

Using Image Processing to Identify and Score Darts thrown into a Dartboard

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Introduction

The game of darts is a throwing sport in which participants toss projectiles into a circular target attached to a vertical surface. The target is divided into many regions which correspond to different point and multiplier values. Darts is commonly played across North America and Europe and is a popular past time for many so an application that allows players to more conveniently keep score would be widely beneficial.

“Darts” is a general term for a targeting game following this basic premise and many game variations exist within this archetype; all utilizing the standard dart projectiles with a regulation dart board. Each game variant may have different objectives for which players to aim but identifying the region in which the dart has hit in the dartboard is necessary for proper scoring. This project proposes the use of image processing to identify thrown darts and to detect which scoring region of the dartboard the dart has struck.

Implementation

The project goals will be achieved by developing a set of image processing algorithms that accomplish the following criteria:

1. Pattern recognition and region detection will be used with video or still images to characterize the dartboard. Dart boards are divided into 20 radial sections^[1] with four multiplier regions within each section. Additionally two concentric circle regions are located at the center of the board^[2], commonly known as the “bullseye”. The dartboard characterization algorithm will need to identify the dartboard pattern at a variety of angles, distances, and lighting conditions.
2. Images of thrown darts are to be processed to identify which player it was thrown by and which region within the dartboard it hit. Individual darts can be identified by use of training images of each player’s darts. Scoring region is to be determined by recognizing the shape and orientation of a detected dart and using its known geometry to extrapolate the scoring region.
3. Algorithm development is planned to be initially developed and tested in MATLAB and ported to an Android device if time permits.

References

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- [2] Yonghong Xie and Qiang Ji, A New Efficient Ellipse Detection Method, *International Conference on Pattern Recognition*, pp.957-960, vol. 2002.
- [3] Vailaya, Aditya, et al. "Automatic image orientation detection." *Image Processing, IEEE Transactions on* 11.7 (2002): 746-755.