**CS-GY-6643 Computer Vision, Spring 2016**

**Final Project Proposal**

**Basketball movement tracking**

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**Motivation:**

Shooting is the most important scoring technique in a basketball match. Athletes and amateur players are always eagle to improve their shooting skills. But it is hard to analyze whether a shoot is good or not by just using bare eyes. So we would like to develop a system which can create 3D basketball trace from the video to help people practice better since it is a very practical and interesting problem. We are looking forward to do it.

**Technical Setup:**

**-**2 Video cameras with tripods.

-No extra lighting is needed.

The idea is to reconstruct the ball movement curve when shooting the basketball. We want to do the reconstruction by calculating the world coordinates of the basketball in each frame of the video. The calculation of coordinates will be done in two ways:

1. with only one video camera, and provided the size of the basketball, calculate the coordinates of the ball by using the simple perspective projection model.

2. with two video cameras, calculate the position of the basketball from the two simultaneous images from different cameras by using the method of stereo reconstruction from disparity.

We will put the cameras in a position that the optical axes are nearly perpendicular to the plane that the basketball is running on. This will benefit the videos well focused and has relatively sharp images of the ball in all the frames.

In the 2-camera case, to get the correspondence between the two videos, we will set up a timer that can be seen in both the video cameras.

When the movement curve is successfully reconstructed, we will try to track the movement of basketball shot in different ways, i.e. with/without spin, and to compare the differences among the curves.

**Methods:**

1. perspective projection equations

2. stereo reconstruction from disparity

3. (to be developed) identifying the basketball in the images: item retrieving.