Over the course of this semester I have been investigating eye metrics as an indicator of focus. I have focused on using an eye tracker to monitor eye blinks, pupil size, and the point of gaze while in front of a computer. Previous studies in a controlled environment have indicated that these metrics are excellent indicators for a person’s cognitive processes. I was studying how these metrics work in an uncontrolled environment and if they have the same success as the controlled environment.

In order to investigate pupil size as a metric I focused on replicating an experiment done by Jeff Klingner in which two numbers are presented two seconds apart. In the original experiment there was a clear spike in pupil diameter both when the first and second numbers were presented. In my experiment I had a second person present me with one flashcard with a number after two seconds and then after another two seconds display the second card. I would multiply the number and say it back. I recorded the data using an eye tracker and a program that utilized the Gazepoint API. I utilized excel as a data processing tool. While processing the data I used the average pupil diameter from the first two seconds of the trial to gather a baseline. After performing five trials I combined the results to try and smooth the results and get a better line. The graph below is the result of the experiments. As you can see there is no discernible trend to the results. I believe that while pupil diameter is a good indicator of cognitive processes in a controlled environment there are too many variables to account for in an uncontrolled environment.

To investigate the point of gaze recorded by the eye tracker I focused on basic eye movements such as looking at the top left of the screen constantly or looking at the bottom right. I was seeking to identify whether the eye tracker was feeding back data that was consistent with where I was looking. When I was looking at the top left of the screen the eye tracker should have given me coordinates consistent with (0,0) however during my experiment I was unable to receive a consistent reading. The coordinate readings were extremely unsteady and not consistent with where I was looking. This was the same case for when I was looking at the middle of the screen and the bottom right. I was unable to obtain any data that performed consistent with what I would have expected proper data to show.

Of the metrics I tested, eye blinks seemed to be the most valid form of data to monitor cognitive processes. I was able to gather valid eye blink data from the eye tracker in all cases in which I was looking at the screen. Once I looked away from the screen the eye tracker gave the same reading as if I was closing my eyes for a very long time. This can be easily accounted for by using a filter for maximum and minimum blink length. By analyzing the time between blinks I obtained data on a number of different trials which were consistent with my blink rate and length during the trial. Using blink rate as a metric it was fairly simple to come up with a program that would combine with the Blink(1) light and monitor a focus based on blink rate. I believe that using blink rate as a metric is the best way to monitor cognitive processes in an uncontrolled and unpredictable environment.