

Trajectory refinement using wiener filter method for video surveillance

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Motion pattern analysis in a crowded area has become a major research area in computer vision research as a result of the many promising upcoming applications; including but not limited to intelligent surveillance, safety evaluation and behaviour analysis. This paper focuses on a specific problem related to human motion pattern classification and proposes a methodology to refine the trajectories extracted from a given video sequence.

The detection of moving objects uses a background subtraction algorithm based on Gaussian mixture models. Morphological operations are applied to the resulting foreground mask to eliminate noise. Then blob analysis is performed to detect groups of connected pixels, which are likely to correspond to moving objects. Next, motion trajectories are extracted by tracking the centroid of each blob. The motion trajectories thus extracted, are observed to contain a considerable amount of interferences when comparing with the actual motion path of a person.

It can be observed that with the relative motion of limbs, the blob area of a tracked person changes with each frame. This area fluctuation can be separately extracted by tracking the blob area at each frame. Moreover, the area fluctuation of the blobs and the interferences in the extracted trajectories are found to be highly correlated.

The method that is generally used to address this issue is fixing the blob area thus completely eliminating the impact of blob area variation. The blob area variation information by itself can provide some valuable information about the actual motion pattern, such as the proximity to the camera. Therefore, it is evident that the elimination of the impact of blob area variation would lead to a loss of important information. Hence, the methodology proposed in this study is to eliminate the effect of the aforementioned interference in trajectories by exploiting the principle of correlation cancellation of Wiener filter.

An experiment was carried out on a real video stream which contained human motion patterns, to test the applicability of the proposed methodology. It is evident through the results that human motion pattern classification accuracy can be improved to a significant level, by incorporating the proposed trajectory refinement method.