

Player Tracking and Analysis of Basketball Plays

Evan Cheshire, Cibeles Halasz, Jose Krause Perin

PROBLEM

The goal of this project was to track the movements of ten different players from a video of a basketball game. With their position tracked, we also wanted to map the position of these players onto an image of a basketball court. The purpose of tracking players could provide information to basketball coaches and organizations. They could then use their position and success of the play to better design offensive and defensive schemes.

APPROACH

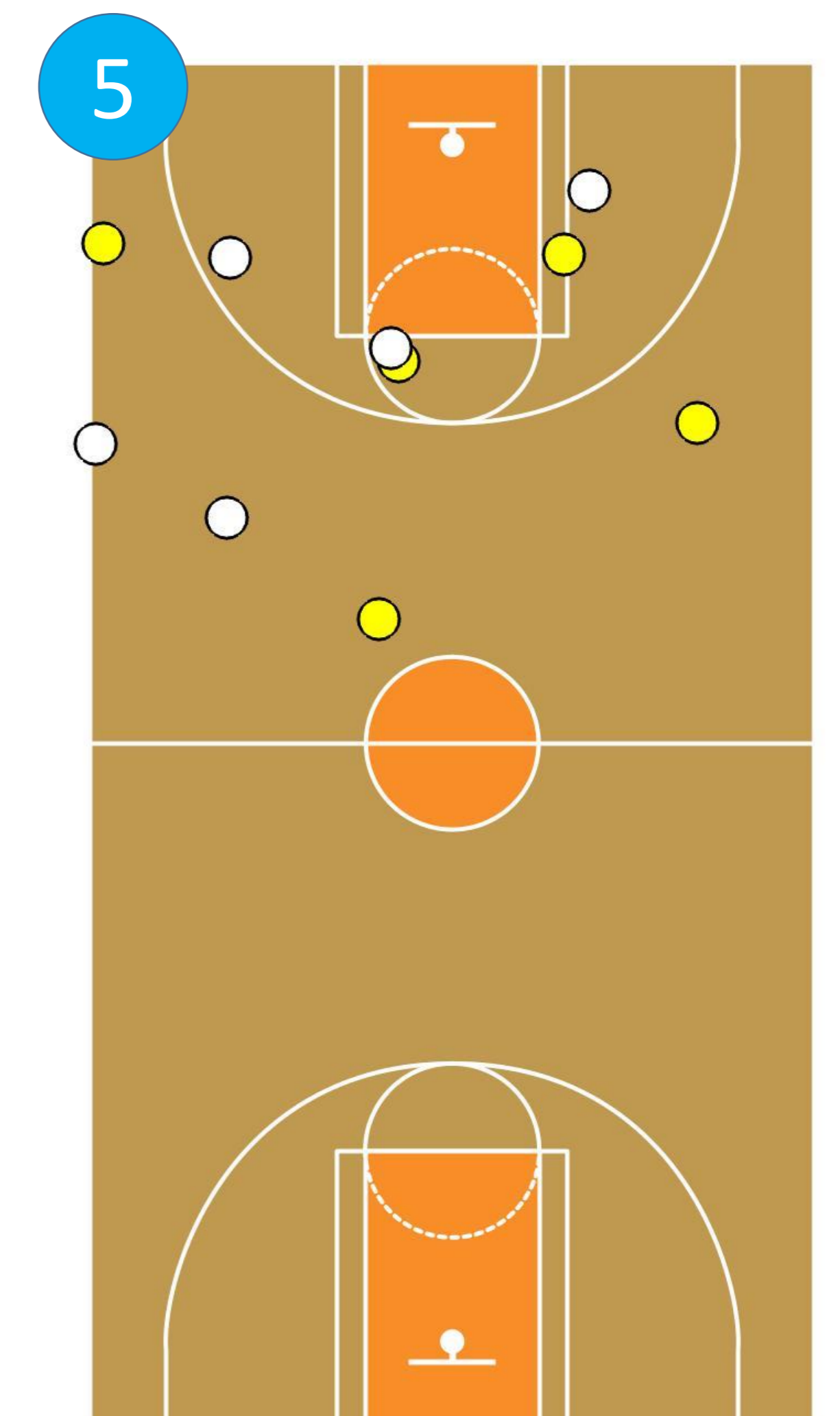
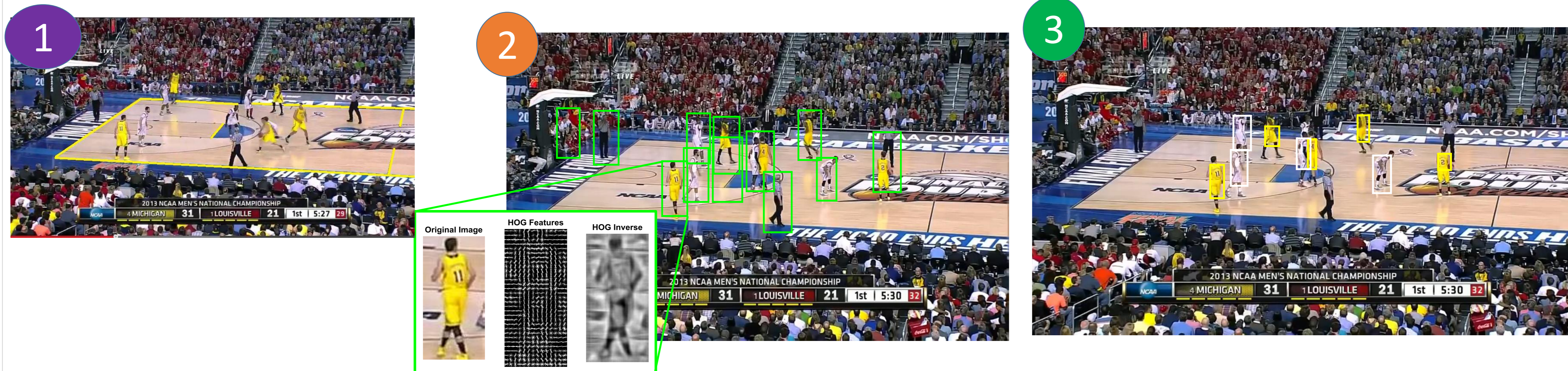
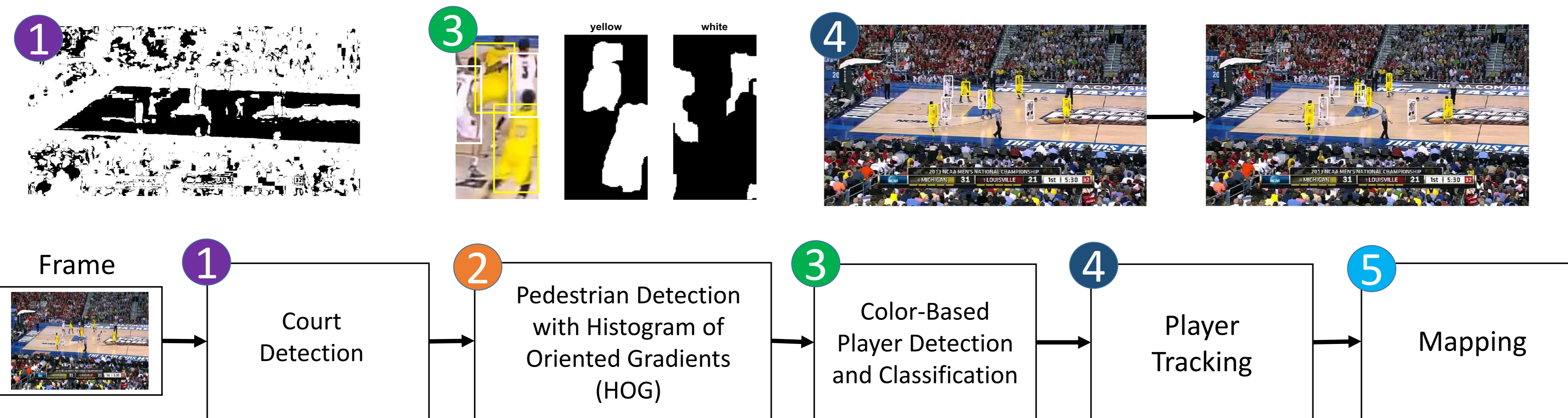
In order to achieve the end goal of a 2 dimensional image with player positioning, we used a 5 step algorithm:

1. Court Detection - Find the lines on the court
2. Pedestrian Detection – Detect the individuals standing on the court
3. Color Classification – Separate these individuals into two teams
4. Player Tracking – Keep position information frame by frame
5. Mapping – Translate onto a court image

DATA & METHODS

We used clips of two basketball games found on YouTube in order to test our functions. The clips we selected were relatively stable in order to reduce the noise created by camera movement. We also used many methods taught in class. We used a Hough transform to find the lines of the court. The detection, classification, and tracking was all based on color schemes, and a minimum distance algorithm. A homography then matched these position to the court image.

ALGORITHM



RESULTS & CONCLUSIONS

The algorithm above does provide an accurate detection and color classification for the players on certain teams. Tracking has some major successes as well, with the ability to retain information on players as they moved through the court space. The algorithm is also very portable for different games. The only change needed for separate games is to reset the color thresholds. While separate problems, tracking depends heavily on the information provided by detection, and when a false detection occurs, this can cause the tracking algorithm to lose accuracy.

REFERENCES

[1] Wei-Lwun Lu, Jo-Anne Ting, James J. Little, Kevin P. Murphy, "Learning to Track and Identify Players from Broadcast Sports Videos," IEEE transactions on pattern analysis and machine intelligence, 2011.

[2] Y. Cai, N. de Freitas, and J. J. Little, "Robust Visual Tracking for Multiple Targets," in ECCV, 2006.

[3] Dollar, Piotr, et al. "Pedestrian detection: An evaluation of the state of the art." Pattern Analysis and Machine Intelligence, IEEE Transactions on 34.4 (2012): 743-761.

[4] Pedro F. Felzenszwalb, Ross B. Girshick, David McAllester and Deva Ramanan, "Object Detection with Discriminatively Trained Part Based Models"

Simulation Packages:

1. Matlab
2. OpenCV
3. Vfeat
4. HOGgles