Title:	Object Tracking and Spatiotemporal Storyboards On Omnidirectional Data
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Subject(s):	Computer Vision
Abstract:	Visual Surveillance has become commonplace. This is the result of the ever lower price of cameras, and the ever increasing perception of threat. Yet there is a certain limitation of visual surveillance that has been inadequately addressed over the years, and this is the problem of reducing the burden of manual inspection of the visual surveillance logs. While recording huge amounts of visual data is now easy, the requirement of manpower to manually process the logs has become huge. This fact has impelled research into ways to speed up manual inspection. This work provides many solutions in this regard, from different angles, in an integrated package. We present a surveillance system which gathers visual information using an omnidirectional camera, summarizes it intelligently for rapid browsing, and presents the summary in different convenient storyboard formats, designed to help the viewer in identifying significant events, - both their occurrence and non-occurrence - while suppressing superfluous detail. Surveillance data over a period of time can be presented, even surveillance data gathered at corresponding times over several days can be comparatively inspected. The comparative spatial - temporal storyboard is a graphic organizer in the form of videos displayed in sequence. It has video footages as the information source of different days, depicting a story which conveys the significant information of moving objects only. Each element of the storyboard is a video summary which highlights intriguing segments of that occasion, and presents them to the user with the footages synchronized with respect to time as well as event. To accomplish this, we use a combination of optical flow estimation and color - based feature extraction and tracking in the visual field of a moving omni-directional camera. To present the information in an ergonomic manner, we resort to splitting the omnidirectional capture field into it into six spatial regions. Of this, the goal of the optical flow estimation is to compute an approximation to the motion field of significant objects from the dynamic video. The approach used combines concepts of several methods for optical flow estimation, while avoiding the shortcomings of those methods. Subsequently, we obtain the color histogram of each detected object. The proposed framework has been narrowed to only include the moving object in a fixed orientation in the video and trying to detect it correctly. Later, the color - based feature extractor keeps track of the moving object, where a set of high dimensional histogram of oriented gradients (HOG)- features clustered via K-means and features inside the object area are matched to the cluster centers via a nearest neighbor search. The dataset used throughout the thesis work to evaluate the proposed approaches, is the collection of dynamic video footages of places at IIT Kanpur taken from Ricoh Theta S, an omni - directional camera, at the speed of 30 frames per second.

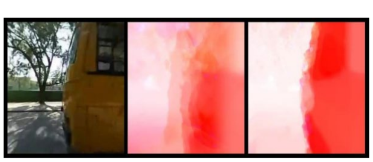

Figure 5.3: **Comparison between optical flow before and after averaging in Right-**

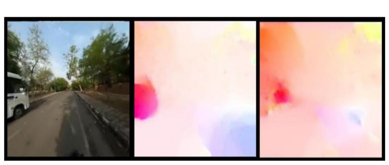

Figure 5.4: **Comparison between optical flow before and after averaging in Rear**

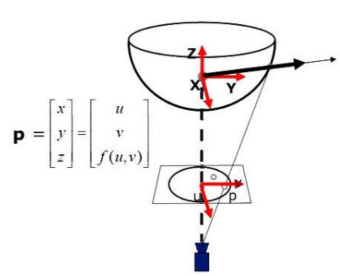

Figure 2.2: Ricoh Theta S