Object Tracking Using Camshift Algorithm in Open CV

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ABSTRACT

These paper reviews tracking of moving object with camshaft algorithm in OpenCV. In many other cases camshaft considered a feature of tracked object. | In our paper, we have not considered any feature of object to be tracked. Here first Reference frame is selected by user and further continuously updated Binary foreground pixels are given as an argument to CAMshift, for locating location of desired object in each frame. Mask image is created from reference frame in order to masked out undesired motion contours in video frame | Before Tracking, Motion contour detection is achieved. | We proved, CAMshift algorithm can be implemented for tracking even if user don't have any feature information of object to be tracked.

I. INTRODUCTION

Object Tracking is one of the key tasks in the field of computer vision. This is a useful operation in automated security solutions, traffic monitoring system, etc. Various methods of object tracking are available. But two main methods used of tracking are widely used in real time application [1]

MeanShift algorithm is designed for static distribution. The method tracks targets by finding the most similar distribution pattern in a frame sequences with its sample pattern by iterative searching. It is simple in implementation. But it fails to track the object when it moves away from Camera. [1]

Continuous adaptive mean-shift (CAMShift) was used to overcome this problem. CAMShift[5] is designed for dynamically changing distributions. These occur when objects in video sequences are being tracked and the object moves so that the size and location of the probability distribution changes in time. The CAMShift algorithm adjusts the search Window size in the course of its operation. Initial window size can be set at any reasonable value.

Feature selection plays an important role in object tracking. The most commonly used features are color, edges, [2] and various color spaces other than RGB are used for tracking purposes such as HSV. Because RGB colorspace does not correspond to the colour differences perceived by humans [3].

In this paper we use CAMshift algorithm for tracking of moving object but we don't use any feature information of object to be tracked. This causes, any object can be tracked even though its feature information is not known to user. In conventional Camshift, Hue saturation value is adjusted to detect the object in each consecutive video frames. But here we are generating mask image. This will mask the other motion contours in frame, only required object is visible in binary foreground image. This binary foreground image is considered as reference image.

II. DETECTION OF MOTION CONTOURS IN VIDEO FRAMES

Moving object detection is first step toward Tracking of moving objects. In motion detection following steps are performed.

First step is to grab a file from camera. for that cvQueryFrame() function is used. The function cvQueryFrame grabs a frame from a camera or video file, decompresses it and Returns it. This function is just a combination of Grab Frame and Retrieve Frame [3].

Term "Background" stands for a set of motionless image pixels, that is, pixels that do not belong to any object, moving in front of the camera [4]. Adoption of background changes such as change in lighting conditions and background scenes is also required. In order to get background accumulation information we use basic function such as cvRunningAvg().

The function cvRunningAvg [7]calculates weighted sum of two images. Once a statistical model is available, there is often a need to update the value slowly to account for slowly changing lighting, etc.

Next step is to find the absolute difference between current frame and calculated running avg. for this cvAbsDiff() function is used. Further image obtained from this operation is converted into Grey scale image and then thresholded to get Binary image. In order to remove small holes in binary image closing operation is performed.

Where there is a motion in videos motion contours are formed at that place. Now, our task is to find these contours. To achieve this cvFindContours()[7] function is used. The function cvFindContours retrieves contours from the binary image and returns

The pointer to the first contour. Other contours may be accessed through the h_next and v_next fields of the returned structure. The function returns total number of retrieved contours.

Once Contours are obtained, bounding rectangles are drawn around them in order to get it visible. This is the way we have detected a contours in each frame of video by incorporating above mentioned steps in appropriate c code sequence.

III. GENERATION OF MASK IMAGE

We are going to use CAMshift algorithm to track the required object in video frames. For that conventionally, feature is selected to track that objects in consecutive video frames. But our approach tracks the object without selection of any feature information of it. We have created Tracked object with help of this mask image. In this mask image initial location of object is available. Following steps are performed to form a Mask image of required image.

- Create a black image.
- Draw a filled Rectangle on black image. Dimensions of this rectangle are same as that of bounding box drawn on required motion contour.
- AND the image with filled rectangle with Binary foreground image resulted from closing operation.

IV. APPROACH TO USE CAMSHIFT ALGORITHM WITHOUT ANY FEATURE INFORMATION

To track targets, CAMShift basically works as follows. First, target`s initial search window is selected and its color histogram is computed. Each frame of the sequence afterwards is converted to a probability distribution image relative to the target`s histogram. Then the new size and location of the target are computed via mean-shift from this converted image, and are used as the initial size and location of the target for the next iterations of the algorithm [5,6].

Step1-Initial Target Location
The initial location of target is selected manually by user. After manually locating the target a surrounding rectangle is drawn around target.

Step 2- Creation of Tracked objects-
Mask image is generated previously along with Current video frame and initial location of target is combiningly used to form a Tracked object.

Step3-Frame by Frame process
Now Binary foreground image for each video frame is calculated. This Binary foreground image is keep on updating as position of tracked object is changing in consecutive video frames

Step4- Color Histogram Generation
Two dimensional color histogram [8] is calculated. We use HSV (Hue Saturation Value) color space in our algorithm for the color histogram generation

Step5-Probability distributed images-
Back Projection is a way of recording how well the pixels of a given image fit the distribution of pixels in a histogram model. For Back Projection calculates the histogram model of a feature. But in our approach we have not use this Feature information to track the object.

Step6- Calling CAMshift
In our approach we have not set any hue saturation value for object to be tracked. CAMshift uses a probability distribution image. We passed current video frame along with previously created tracked object and most important Binary foreground image to CAMshift algorithm. This will cause to track the required object in current frame. Binary foreground image is keep on updating as the position of target changes in each consecutive video frames.
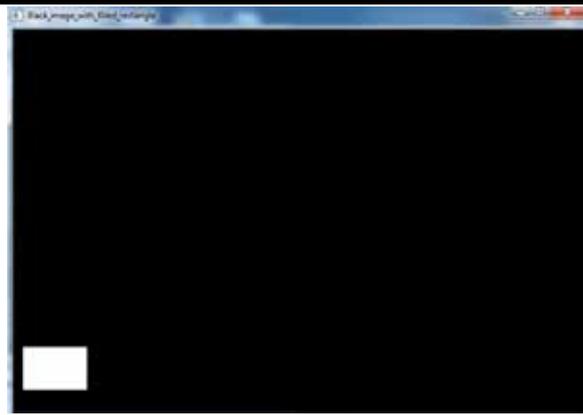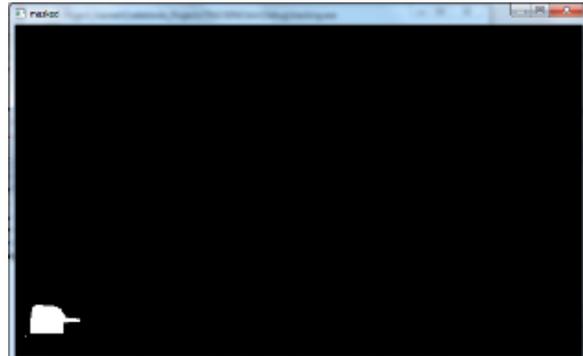
V. EXPRIMENTAL RESULTS
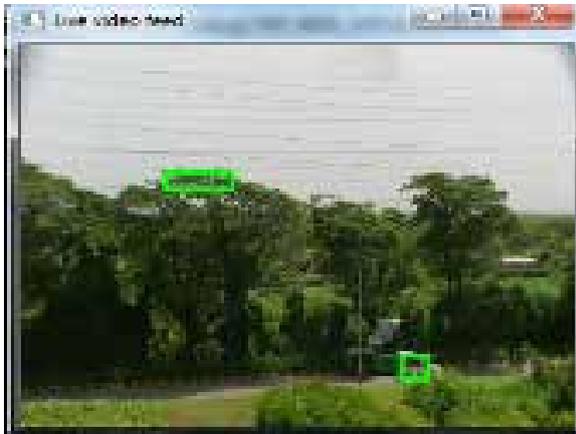
Figure1.Motion contours formed in video frame
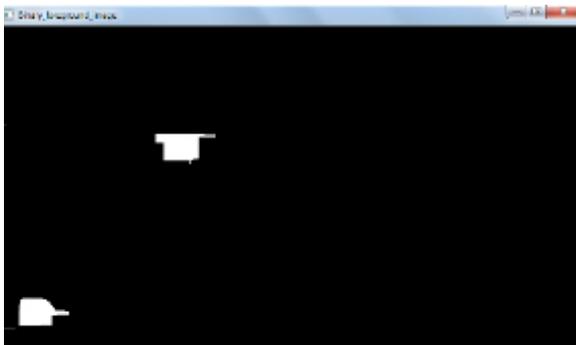
Figure2.Binary foreground image of reference video frame (say frame 232th)

Figure3. Black image with filled white Rectangle.

Figure4.Mask Image

(Image in Figure2 AND Image in Figure3)

Figure5.Elipse following Tracked object after calling CAMshift Algorithm

Figure6.Tracking continued in further frames.

We implemented our approach over CAMshift algorithm with C code using OpenCV library functions.

In Figure1, where there is a motion occurred in video, bounding rectangle is drawn around that motion contour. In each video frames motion contours may change.

In Figure2, this frame is considered as a Reference frame for understanding initial location of object to be tracked. With help of this reference frame, object location is identified in further video frames.

This binary foreground image is kept on updating for each video frame. This updated foreground image is given to CAMshift algorithm.

Figure3 shows a Black image with filled white rectangle drawn on it. A dimension of this rectangle is same as that of initial position of object in reference frame.

Figure4 shows Mask image. This mask image is formed by performing AND operation of Black image with filled rectangle and binary foreground image of reference frame. By masking we get only binary foreground of required object to be tracked. Rest other motion contours are masked.

Figure5 and Figure6 shows, object is tracked in every video frame after calling CAMshift algorithm. Tracked object is displayed by drawing Ellipse around it in each consecutive video frames.

VI. CONCLUSION

We proposed the efficient approach of CAMshift algorithm to track an object in video frame. In this approach, feature information of object to be tracked is not required. Hence one can track any type of object in video even though its feature information is not known to user. We finally evaluated our algorithm`s performance in practice, and showed how our approach can stand tracking even though feature information of object is not known to user. We have successfully implemented Use of Mask image to find initial location of object and continuous updated binary foreground image in CAMshift algorithm. This approach increases the efficiency of CAMshift algorithm to track object, even though its feature information is not known.

VII.FUTURE WORK

In the future work, our algorithm will modify to track all motion contours in each frame by preparing link list of motion contours and tracked object. By doing other few changes, our algorithm is capable to track motion contours which are travel from one frame to another frame. And also it should identify newly introduce motion contours and also able to track them in consecutive video frames.

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