

B. TECH PROJECT PROPOSAL

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1 TITLE

Improvement in Object Tracking Algorithm

2 MOTIVATION

The advance of technology makes video acquisition devices better and less costly, thereby increasing the number of applications that can effectively utilize digital video. Compared to still images, video sequences provide more information about how objects and scenarios change over time. And object tracking in videos can further be utilised for various applications involving obtaining information from videos.

There is great interest in moving object tracking algorithms in the fields of reconnaissance, robot technology, video compression, traffic surveillance etc. But the current object tracking algorithms are still not completely robust in dealing with object tracking challenges described further. So, it is an attempt to develop a betterment of existing algorithms.

3 PAST WORK

The various techniques used so far includes blob tracking (segmentation of object interior), kernel based tracking (mean shift tracking), contour tracking (detection of object boundary – condensation algorithm), visual feature matching, levelset tracking and lot more.

Many existing algorithms, segment each video frame to determine the objects. This action can be computationally expensive, and it is not necessary if the goal is to determine the moving objects. Alternatively, there are algorithms that derive the objects based on the motion between frames. But these tracking algorithms are limited and not able to handle some complex situations such as new tracks (object starts moving), ceased tracks (object stops moving) and possible collisions (objects move together).

Challenges in object tracking:

3.1 Occlusion

Occlusions can be classified as either static or dynamic based on the respective nature of the occluder i.e. occlusions caused by either the static scene structure or other moving objects

3.1.1 Static occlusion

Occlusion caused by a static structure like tree, pillar etc.



Static Occlusion: Occlusion caused by a tree

3.1.2 Dynamic occlusion

Occlusion caused by moving objects like two cars moving in opposite direction, one hiding the other for short interval of time. It can be further classified into merging and splitting of various objects. For example, two persons coming along and then going in separate ways or vice versa.



Dynamic Occlusion: moving grey car is occluded by another moving white car



Splitting of objects

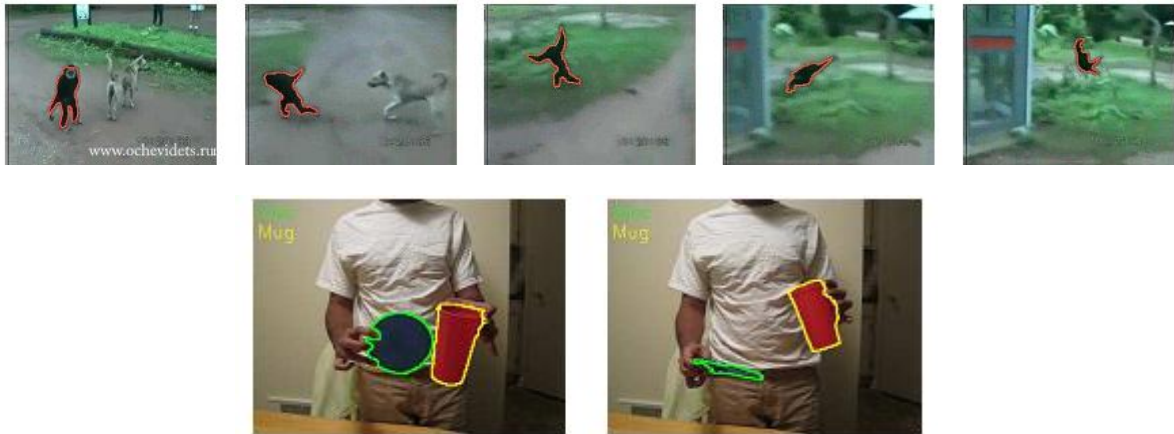
Occlusion can be full or partial. It depends on the size of the object which occludes.

3.2 Motion Model

Inaccuracies in the motion model often lead to track losses. This is due to the fact that most tracking algorithms hypothesize smooth motion models which fail in certain practical scenarios.

3.3 Object Appearance in Image

Object appearance includes its shape and visibility features such as color distributions, gradient information, high curvature points etc. These can create problem due to sudden changes in any of these features. Also, the object's shape might change as in case of a car coming towards the camera and then suddenly change the direction. Change of shape can be within object itself like opening and closing of car's door, a running animal etc.



A running monkey and two views of plate: shows how object shape can change frequently

3.4 Real-time Constraint

With a lot of time given, an exhaustive search would be able to locate an object in the image frame properly. However, in most practical cases, we need to use only a small portion of the model space to reduce the computational burden. In an offline processing, the data content can be very large which limits use of any number of object models to achieve the desired results in real time.

4 METHODOLOGY

Following methodology is planned:

- Study various algorithms of object tracking developed by various people.
- Analyze the algorithms on the lines of its robustness, running time and ability to overcome above mentioned challenges.
- Try to propose and work on a better algorithm and test it over a large data set.

5 OBJECTIVE TO ACHIEVE

A better algorithm for object tracking in video.