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MOG BASED BACKGROUND SUBTRACTION AND VIDEO WATER MARKING

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Abstract:

Background subtraction is an important step for video analysis, where it is used to discover the objects of interest for further processing. Background subtraction method is motion detection method, which uses the difference of the current image and the background image to detect moving objects. Here the proposed algorithm is known as Mixture of Gaussian (MOG) process. An approach is used along with the kalman filter for frame by frame detection. Then the MOG is used automatically to estimates the number of mixture components required to model the pixels background color distribution. Here implement the background suppression for static and dynamic background images without using any reference background images, and also suppress the noise in the background image's shadows. Kalman filter techniques are characterized by low computational cost and being based on a solid statistical model, by a good robustness level.Then the key of this method is the initialization and update of background image and detection of moving object, which is also accurate.

Key Words: Mixture of Gaussian, Kalman Filter, Frame Detection, Suppression & Dirichlet Process

1. Introduction:

Digital image processing is dealt with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an image as an output. Background subtraction of object is tracked by using this Digital Image Processing. Background subtraction with Dirichlet process is given the static background by using median and mean filter. Median filter is lowered storage and computation requirements at the expense of a slower adapting background. Here the output isn't accurate with shadow/noise. The problem is overcome by the Background Subtraction with Mixture of Gaussian models.

Histogram: A histogram is bar graph that shows a distribution of data. in image processing histograms are used to show the how many of each pixel value, present in an image.

Negative: The negative of an image means the output image is the reversal of the input image. The new image appears as the opposite of the original. The misadjust function performs this operation.

Median Filters: Median Filters can be very useful for removing noise which is from images. The averaging filter examines the pixel in question and its neighbour's pixel values and returns the mean which of these pixel values.

Edge Detectors: Edge detectors are very useful for locating objects with in images. There are many different kinds of edge detectors namely the Sobel edge detector and the canny edge detector .

Segmentation: Segmentation is the process of fractioning an image into its component objects. This can be accomplished in various ways in MATLAB. One way is to use a combination of morphological operations to segment touching objects within an image. Another method is to use a combination of dilation and erosion to segment objects.

2. Background Subtraction:

Kalman filtering and Mixture of Gaussians (MoG). MoG is more robust, as it can handle multi-modal distributions. Kalman filters effectively track a single Gaussian, and are therefore uni-modal: it can filter out only leaf or sky but not waves in the sea , but usually not both .In MOG, first read a video as image and then it is converted into gray scale. Means and weights are initialized and then frame by frame process is continued with Gaussian component for each pixel. The frame is updated with segmented background. In kalman filter, some algorithm steps are read by same as in MOG. After read and computed number of frames the steps are different. That is difference of current and previous frame/image in individual RGB panel based on the threshold. The shadow/noise is removed by the kalman filter. The frame is updated with Kalman filter segmented background. The MOG and Kalman filter results are given into the performance analysis and produced better subtracted foreground. It is given the high performance & accurate segmented result with reduced noise and shadow

Mixture of Gaussian: The Mixture of Gaussian process and kalman filter are important algorithm. Static and dynamic background image are used in this method. The simplest way to model the background is to acquire a background image, which isn't having Block diagram shown in Fig.1. The frame by frame is read in MOG

process and kalman filter algorithm, which is given to performance analysis. Finally it produced the high performance & accurate segmented result with reduced noise and shadow.

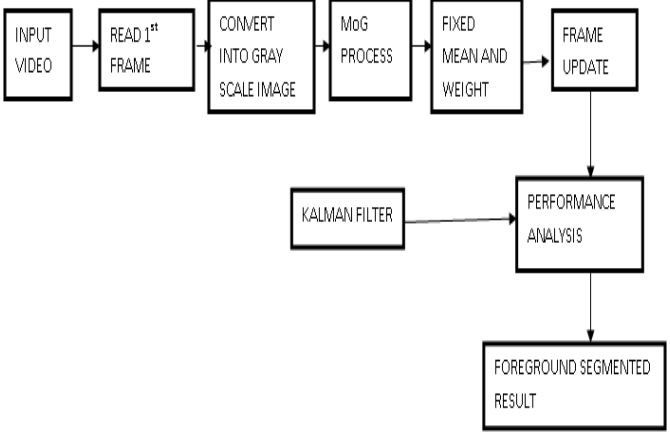

Figure 1: Block diagram for background subtraction

The kalman filter result and MoG process result is given to the performance analysis. The performance analysis is compared the MOG and Kalman filter results and produced the better foreground segmented output with reduced noise and shadow. The Reference background image is found the moving image and given to processing unit. Here median filter and Dirichlet process algorithm is used in existing method. It produced the static background by done these processes. Then in this method isn't given the accurate performance of moving object then the shadow and noise aren't reduced.

Algorithm Involved in Background Subtraction:

- ✓ Compare the input pixels to the means u_i of their associated components. If a pixel value is close enough to a given component's mean, that component is considered a matched component. Specifically, to be a matched component, the absolute difference between the pixel and mean must be less than the component's standard deviation scaled by a factor *D*.
- ✓ Update the component variables (w, u, and σ) to reflect the new pixel value. For matched components, a set of equations increase our confidence in the component (w increases, σ decreases, and *u* is nudged towards the pixel value). For non-matched components, the weights decrease exponentially (u and σ stay the same). How fast these variables change is dependent on a learning factor *p* present in all the equations.
- ✓ Determine which components are part the background subtraction model
- ✓ Order the components according to a confidence metric w/σ, which rewards high *w* and low σ. We do this because we want to keep only the M most confident guesses.
- ✓ Apply a threshold to the component weights w.
- ✓ The background model is then the first M components (in order of highest to lowest w/σ), whose weight w is above the threshold. M is the maximum number of components in the
- ✓ Background model, and reflects the number of modes we expect in the background probability distribution function *f* (or it may reflect our computational resource limitations).

MOG Algorithm: In this approach each pixel is modelled with a mixture of Gaussian distributions so that the model is general enough to handle common background variations. The background subtraction involves two different tasks, each of which needs to be performed real-time, with having the video frames as the input. Then the algorithm is given below,

- ✓ Read a video
- ✓ Read 1st frame as a background
- ✓ Convert grayscale and find height and width
- ✓ Define MoG variables
- ✓ Initialize component means and weights
- ✓ Frame by Frame process
- ✓ Update Gaussian components for each pixel
- ✓ Calculate foreground
- ✓ Frame update
- ✓ Final foreground segmented results

Kalman Filter: Kalman filtering is presented for updating the background image within video sequences. Moreover, methods to estimate measurement noise variance and to deal with the problem of saturated pixels, to improve the accuracy and robustness of the algorithm. The algorithm has been successfully tested in a traffic surveillance task by comparing it to a background updating ,Kalman filter techniques are characterized by low

computational cost and, being based on solid statistical model, by a good robustness level. Then the procedure is given below,

- ✓ Read a video
- ✓ Read all video frames and compute no of frames
- ✓ Kalman filter initialize
- ✓ Find difference between current and previous frame in individual RGB panel based on threshold
- ✓ Remove shadow/noise
- ✓ Frame by Frame process
- ✓ Find connected components
- ✓ Measure properties of image region
- ✓ Frame update
- ✓ Final foreground segmented results
- ✓ Both methods' step 10 will be update as final results

Output of Background Subtraction: The final output of the given program which clearly subtract the background other than the main picture. We can feel the difference by seeing the above picture. The first picture is the input which processed by kalman filter and gives the result as shows the in the second picture and later we applied MoG algorithm and found the result as shown in Fig.2 and there is no noise in the obtained result.

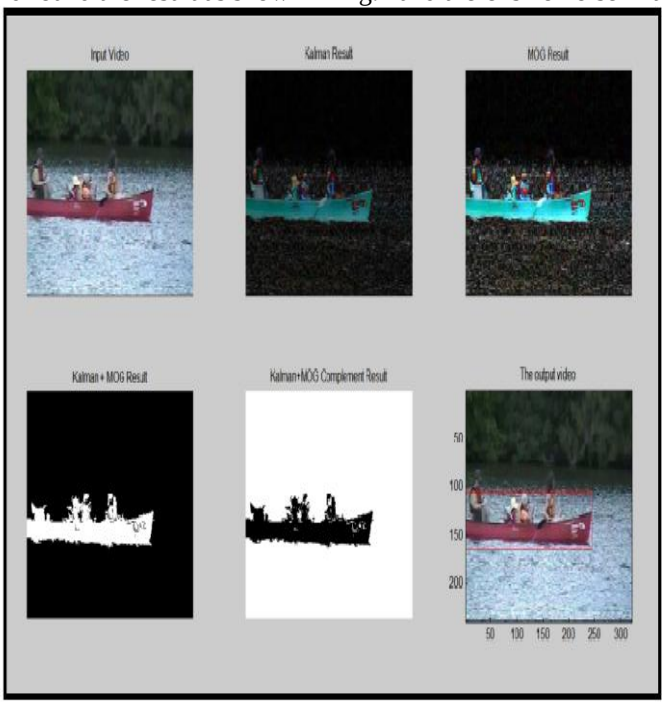

Figure 2: Output of Background Subtraction

With the help of MoG, here we find out absolute static background without the noise, rather than the moving object and finally we take complement for the Mog output to find out the object.

- ✓ First image in the output is the raw input image from the video and the input image is divided into several Frames.
- ✓ The second image is the output of the kalman filter
- ✓ The third one is the output of the Mixture of Gaussian which reduces the noise from the input image.
- ✓ The fourth image is the output of the kalman filter and MOG which detect the static background it is used to identify the object easily.
- ✓ The fifth image is the output of the kalman filter and MOG component, which gives the output of the object from the fourth image. With less noise and in a dynamic background.

3. Conclusions:

The background subtraction is dealt by using the Mixture of Gaussian models and kalman filter. Then the quality of performance is improved. Here the video or moving object is converted into the frame by frame detection. It is not taken the direct video as input. In future, it will be modified as the direct video will be given and gotten the segment value. Here the frame by frame detection isn't needed. So the system will be given reduced blocks. The process to take time of frame detection will be reduced. And then sudden complex lighting changes are not handled, which means it fails to handle some indoor lighting changes. The module is extension work of this project. This module includes Kalman filter based algorithm. It is a widely-used recursive technique for tracking linear dynamical systems.

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