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Mobile Concussion Testing

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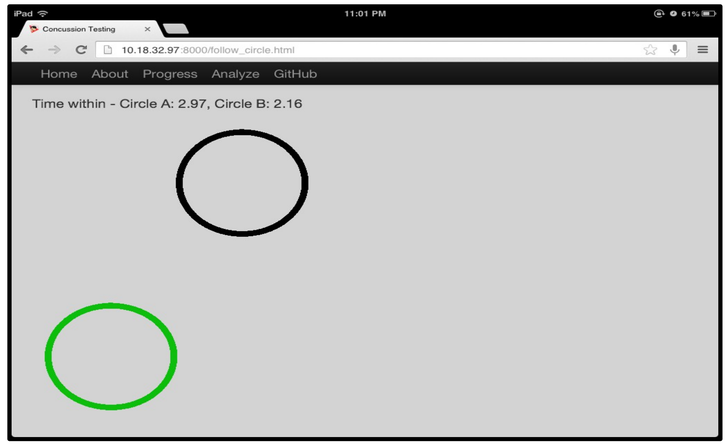
Reflexes

- Two open circles moving randomly around a screen
- User must keep one finger in each circle



Balance

- Ball moves with an initial random acceleration
- User must tilt device as necessary to keep the ball in the open circle

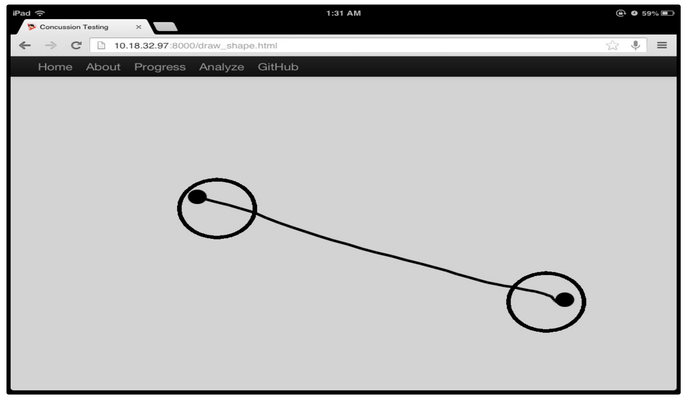
http://aw204.host.cs.st-andrews.ac.uk/concuss
http://aw204.host.cs.st-andrews.ac.uk/camgaze
http://www.ncbi.nlm.nih.gov/pubmed/19617197 [1]

Research Statement & Motivation

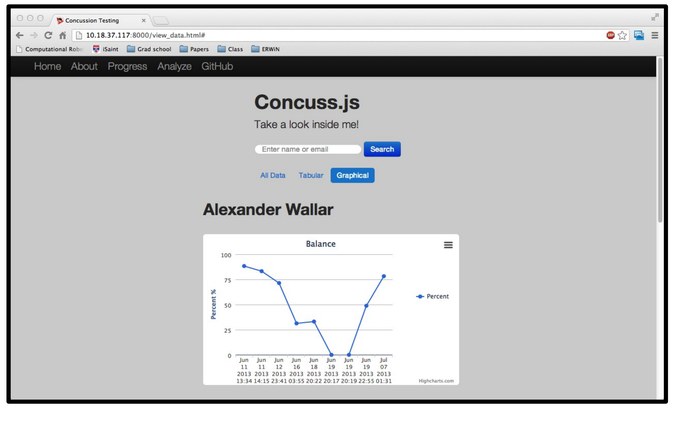
- To create a tablet based application that measures a user's memory, balance and reflexes.
- Go is used on the server side and JavaScript is used on the client side
- Results are stored in a RethinkDB database
- By detecting concussions earlier, better medical attention can be given and the magnitude of long term side effects can be reduced

Memory

- Two open circles shown for a decreasing period of time
- User must draw a line from where they remember the circles to be



Data Analysis



Eye Tracking & Gaze Prediction

- Impaired eye movements in post-concussion syndrome patients indicate suboptimal brain function beyond the influence of depression, malingering or intellectual ability[1]

Method

1. Detect the eyes using a Haar Cascade Classifier
2. Convert the ROI image to grayscale
3. Threshold the image and conduct blob detection on the binary image.
4. Repeat Step 3 with varying minimum and maximum color thresholds, saving the result.
5. Assign the blob with the lowest error weight to be the detected pupil
6. Determine the blob centroid and retrieve the resultant vectors from the boundary rectangle to predict gaze direction