

VMG Candidate Project
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Approach: The core idea of the current algorithm is to use the HSV color space of the basketball to track the ball throughout the video. The color range is manually defined and targets the orange color of the basketball. OpenCV is used. The idea is inspired by the following blog:
<https://www.pyimagesearch.com/2015/09/21/opencv-track-object-movement/>

Result: The algorithm was able to identify and track the movement of the objects with the predefined HSV colors. The problem is that there are multiple objects of such color in the video, leading to the program identifying objects other than the basketball itself. Therefore, so far the algorithm is not able to accurately detect the ball itself or report its coordinates.

Where I am currently at: I am currently debugging the following issue:

qt.qpa.plugin: Could not find the Qt platform plugin "cocoa" in ""
This application failed to start because no Qt platform plugin could be initialized. Reinstalling the application may fix this problem.

Thought Process:

- (1) I started the project by attempting to implement Mask-RCNN, which is suggested by the linked paper to this project. I also believe such approach is well-suited for this object detection project for two main reasons: 1) There are abundant video data available. 2) Mask-RCNN is able to produce a mask for the basketball and an accurate mask will help with accurate identification of the centroid of the ball, leading to accurate coordinate tracking of the basketball. However, I encountered problems when I was installing tensorflow-gpu1.5, especially when I was installing cuDNN for my macOS Mojave system. In order to progress on the project, I decided to move onto OpenCV.
- (2) I intended to implement Fast-RCNN with OpenCV. As I was downgrading python version to 3.6.5 so that it can work with OpenCV 4.0 (or any OpenCV 3.3+ with deep learning module), I encountered problems with setting up the virtual environment. In order to save time, I decided to move onto traditional vision or image processing techniques with OpenCV.
- (3) I have attempted the following approaches but unfortunately have not succeeded in solving or working around the "qt plugin" issue.
 - a. Select roi of the basketball. Use the HSV color histogram feature, combined with KNN or not, to track basketball.
 - b. The approach which my current code manifests: use predefined HSV color range to track basketball.
 - c. Meanshift or Camshift does not work well as they were shown not able to accurately produce a tight bounding box around the basketball.