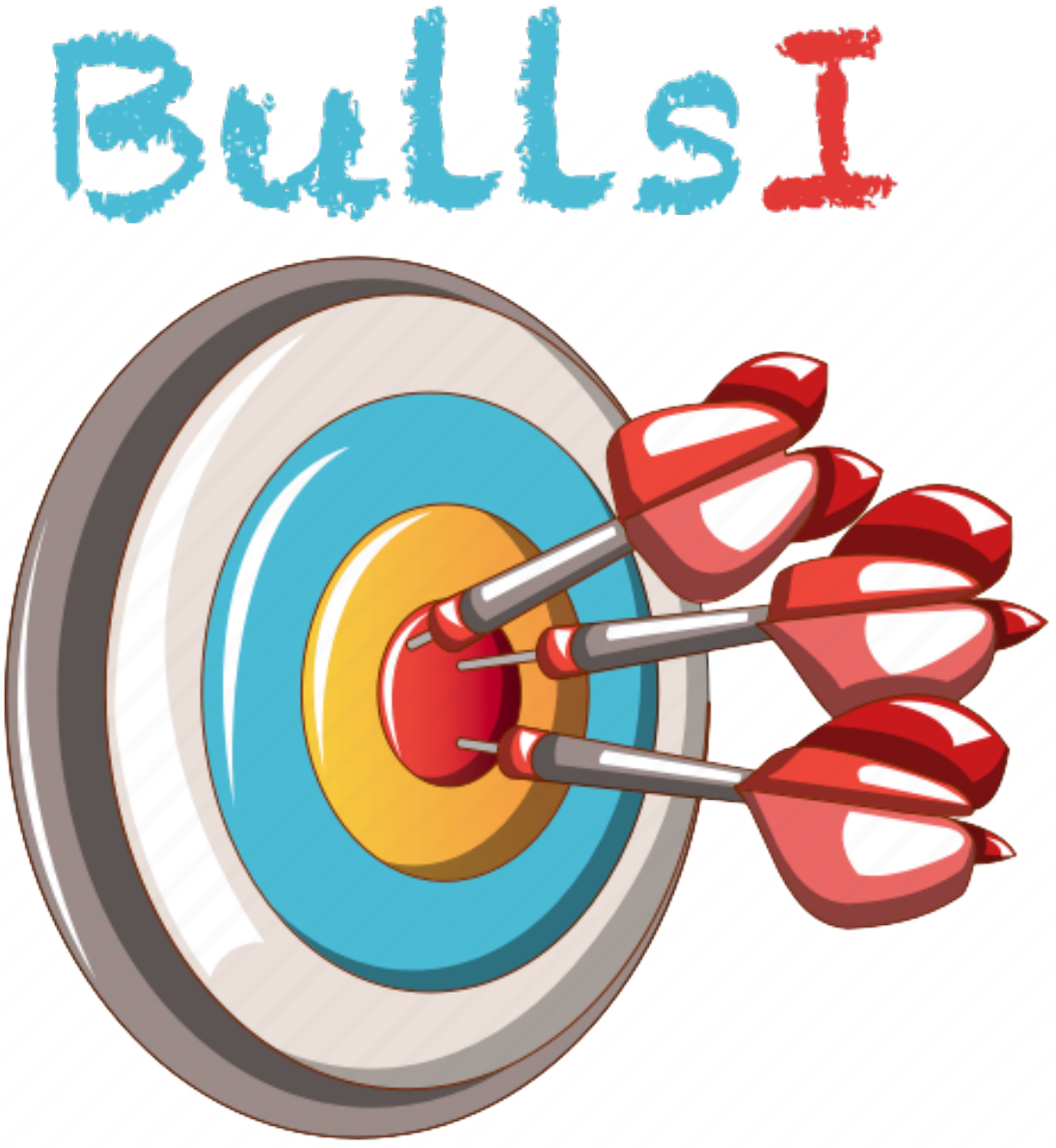
Creative Tech
Individual project Research



In this document you will find the results of the research that was done to discover how to design and built the project. This document will also briefly describe the envisioned solution that this project will try and accomplish.

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Main findings that helped shape the direction of the project

While playing darts the idea occurred that the scoring system of darts could be automated and if this were to happen the pleasure of playing darts would go up tremendously.

After this thought I quickly started googling for solutions and how to approach the issue at hand: “how to know where the dart landed digitally and automatically”. The first thing that would occur to most is using cameras or sensors to detect the hit on the board. Because sensors would require heavy modification of the board and would make replacing the board when used up a difficult task. The choice quickly falls on using cameras. The idea I came up with immediately was to detect the dart from the thrower’s perspective with 1 webcam and via this count the score and run the game on the computer. This however brings some issues. It’s not very precise and 1 camera can miss calculate the position of the dart because of shadow etc. the margin on a game of darts is small and you don’t want the program to make critical errors since this would frustrate the players heavily.

The next solution I arrived at was using multiple cameras. I looked into multiple systems built by some companies and GitHub / Home built project that use this solution. None of them really fit the ideal situation but they gave a good inspiration on how to approach it. I chose to use 2 camera’s and try and triangulate the dart location on a grid. The reason for this is mostly budget, because more cameras = more $$$.

The solution with 2 cameras that I thought of and will try and built in the duration of the individual project is based on triangulation and will need to detect a dart has landed on the board and then via each camera get the position from left to right to locate it on the grid. With the 2 given coordinates we can place it on the board in 2d and calculate the score via the radius from center.

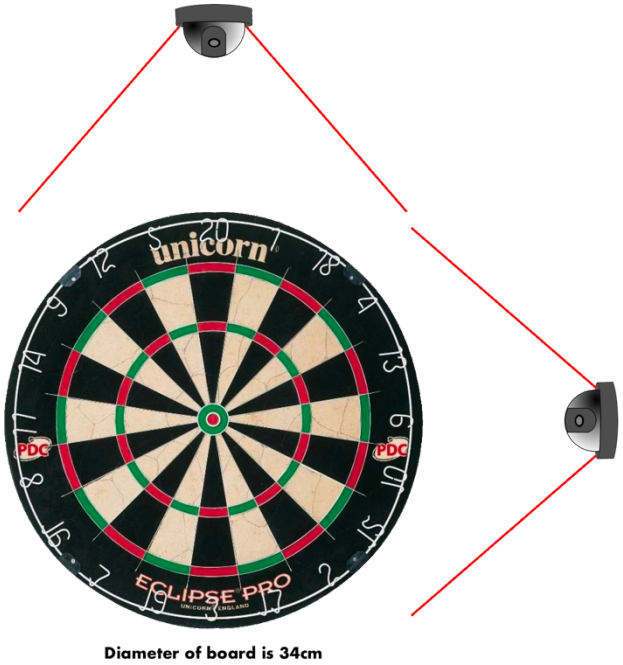

Figure 2 Camera position relative to board

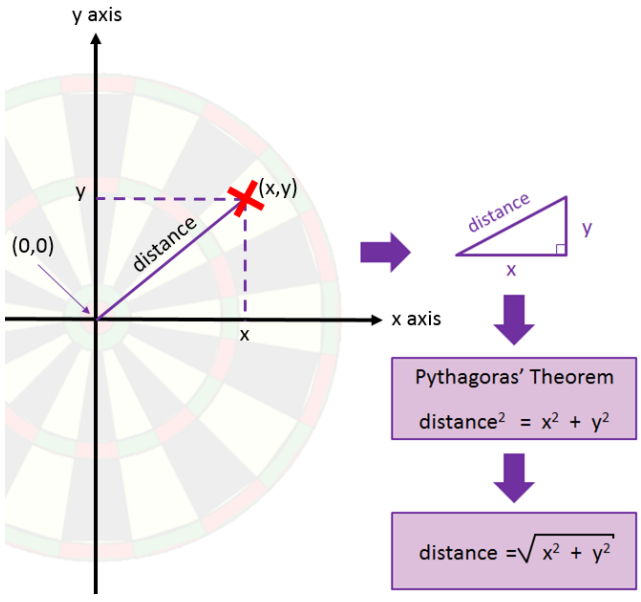

Figure 1 Calculation of score based on x and y axis position

Already existing projects of the same type

A small list of already existing projects of the same type. Almost all of them used a different approach than I have envisioned for this. 1 project also uses 2 cameras and triangulation, but it is written in Scala and the documentation is nonexistent.

- https://github.com/nluede/cvdarts
- https://github.com/hanneshoettinger/opencv-steel-darts
- https://github.com/YellowFive5/DartboardRecognition
- https://matherm.github.io/2018/02/02/the-score-is-nine/
- https://github.com/vassdoki/opencv-darts

An honorable mention for this pdf document about detecting darts thrown into a dart board and calculating the score.
https://web.stanford.edu/class/ee368/Project_Autumn_1516/Reports/Delaney.pdf

The calculation of score based on the y and x axis.

All the info I found about how to do this was found on:
https://www.101computing.net/darts-scoring-algorithm/