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Object Tracking In Images And Videos

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Abstract: Object monitoring has usually been a hotspot inside the field of computer imaginative and prescient, which has a number applications in actual world.The object tracking is an essential venture in many vision applications. The primary steps in video evaluation are: detection of exciting transferring objects and monitoring of such gadgets from frame to border.Maximum of tracking algorithms use pre-defined methods to manner. on this paper, we introduce the suggest shift monitoring set of rules, which is a kind of vital no parameters estimation method, then we compare the tracking overall performance of imply shift set of rules on different video sequences.Experimental consequences display that the mean shift tracker is powerful and strong tracking technique.

Key Words: Object tracking, computer vision, Mean shift, no parameters estimation

1. Introduction

Object tracking is a vital mechanism as it permits diverse packages together with: Retail area instrumentation – to investigate purchasing conduct of clients, to decorate constructing and environment layout; protection and surveillance – to understand people, to offer higher feel of security the usage of visible facts; Video abstraction – to reap automatic annotation of motion pictures, to generate object-primarily based summaries; scientific remedy – to enhance the nice of life for physical therapy sufferers and disabled humans; site visitors control – to investigate go with the flow, to detect injuries; Interactive games – to provide herbal approaches of interaction with clever structures including weightless far off manipulate; Video enhancing – to dispose of cumbersome human-operator interplay, to design futuristic video results [1]. In other words, it affords ease of manufacturing and has top notch applicability to daily troubles, e.g. plane detection, object based video compression [9], perceptual consumer interface [4], adaptive visitors lights, human-pc interaction, driverhelp [10], surveillance [5], automobile navigation, smart rooms [8], augmented truth [7] and many others.

In video tracking, whilst the objects are moving speedy relative to the body charge then it's far incredibly hard to accomplice goal location in consecutive video frames [2]. Forthis, diverse procedures for item monitoring had been proposed. And which approach is to be carried out is absolutely depending upon the context in which the monitoring is carried out. Based totally at the changes to the houses of the object being tracked, item-tracking is a sort of technique to track an object and to perform a direct motion on some different item which has no relation to the tracked item. Most of tracking algorithms have been proposed and improved. Object tracking is an estimation question or the trajectory analysis for an object when moving through a sequence of images or video. These usual tracking methods consist of block-matching, KLT, the Kalman filter, Mean shift, Camshift and so on.

1.1 Block-Matching:

The different motion analysis (DMA) method is applied to track the moving object because of simplicity. When we start to perform this algorithm, a background frame without any moving object is captured. Later when a moving object enters the observation scope, the second picture is recorded. By subtracting the second picture from the first picture (background), the difference between two images is obtained and the position of moving object can be obtained. By computing the summation of absolute difference (SAD) between adjacent frames and setting a threshold value for filtering out smaller variations, the moving object can be tracked more accurately. However, when the moving object exists in both adjacent frames, the tracking area of moving object would be overestimated. In order to overcome this disadvantage of DMA method, the Block-Matching Algorithm (BMA), in which motion estimation is utilized to adjust the size of tracking area, is used.

The basic idea of BMA is to divide the current frame in video sequence into equal-sized small blocks. For each block, we try to find the corresponding block from the search area of previous frame, which "matches" most closely to the current block. Therefore, this "best-matching" block from the previous is chosen as the motion source of the current block. The relative position of these two blocks gives the so-called motion vector (MV), which needs to be computed and transmitted. When all motion vectors of the blocks in tracking area have been found, the motion vector happened (a) Background (b) Next image (c) After subtracting, the tracking area is larger than the moving object size most frequently is chosen for the correction of tracking area size.Typically, the sum of absolute difference (SAD) is selected to measure how closely two blocks match with each other, because the SAD doesn't require multiplications; in other words, less computation time and resources are needed.

1.2 KLT (Kanade-Lucas-Tomasi) Tracking:

The KLT tracking algorithm tracks global feature points instead of a target object, and the features can hardly be tracked through a long sequence because some features may easily get lost after multiple frames. Kanade-LucasTomasi (KLT) method has been chosen as a basis/benchmark for many algorithmsdue to its simplicity and limited assumptions made about the underlying image.

The KLT tracks an object in two steps, it locates the trackable features in the initial frame, then tracks each one of the detected features in the rest of the frames by means of its displacement. In this work, the authors An Automated Real-Time People Tracking System Based on KLT Features Detection 103 use the first part of the KLT (selecting trackable features) and subsequently track the whole set of features together instead of tracking each feature separately.

1.3 TheKalman Filter Algorithm:

The Kalman filter object is designed for tracking. You can use it to predict a physical object's future location, to reduce noise in the detected location, or to help associate multiple physical objects with their corresponding tracks. A Kalman filter object can be configured for each physical object for multiple object tracking.

To use the Kalman filter, the object must be moving at constant velocity or constant acceleration.The Kalman filter algorithm involves two steps, prediction and correction (also known as the update step). The first step uses previous states to predict the current state. The second step uses the current measurement, such as object location, to correct the state. The Kalman filter implements a discrete time, linear State-Space System.

1.4 CamShift Algorithm:

The Continuously Adaptive Mean Shift Algorithm (CamShift) is an adaptation of the Mean Shift algorithm for object tracking that is intended as a step towards head and face tracking for a perceptual user interface.

CamShift is primarily intended to perform efficient head and face tracking in a perceptual user interface (Bradski, 1998). It is based on an adaptation of Mean Shift that, given a probability density image, finds the mean (mode) of the distribution by iterating in the direction of maximum increase in probability density (Intel Corporation, 2001).

The primary difference between CamShift and the Mean Shift algorithm is that CamShift uses continuously adaptive probability distributions (that is, distributions that may be recomputed for each frame) while Mean Shift is based on static distributions, which are not updated unless the target experiences significant changes in shape, size or color.Since CamShift does not maintain static distributions, spatial moments are used to iterate towards to mode of the distribution. This is in contrast to the conventional implementation of the Mean Shift algorithm where target and candidate distributions are used to iterate towards the maximum increase in density using the ratio of the current (candidate) distribution over the target.

2. Mean Shift Algorithm

Mean shift method is a nonparametric density estimator and their procedures are iterative type to obtain the nearest mode of distribution. Mean shift is dependent on the static distribution, which are not updated until the target experiences the significant change in the shape, size and color. It has two components i.e. target model and target candidate. The target model is represented by its probability density function in feature space. Mean-Shift tracking is also known as Kernel-Based tracking. It is an iterative positioning method built on the augmentation of a parallel measure.

Mean shift algorithm is a kind of important no parameters estimation method, which has been successfully applied in target tracking and related computer vision field. Mean-shift tracker which is based on color histogram and it is a kind of important no parameters estimation method, then we evaluate the tracking performance of Mean shift algorithm on different video sequences.It is basically iterative expectation maximization – clustering algorithm executed within local search regions. In other words, it is a type of non-parametric clustering algorithm that does not need prior information of the number of clusters and also does not constrain the shape of the clusters. That is, the Mean-shift algorithm is a nonparametric density gradient estimator.

In order to track an object by using Mean-Shift algorithm we follow the below steps.

1. Select a search window size and the initial position of the search window.
2. Estimate the mean position in the search window.
3. Center the search window at the mean position estimated in Step 2.
4. Repeat Steps 2 and 3 until the mean position moves less than a preset threshold. That is, until convergence is achieved.

2.1 Procedure of Object Tracking:

1. Choose initial search window size and location.
2. Set calculation region at search window center.
3. Color histogram lookup in region of interest.
4. Mapping selected region with region of interest.
5. Extracting x, y coordinates and height & width value.
6. Update the mouse function accordingly and choose the next frame and repeat step 4.

To demonstrate the efficiency of the mean shift tracking algorithm, Fig.1 presents the tracking results under the object in a fast motion condition. On the ball sequence, the ball has a greater speed and do back and forth movement up and down. The Mean shift tracking algorithm can obtain a better tracking performance and it can be robust to track the ball with a fast movement.

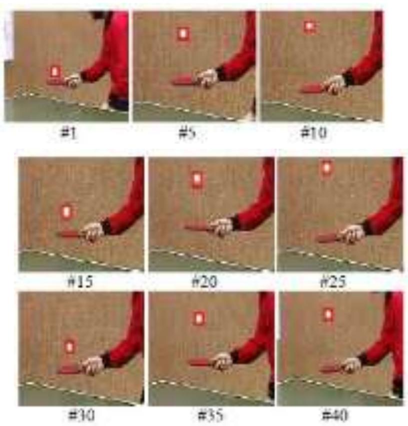

Figure 1. Results of Mean shift tracking on the ball sequence

3. Conclusion

Object tracking in an untidy surrounding remains a demanding investigation subject. In this paper we reviewed the mean shift algorithm with some definite improvements.

At first, the frames of the video file are created. And after that, the window size is estimated to track a target precisely when the target's shape and location are altering. Numerous consequences can be obtained by implementing mean-shift algorithm over the target object. According to motion model, one should begin the tracker in several different positions in the neighbourhood of basin of attraction if the movement of the target from frame to frame is well known to be greater than the operational basin of attraction. If total closure is present, one should take on a more revealing motion filter. In the same way, one should check that the selected target description is adequately different for the application domain or not. Hence our review of tracking an object will surely make us to analyze new areas of investigation and moreover, also helps to improve its applications in the already existing areas.

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