Interactive Video Summarization

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Introduction

My goal this summer was to create an interactive video summarization program. The main goal was to summarize a full video into a single image. This image uses various annotations to accurately describe what happened in the video.

Video Summarization allows a user to quickly analyze long segments of video as well as compare different videos. The interactivity of the program would allow the user to analyze summarizations of different sections of a film in real time.

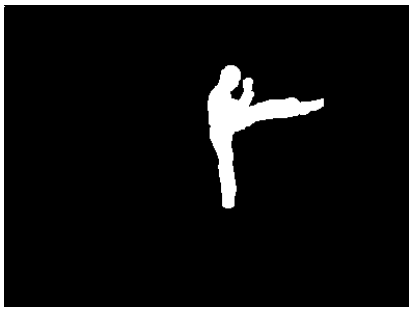
Background

The concept of summarizing a video is a new idea, though many concepts have been used in the past. The most prominent version of video summarization is key framing, which most people see on a regular basis, in the form of DVD menus. In scene selection, an image is used that is representative of that scene. This makes it easy for the user to decide which scene they would like to watch.

Another form of video summarization is in comic books. A panel in a comic book is used to describe an action over a period of time by annotating the image with onomatopoeias, motion trails, and impact points to show movement and force.

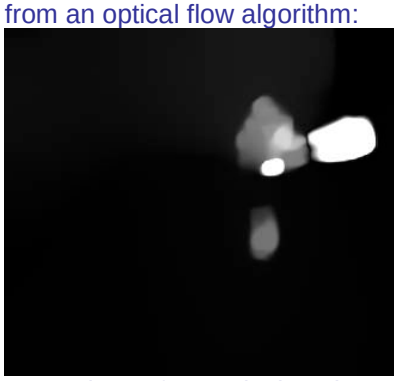
Research

- Experimented with Summarization using a handmade foreground mask:



Example Background/Foreground Mask

- Studied the use of Java in MatLab
  - Used to improve interactivity
- Experimented with image differencing
  - Used to determine the objects of interest in a scene by identifying what has changed over the period of two frames
- Experimented with Optical Flow
  - Created a mask using values from an optical flow algorithm:



Example of Optical Flow Output Mask

  - Identified problems such as missegmentation.
  - Corrected problems using method of background removal.

Impact:

- **Produced Successful Video Summarization**
  - **Used Background/Foreground Mask**

Example Summarization

  - **Used Optical Flow Mask**
  - **Used Background Removal**
- **Created Summarization Graphical User Interface**

Summarization Program

  - **Implemented Dual Slider, used to set the duration of the video to be summarized.**
  - **Implemented click callback. By clicking on a trail from the summarized video, the program displays the frame represented by the trail.**

Conclusions

- Good video summarization relies on annotation which is intuitive and descriptive
- There are many ways to annotate a scene, some of the most intuitive being motion trails and key frames.
- The use of background removal is a superb means of locating an object of interest, provided the video uses a stationary camera

Future Work

In the future, other I would implement other means of summarization in my program, such as the use of key frames. I would also research other methods of determining the location of interesting objects over a period of time which would take into account camera movement.