

Research on Description and Matching Technology of Video for Content Based Copy Detection

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With the rapidly development of multimedia technology, huge amount of video data become more and more common. The traditional manual retrieval cannot meet the requisition, however, the automatic processing by computer has been employed, and thus forms a so-called human-computer interaction pattern for video analysis, retrieval and detection. In recent years, the content based video retrieval has become a hot topic in multimedia domain, previous work mostly focus on shot detection and classification, till now, many researchers put their eye on video retrieval, especially on content based video copy detection.

Recently, online video websites such as YouTube, Yahoo! and Google, etc. have taken the fancy of the users for the convenience of browsing the large amount of videos for free, which, for sure, enrich our daily life, however, it brings the following problems: 1) because of the huge amount of video data, there will be many duplicated videos within the retrieval result, which becomes a decline of the efficiency; 2) many of the uploaded videos are copied illegally or without authorization, which impairs the intellectual properties of the author. Based on these questions, the Content Based Copy Detection (CBCD) issue aroused researchers' great interest. However, the existing approaches have some shortcomings either on the robustness of detection results, or on the extendibility to large-scale dataset, as a result, the current copy detection system lack efficiency and effectiveness. According to the recent works, in this paper, we aim to work out the following questions:

- 1) Propose effective and robust video descriptor. A good video descriptor is the foundation of video retrieval algorithm and system, which should have the following advantages: robustness, discriminability, fast and compact, and these can help make a detection system invariant for some types of copy trick and transformation patterns; besides, these are what a user-oriented and real-time detection system requires. In this paper, we propose two different kind of video descriptors: slice entropy scattergraph (SES) and weighted histogram of oriented gradient (WHOG). SES employs video spatio-temporal slices, based on entropy and its deviation so as to preserve as much as the video information and takes advantage of a scattergraph which is succinct and efficient to plot the distribution of video content. WHOG is motivated by the widely used HOG in human detection, which fuses two basic features by summing HOGs with the relative mean intensity as the corresponding weights. Both of the two descriptors have the four advantages mentioned above, and they all have the potential to be extended to large-scale corpus. Find

- 2) Propose fast and succinct matching technology. The matching quality is the final result of CBCD issue. Besides the two descriptors, in this paper, we adopt a simple matching method. For each video, we firstly segment it into clips at the same length, which we treat as the basic process unit. After extracting features of each clip, we match the clips and find the ones with the highest similarity. This procedure can save as much as video information and can avoid numerous computation time cost. As long as we get a stable shot detection algorithm, we can improve this clip-level method to shot-based.
- 3) Prepared for constructing a stable and quick retrieval system. As we combine the proposed descriptors and the matching method together, a quick and robust retrieval system can be formed. This system can handle the large scale dataset, and it is suit for special approaches.

In a word, our work in this paper is motivated by the requisition of users. By further study and improvement on the representation of video, we will develop a stable and human-computer interaction video detection system, thus greatly enhance the efficiency of web-based processing and protect the intellectual properties and benefit of the authors.

Keywords— Content Based Copy Detection (CBCD), video descriptor, slice entropy scattergraph (SES), weighted histogram of oriented gradient (WHOG)