Feature Space Abstraction in Video Skimming (PI: Dr. Liu Yan; 2009/10)

The rapid growth of multimedia applications creates the urgent need for efficient multimedia data management. Video summarization provides a means to manage video collections more efficiently by generating a summary, in such a way that the viewer can understand the video through watching the summary. The video summary abstracts the content of the original video file in the form of text, images, or a short video segment. Video skimming, which generates the summary in the form of a short video segment, called a video skim, is in great demands for multimedia browsing, retrieval and mining.

The key problem of video skimming is how to make the computer recognize the important content of the video as if being understood. An immediate solution, also the prevailing video skimming strategy, is constructing a set of features based on human's experience to indicate the importance of the data. We define this set of indicate features as the abstract of the feature space, because it is calculated from the huge feature space of the raw data and expected to compactly represent the essentials of the video. According to the abstract of the feature space, we select the important video clips and assemble them to form a video skim. Unfortunately, current feature space abstraction based on human intuition suffers from high labor cost and low efficiency. It is also difficult to discover the hidden semantic patterns merely depending on human's observation. Moreover, the heuristics of these methods lead to the lack of theoretical or statistical ground, which makes it hard to validate the reliability and universality of the algorithms.

This project proposes the novel framework and designs intelligent algorithms to abstract feature space automatically for video skimming. We first formulate video skimming problem to learning based ranking model. Then, dimensionality reduction algorithms, which attempt to generate a low-dimensional equivalence of the original

feature space based on data analysis, are explored for feature space abstraction under ranking model. Third, the proposed models and algorithms are tested and evaluated on a self-developed prototype of the video skimming system.

The findings of this project show large scientific merit in multimedia understanding and machine learning, especially for video summarization and dimensionality reduction. The developed video skimming software has potential commercial values in industries of search engineer, filming making, and public communication. These scientific merit and commercial potentials will finally benefit the economic prosperity and convenient life for Hong Kong society.