreground information confused and moving objects lost.

Siriyen Larsen et.al. Proposed a method based on analyzing the border contour of the shadows (with the connected vehicle), and propose criteria based on the curvature and normal vector to localize the vehicle. The vehicle detection strategy consists of a segmentation stage, where image objects representing vehicle candidates are found, followed by feature extraction and classification.

Sooho Park et.al.proposed a method methods to detect the shadows on an urban road with a fast computation time. First, we start with a pixel-based method that is well suited for an The authors are with the Computer Science and Artificial Intelligence Laboratory. Asampling region is choosen near the vehicle where we can reliably sample the road pixels to estimate the characteristics of the road. Based on this estimate and a machine learning method, each pixel of the image is classified into one of the following categories: road, shadow, dark object, and brighter object.

Module Description:

The proposed work is divided into three different modules:

1. Preprocessing
2. Background Detection with Shadow
3. Background Detection without Shadow
4. Detected Foreground with Illumination changes.

Preprocessing:

The captured video is divided into RGB image Frames and each RGB Frame is converted into Grayscale Frames. Noise is removed from each Grayscale frames using Median Filter. The output of this module isGrayscale converted Frames without noise.

Background Subtraction:

To the noise removed Frames Background subtraction algorithm is applied. Background subtraction involves two distinct processes that work in a closed loop: background modeling and foreground detection. In background modeling, a model of the background in the field of view of a camera is created and periodically updated, for example to account for llumination changes. In fore ground detection, a decision is made as to whether a new intensity fits the background model; the resulting change label field is fedback into background modeling so that no foreground intensities contaminate the background model[9]. In the proposed work the gray scale image is sampled on a 3-D lattice. The sequence of such Frames are numbered, A nonparametric Adaptive background model with Gaussian mixture (ABM) model is applied to the 3-D lattice and it adapts to slow backgroundchanges such as illumination. The Image obtained is a Background image with shadow.

Algorithm:

- Model the values of a particular pixel as a mixture of Gaussians.
- Then determine which Gaussians may correspond to background Gray-Based on the variancevalue of each of the Gaussians.
- Pixel values that do not comes under background distributions are considered foreground until there is

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a Gaussian that includes the value within them.

- After each iteration update the Gaussians.
- Pixel values that do not match one of the pixel's "background" Gaussians are grouped using connected components and adaptive model is applied for a particular image.
- After adaptive model is applied estimate the Gaussian weight, mean and variance of the mixture.

The below figure shows the subtracted background image. But the detected image is associated with a shadow. A shadow removal technique is applied to detect only the foreground from the background.

Fig.1. Background Detection with Shadow

Background Subtraction Without Shadow: In tis module the shadow is removed at various illumination changes by converting the frames into the YCbCr color-space. The CamShiftAdditive(CSA) method for the correction on the Y channel in the Gray scale image and then Reintegrating ModelBased(RMB) method for the correction of the Cb and Cr channels are used in order to remove the shadow. The system can able to remove the shadow caused by direct light and ambient light. Some of the basic Assumptions of Shadow [10] are made. They are : The following assumptions are made regarding Shadow,

1. Illumination image is spatially smooth.
2. No change in the texture inside the shadow region.
3. The illumination image is close to being constant in shadow regions.

Algorithm

- Pixels value is separated into high and low level intensity. Threshold is set to differentiate between self and cast shadow.
- Cast shadow pixels are replaced by background pixels.
- Standard deviation is calculated for ratio value. Conditions are set for a shadowed pixel.
- Intensities in the neighbor pixels in the foreground region are equal to the ratio of neighbor pixels in the background image in the presence of shadow.

The below figure shows the background subtraction with shadow removal and the second figure shows about the illumination changes.

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Fig.2.Background Subtraction without Shadow

The illumination changes are handled and the result shows that the proposed method can detect the Foreground at various illumination changes.

III EXPERIMENTAL RESULTS

The experimental result shows detected foreground image with various illumination changes. The proposed work is carried out with different input video and the result proved to an effective one.

IV CONCLUSION

The ABM, CSA and RMB algorithm is used in different modules and the result obtained is compared with the other related work and the result proved to be an effective one. The output of this method can extended to be used in Detecting and Tracking system.

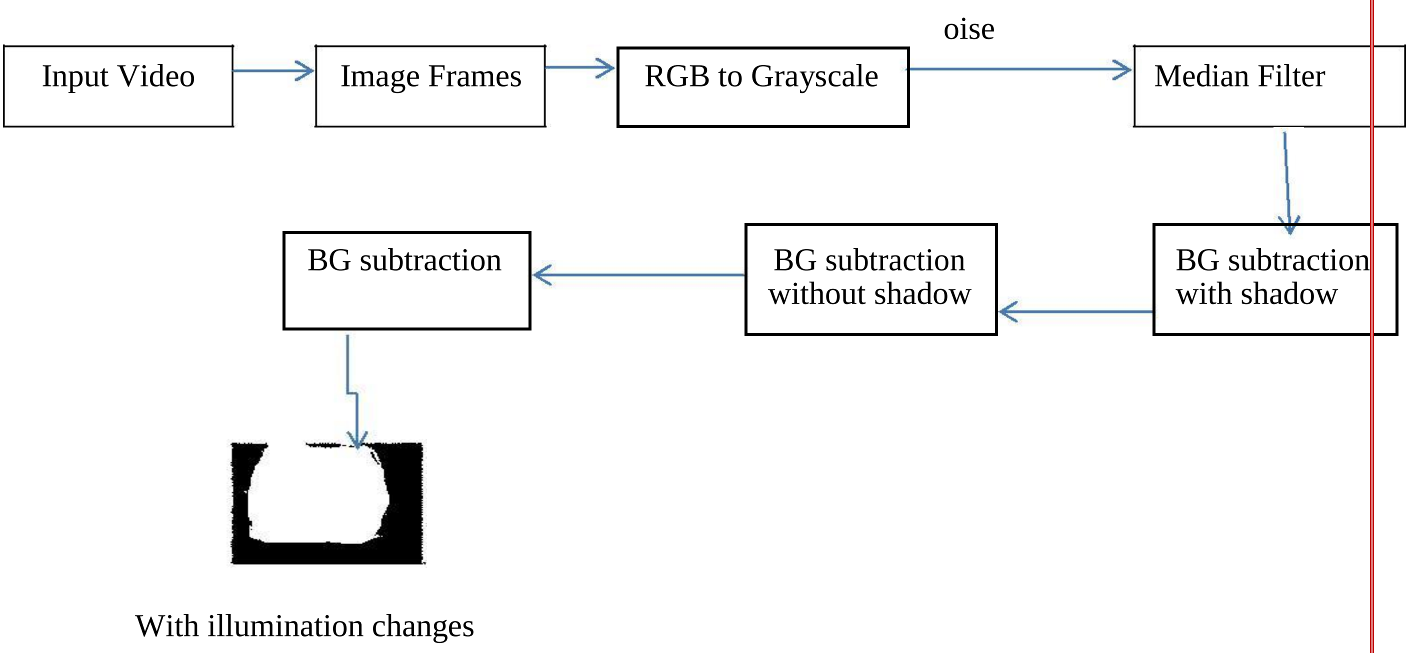

Fig.3.Architecture Diagram

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