IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
PP 39-44

Moving Object Detection and Tracking from Video

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Abstract: *In video or image, detection and tracking of an object is more widespread and used for motion detection of an object. Identify objects in the video sequence and cluster pixels of these objects is the first step in object detection. To track or observe the moments of a particular object in every frame is the process of tracking. There are many false positive cases in the frame. To reduce these drawbacks Saliency Map Model is used. The proposed method uses the Saliency Map Model for the object detection from video and tracking the moving objects from video using Extended Kalman Filter. Extended Kalman Filter is used for tracking the object. The proposed method evaluated based on evaluation parameter delay and accuracy. Finally, the proposed method compared with existing object tracking method*
Keywords: *object detection, Saliency Map, object tracking, Extended Kalman Filter*

I. Introduction

The basic of intelligent video analysis is object detection. Object Detection is the process of finding instances of real world object such as faces, bicycles and buildings in images or videos. The first important step in object detection is to identify object in the video sequence and cluster pixels of these objects. Objects are classified into static object and moving object. Static object can be background things such as tree, building etc. and moving objectare also called as foreground object. Some examples of moving objects are bird, person, vehicle etc. In this paper, focus is on moving object detection from video.

The task of moving object detection is to detect meaningful moving object. Moving objects which are meaningless should not be detected. Some example of meaningless moving object include waving leafs, shadows and water ripples. Saliency map model technique is used to detect the object. Saliency map is an image that shows every pixels visually active component and it contains interested area information [1]. Saliency Map makes estimated background have less chance than foreground (i.e. moving objects). There are many false positive cases in the result of many algorithms of moving object detection. To reduce false positive cases saliency map is used.

Fig. 1 Original Images (Top) & Their Saliency Maps (Bottoms)

Object tracking plays an essential role in the field of image processing algorithm [2]. Object tracking approach specially used to track the object along with travelling direction of an object [3]. Recently tracking-by-detection method has become much popular model for object tracking with the advances in detection of an object[4].From different angle object can be track therefore tracking can be mainly classified into single object tracking, Multiple object tracking [5][6],outline tracking and online tracking [7].In video, from the viewpoint of tracking the use of Extended Kalman Filter algorithm can be made for the purpose of motion estimation and tracking of an object. When starting the tracking of an object the first step is object detection. Mechanism which is required for object detection is carried out in video for tracking when the object first appears in the frame or sequence of frame [8] [9].In a video sequence locating the object of interest is process of object tracking. Object tracking aims at processing visual information to follow a moving object. Object can be track to recognize their behavior [10] Object tracking is performed by monitoring changes in an object's presence, size, position, etc. Object Tracking is carried out to check the presence of object in videos. Object tracking is a method of finding an object of interest in the video to get the useful information by keeping the track of its motion, orientation and occlusion etc. [11]. Video is nothing but sequence of images, each is called as frame. Each frame can be classified into two set of objects, foreground object and background object[12].The whole process of object tracking consist of following three main steps, object detection, classification of an object and object tracking[13]. Various application of object tracking using different techniques and approaches are implemented. Basic application of object tracking which is widely used is Video surveillance [14]. The purpose of video surveillance system is to solve different types of problems such as detection of an object and object tracking [15].Tracking a real-time frame works color has been generally used [16].

System can be divided into linear and non-linear. Kalman filter mainly used for linear system and Extended Kalman Filter (EKF) is used for the purpose of tracking an non-linear object [17].In 1960, a standard approach for optimal estimation is proposed by R. E. Kalman [18]. The valuable technique used for distinct types of moving object tracking is Kalman Filter [19].Kalman Filter consist of two main phases such as predict and update [20]. Extended Kalman filter is an extension of anKalman Filter and it is the one way to handle the non-linearities.

Saliency Map:-

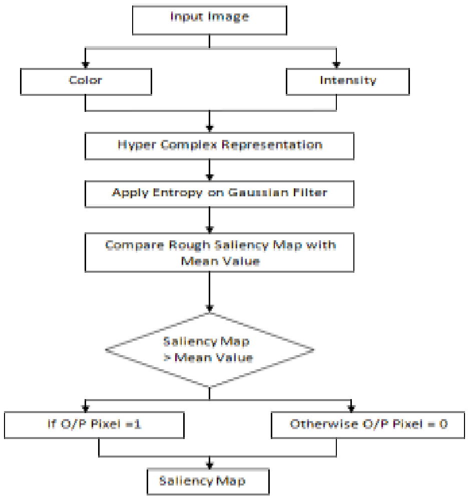


Fig. Flow of Saliency Map

Input image is read first then color values (red, green, blue) of the input image r, g, b is calculated. I is an intensity of image which is calculated by the formula I = (r + g + b) / 3. Color channels is generated for each pixel, R = r - (g + b) / 2 for red, G = g - (r + b) / 2 for green, B = b - (r + g) / 2 for blue, and Y=(r + g) /2 - |r - g| /2 - b for yellow. coloropponency is determine for RG = R – G and BY = B –Y. Then by using the hyper compress representation convert thetime domain into frequency domain. Energy of each pixel is called as entropy that is apply on Gaussian filter to find the maximum entropy. The find maximum entropy is called as rough saliency map. Rough saliency map is compared with the mean value. If the saliency map value is greater than the mean value then output pixel is equal to one otherwise output pixel is zero. This output pixel is used to find the saliency map. By using boundary cut value get the exact image.

Fig. Original Image and Their Color Component

First image is the original image, read that image and calculate color values (red, green, blue) of the imagei. e. r, g, b. I is an intensity of image which is calculated by the formula I = (r + g + b) / 3. Color channels is generated for each pixel, R = r - (g + b) / 2 for red, G = g - (r + b) / 2 for green, B = b - (r + g) / 2 for blue, and Y=(r +g) /2 - |r - g| /2 - b for yellow. coloropponency is determine for RG = R – G and BY = B –Y.

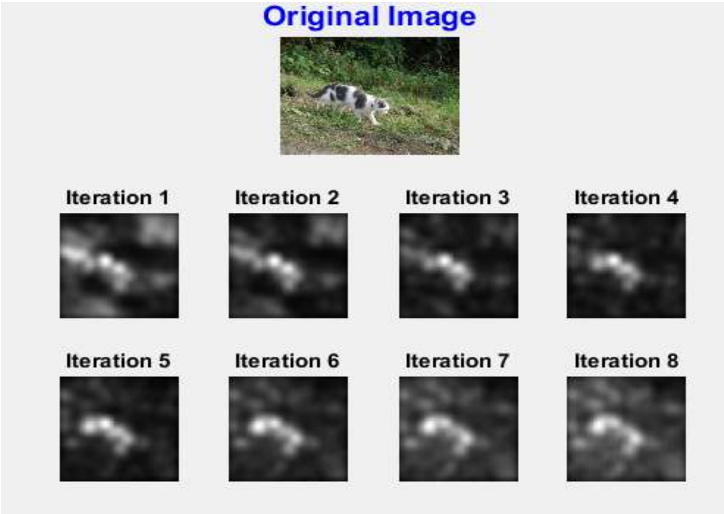
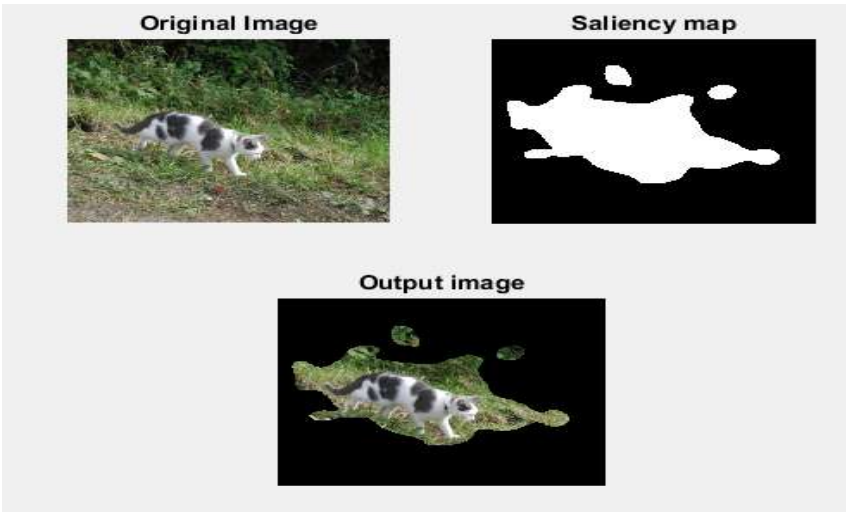


Fig. Original Image and Their Iteration

Top image is the original image which is of 8 bit image so process each an every bit. Bottom image shows the iteration 1, iteration 2, iteration 3, iteration



4, iteration 5, iteration 6, iteration 7, iteration 8.

Fig. Original Image along with their Saliency Map and Output Image

In Fig. First image shows original image, second image shows their saliency map and third image shows the final output.

Feature Extraction

Segmented image is strip of black region then it is given to GLCM block & wavelet block to find features. GLCM i.e Gray level Co-Occurrence matrix compare each pixel with other pixel to calculate no. of match pairs. In graph x-axis shows Pixel pair and Y-axis shows number of times of occurrence. Calculate R-GLCM,G-GLCM,B-GLCM. DB2 is apply on level 5 to get the feature. Combine the GLCM and Wavelet features to get the feature vector.

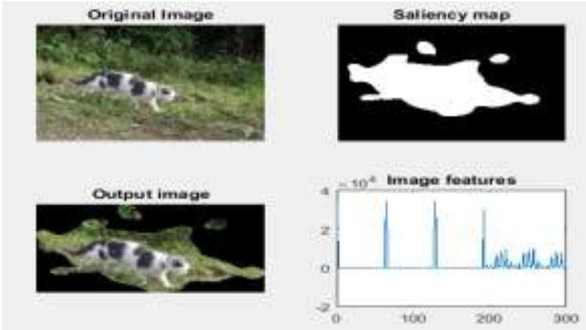
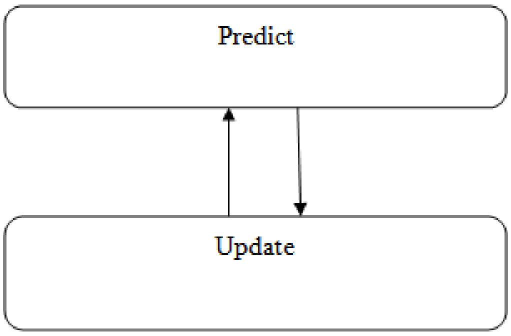


Fig. Features are extracted and shows on Graph

EKF ALGORITHM:-
EKF algorithm is an extension of kalman filter. Kalman filter works on two phases.
(1) Predict (2) Update



In predict phase, Kalman filter predicted or estimated the current location of the moving object based on the previous observation made. In the update phase the capacity of the objects current location is pooled with the predicted location and acquires the posteriori projected current position of the object.
The steps of EKF Algorithm are:-
Prediction:- In predict phase, Extended Kalman filter predicted or estimated the current location of the moving object based on the previous observation made.
Association:-In the association phase check object is move or not. In this phase new position is get by DWT (Discrete Wavelet Transform).

Correction:- In Correction phase if get new plot or position then do the correction.

Experimental Results:-
Based on the proposed Algorithm for moving object detection, the experimentsare conducted and result are shown. Fig. shows the Graphical User Interface of moving object detection and tracking from video. In that first we have to browse the file then select the algorithm that is Extended Kalman Filter (EKF) or Saliency Map with EKF. Click on the Select Object and Track button after that window is appear is shown in fig. and from that video choose the object for tracking. When want to stop tracking click on the stop tracking button.

Fig. Object movement from point A to point B

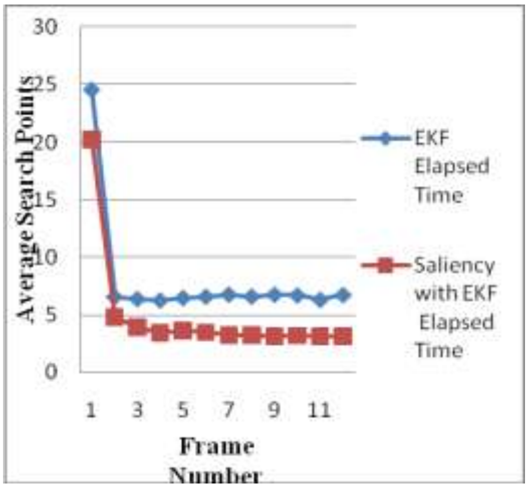


Fig. Frame-wise performance comparison between EKF and Saliency with EKF on "PERSON" sequence by average search point.

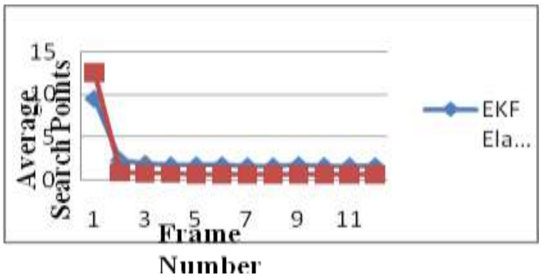


Fig. Frame-wise performance comparison between EKF and Saliency with EKF on "CAR" sequence by average search point.

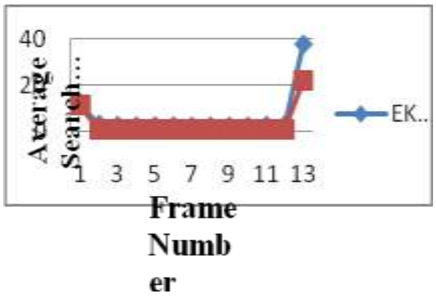


Fig. Frame-Wise performance comparison between EKF and Saliency with EKF on "PET" sequence by average search point.

$$Accuracy = \frac{Corrected\ Output}{No.of\ Frame\ Tested} \times 100$$

For Person video

$$Accuracy = \frac{Corrected\ Output}{No.of\ Frame\ Tested} \times 100$$

$$Accuracy = \frac{219}{169} \times 100$$

$$Accuracy = 91.15$$

For Car video

$$Accuracy = \frac{Corrected\ Output}{No.of\ Frame\ Tested} \times 100$$

$$Accuracy = \frac{103}{113} \times 100$$
$$Accuracy = 92.89$$

For Pet video

$$Accuracy = \frac{Corrected\ Output}{No.of\ Frame\ Tested} \times 100$$

$$Accuracy = \frac{219}{239} \times 100$$
$$Accuracy = 91.63$$

Simulator

The proposed approach is implemented using (MATLAB 9.0.0.341360) (R2016a). The experiments are carried out on Intel (R) Core (TM) 3 Duo T6570, 2.10 GHz processor. The RAM of 4GB is used. The operating system is 32-bit installed on Windows 7 platform.

II. Conclusion And Future Scope

In this paper, we have presented methods for moving object detection and tracking. The method makes use of Saliency Map for object detection. Saliency map reduces the number of false positive cases in the images. To trackobject Extended Kalman Filter (EKF) is used. EKF is the only one way to handle the non-linearities. Delay of the Saliency Map with EKF is less than the delay of standard EKF. In future this research can extend the Extended Kalman Filter algorithm for object tracking applications using real-time object tracking system.

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