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Measuring the Effects of Occlusion on Kernel Based Object Tracking Using Simulated Videos

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Abstract

Occlusion handling is one of the most studied problems for object tracking in computer vision. Many previous works claimed that occlusion can be handled effectively using Kalman filter, Particle filter and Mean Shift tracking methods. However, these methods were only tested on specific task videos. In order to explore the actual potential of these methods, this paper examined the tracking methods with six simulation videos that consider various occlusion scenarios. Tracking performances are evaluated based on Sequence Frame Detection Accuracy (SFDA). The results show that Mean shift tracker would fail completely when full occlusion occurs as claimed by many previous works. In most cases, Kalman filter and Particle filter tracker achieved SFDA score between 0.3 and 0.4. It demonstrates that Particle filter tracker fails to detect object with arbitrary movement in one of the experiments. The effect of occlusion on each tracker is analysed with Frame Detection Accuracy (FDA) graph.

Keywords: Computer Vision, Object Tracking, Occlusion Handling

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Nomenclature

G_i	the ith ground-truth object at the sequence level
$G_i^{(t)}$	the ith ground-truth object in frame t
D_i	the ith detected object at the sequence level
$D_i^{(t)}$	the ith detected object in frame t
$N_G^{(t)}$ and $N_D^{(t)}$	the number of ground-truth objects and the number of detected objects in frame t, respectively;
Nframce	the number of frames in the sequence.
N_{mapped}	the number of mapped ground truth and detected object pairs when the mapping is done at the sequence level

1. Introduction

Occlusion handing is a major challenge for object tracking in computer vision. Occlusion occurred when an object of interest is temporary disappeared from camera views during tracking while the object has not exit the region of interest (ROI). Region of interest in video surveillance is the viewable area in a video frame that is concerned with the user interest.

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