
Title:	Spatio-Temporal Regularity Based Video Analysis In Video Cube.
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Abstract:	<p>Video is a sequence of image frames that possesses both temporal information, that is motion, and spatial information, that is structure of the scene. In video processing, both the informations are semantically important and appear in the form of edges, corners, blob, dense motion field, colour, etc. To exploit these features is a common procedure in the field of video processing, in order to solve various video processing applications. In this thesis a new kind of feature called regularity is investigated which incorporates both the spatial structure and motion information simultaneously. Since regularity of features has an ability to appear continuously in sequence of frames it is more meaningful to consider video as a cube for processing rather than frame by frame. In our work video is taken as 3D volume that exploits all the information simultaneously. In order to process the video a framework called Spatio-Temporal Regularity Flow Model (SPREF) is used. In this thesis, we address four motion based applications of video using the regularity of both the spatial structure and the motion information. The selected applications are: video stabilization, camera motion pattern recognition, motion segmentation and line scratch detection and restoration. Initially energy based video stabilization method is proposed in which energy of frame is used in motion smoothing. The selection of the smoothing term being frame based, it is one of the drawback of energy based stabilization. Hence we attempted to develop a more robust video stabilization method that based on quadratic smoothing. Selective stabilization method is also implemented in order to smooth only those frames of the video that are unstable. Camera motion pattern generation and recognition is our next work in which flow curve is used to generate the pattern of camera motion in spatio-temporal planes. Hough transform is used for the recognition of camera pattern. After camera motion we have investigated another important application of video processing namely, motion segmentation. In this approach motion segmentation is divided into two categories namely, object tracking and all moving region segmentation. All moving region segmentation is further divided into two sub categories namely, all moving object segmentation and selective motion segmentation. By considering video cube as a processing unit, we propose octtree based unified approach in order to solve all the defined motion segmentation categories. In the last part of thesis we propose the detection and restoration of vertical and oriented line scratch in recorded old film using the spatio-temporal video frames. A vertical line scratch is a line in spatial frame but it appears as a patch in spatio-temporal frames. Similarly orientation of oriented scratch in spatial</p>

frame is random, but it is regular in spatio-temporal frames. Hence, transformation of irregular patterns to a regular pattern or transformation of spatial frame to the spatio-temporal frames is the remarkable step of the proposed method. For the restoration of missing pixels spatio-temporal data is used to fill the missing pixels region.

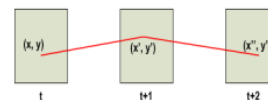
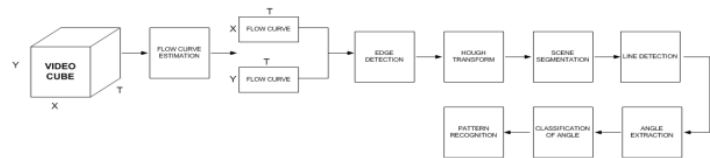
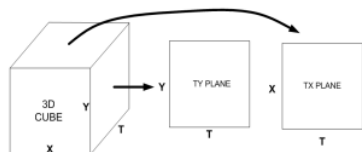
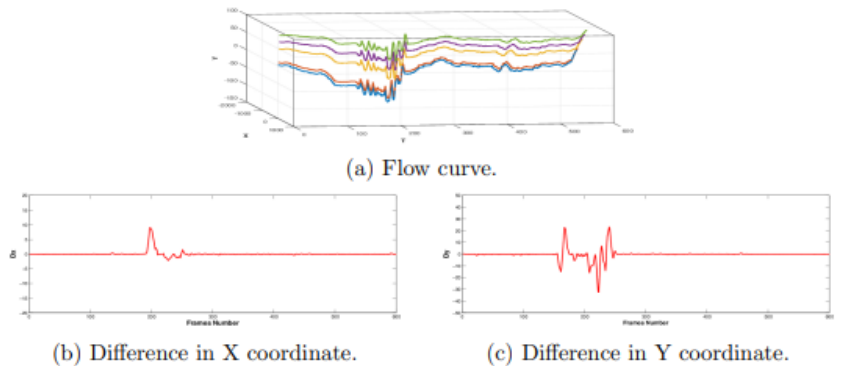
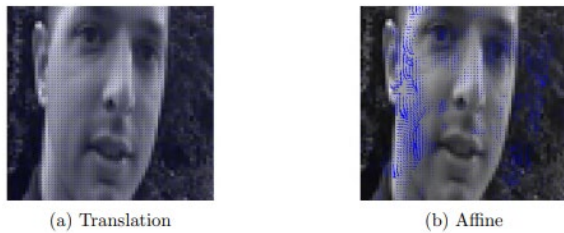
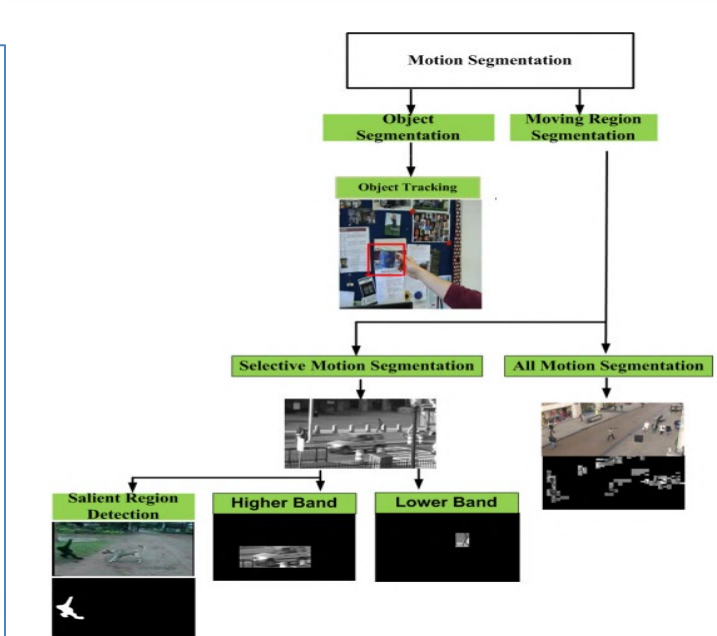
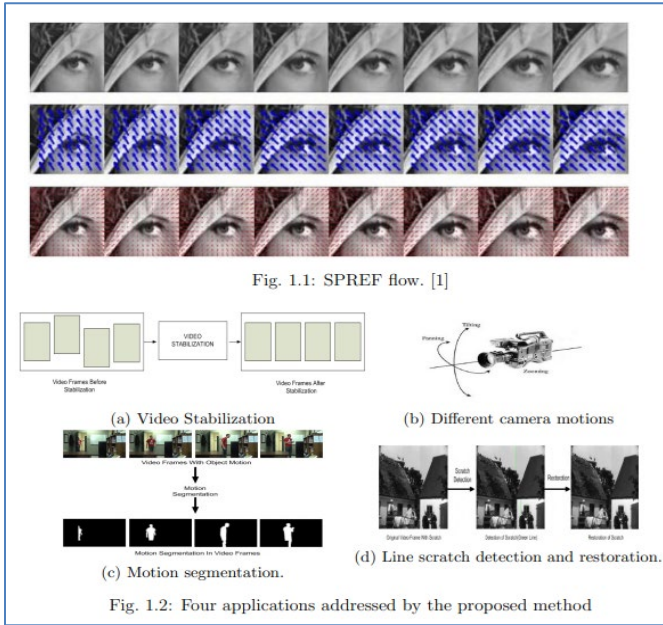


Fig. 6.3: Representation of spatio-temporal planes TY and TX .

Fig. 6.2: Representation of flow curve.