論文内容の要旨

論文題目　A study on the advanced camera work analysis for high efficient shot retrieval system

（高効率ショット検索システムのための高度カメラワーク分析に関する研究）

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The continuously growing amount of worldwide accessible multimedia archives causes an increasing complexity concerning the location of relevant content. The quick access to the desired information from a large volume of database enhances in analyzing the content and exploits the full potential use of digital video archives. Although the temporal sequence of camera operations can help to infer the higher-level semantic content and query information in video retrieval, the efficient methodology for annotating the visual information of camera operations is still inapplicable.

The advanced camera work analysis is proposed to automatically derive the information concerning the camera operations efficiently. The camera motions of panning, tilting, zooming, and the combination of these basic types of motions are determined based on the pattern analysis of motion trajectories of image features.

In the camera motion analysis, the process first detects the corners and interesting points of an image and then tracks those feature points along an image sequence. The global motion is classified based on position, tracking time and number of feature points. The effective feature detection region is applied to minimize the effect of object motions with the most efficient computational time. The calculation in determining camera motion is extremely decreased in the proposed method because only the best feature points are analyzed, not the whole pixel in every frame like in the motion vector analysis. The method is computationally simple associated with the spatial difference and linear regression of the motion trajectories. The spatial-temporal characteristic of the trajectories is a key significance in determining the type of camera

operations. The camera motion based video retrieval system is implemented. The system serves about six times faster to access a target document than the keyword based retrieval system.

The speed information is calculated by analyzing the slope of trajectories and converted into the human perception level. The temporal segmentation of image sequences into several camera motion subunits with the speed information expeditiously facilitates the motion annotation and content description particularly in the applications of video retrieval, indexing and scene analysis. The shot retrieval system for the long video sequence is implemented based on the camera motion and its speed in the term of human perception level. From the experimental results, the system serves about sixteen times faster than the manual search to access a target shot.

By applying the proposed camera work analysis, the high efficient shot retrieval system is developed. The system is designed to facilitate and fast access the content of the video sequence. The camera motion helps in an assist with the clustering process while the speed information helps in optimizing the ranking of search results. In addition to the retrieval task, the proposed camera work detection is expected to facilitate the researches related to the content analysis of moving picture such as learning of autonomous robot to respond its surrounding environment, cataloging and comparative studies for museums and archaeology, etc. The utilizing of camera work analysis to research on the high-level semantic content will greatly facilitate the potential applications of scene analysis and content description.