

Motion Segmentation and Indexing for Video Database.*

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ABSTRACT Recent growth in the number of digital images available motivates the development of image/video databases for the effective management of these ever-increasing images. A common image retrieval task requires retrieving all images in the database similar in image content to an example query image. In this paper, we develop a simple, fast and robust motion segmentation algorithm to separate images into independently moving objects and an indexing scheme that uses the trajectories, shapes and image flow vectors of the independently moving objects to insert/query the sequences in a database. In order to test our ideas, we developed a video database prototype and experimented with real images from scenes showing moving cars.

1. Introduction

Recent growth in the number of digital image sequences or video available in a computer motivates the development of video databases for the effective management of the ever-increasing volume of information. A video database stores and retrieves image sequences in an efficient way based on content although there are more traditional databases that represent the content of an image sequence by a user-assigned text label. This later approach not only requires the user to provide a text label for every image sequence in a database but also the subjectivity in human descriptions may

result in a retrieval failure due to a difference in the text description about the image sequence during insertion and query. For this reason, recent research in video databases (for example [5, 6, 9, 14, 21, 24, 22]) focuses on indexing based on image content by the database itself. Niblack et al [21] use color, texture and shape of objects as a representation of content of images stored in an image database. Objects are identified by a user sketching out their outlines and then optimally traced out in a computer using active contours or snakes. Petrakis and Faloutsos [24] measure the content of medical images by the geometric properties such as size and orientation of objects in them. They require their input images already be segmented into closed contours corresponding to objects in the images. Das and Riseman [5], Huang and Kumar [14] suggest using the color attributes in an image as a measurement of image content in color image databases. Hampapur et al [9] represent the characteristic properties of a video sequence by the content of its image, audio and motion components. Image content of a video sequence is captured in a minimal set of key frames which provide an adequate representation of the sequence. Audio content of a video sequence is represented by points in the audio stream of the sequence where a change in speaker, change between speech and music, or change between silence and sound occurs. The motion content of a video sequence is represented by the total amount of motion, uniformity of motion in the sequence

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