EE227B PROJECT PROPOSAL

1. Project Overview

We propose to investigate combinatorial optimization over pixel space in videos for video segmentation. Specifically, from a given video sequence, and user intialized object(s) of interest, the aim is to track the region(s) of interest through the subsequent image frames in the video. This problem is difficult due to occlusions, changes in pose, shape and color; and in extreme cases objects (or a parts of object) leave the frame and re-enters after a certain time. Other methods which address this problem provide only locally optimal solutions. We plan to build upon the formulation of video segmentation as a Markov Random Field optimization problem [Tsai et. al, 2010] to find a globally optimal solution.

Our the formulation of the problem in the video segmentation domain will take into account the following constraints of a generic video sequence:

(1) Spatial attribute coherence of every pixel in its neighborhood.
(2) Temporal attribute coherence of every pixel with itself in the adjacent frames.
(3) Temporal motion coherence of every pixel with its corresponding pixel in adjacent frames.
(4) The neighborhood of each pixel of interest under should also have a motion to the pixel of interest.
(5) Number of pixels labeled as the object does not change drastically from frame to frame.

We will formulate each of these as a linear constraint in an optimization problem. Furthermore, as the problem is inherently an integer program, we will consider relaxations to the problem as well as efficient methods for solving the integer program (i.e. branch-and-bound).

2. Team

The team consists of Animesh Garg, Jeff Mahler, Ali Punjabi, and Shubham Tulsani. Each of us has experience in computer vision, which will aid in our formulation and implementation of the project. Each of us will work together to decide the form and nature of the constraints we will use. The tasks will be further broken up in terms of implementation once the formulation is complete.

3. Deliverables

Our project deliverables are:

- 10-15 page final report
- Code to produce our results
- Experimental results on a binary dataset (on color dataset if time permits)

Date: October 23 2013.