Part –1 – Behavioral Data Analysis

1# Loading the file....

Successfully loaded the given mat file and extracted the data.

2# Find the unique target locations....

Figure 1 will show the unique target location of all the 8 targets and the initial hand and eye position of the animal.

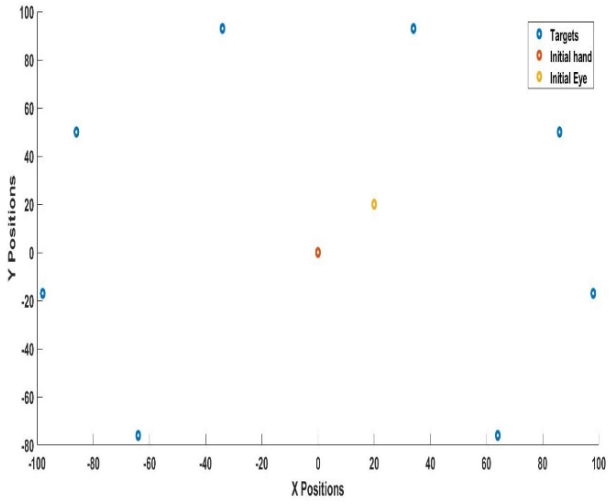

Figure 1: Representation of unique Target Positions

3# Animal's hand position of each trial

The figure 2 shows the hand position of all the trials with the specific target location. Different colors are used to differentiate targets at different directions.

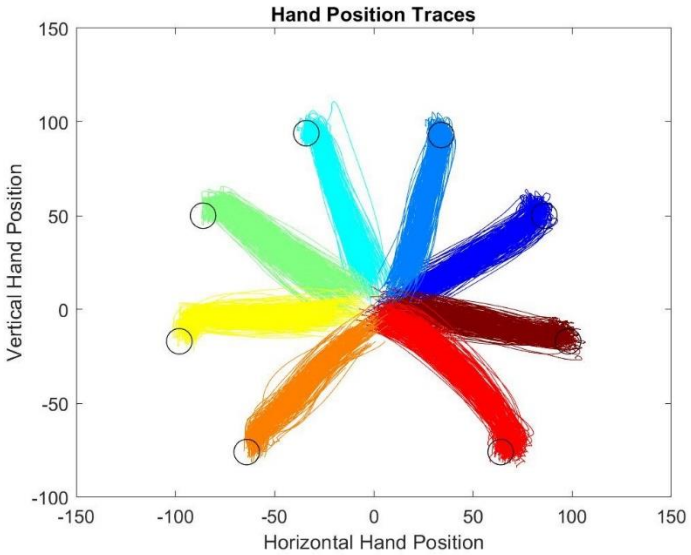

Figure 2: Representation of Hand position of all trials

5# Reach Reaction Time….

The figure 3 shows the analysis of each reaction time on specific targets, The x-axis has the numbering of the targets from 1 to 8, which represents locations as (-34, 93) -> 1, (-86, 50) -> 2, (-98, -17) -> 3, (-64, -76) -> 4, (-64, -76) -> 5, (98, -17) -> 6, (86, 50) -> 7, (34, 93) -> 8. It is observed that the animal takes longer time to reach the target appears at the top than that appears at the bottom. Yes, according to a one-way ANOVA test, the reaction times of the 8 targets are statistically significant. The p-value observed in the data (taken after excluding a large negative outlier) is many orders of magnitude below 0.05.

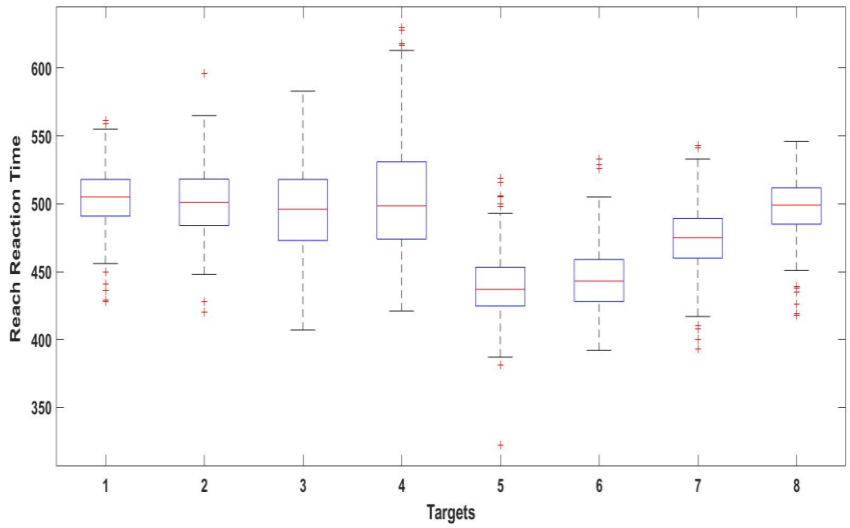

Figure 3: Analysis of Reach Reaction Time of all the trials in Particular Targets

6# Statistical significant of reach reaction time…..

In conclusion, it might be because of the ocular movement of the animal. It might take longer time to move its eye position to the targets at the top.

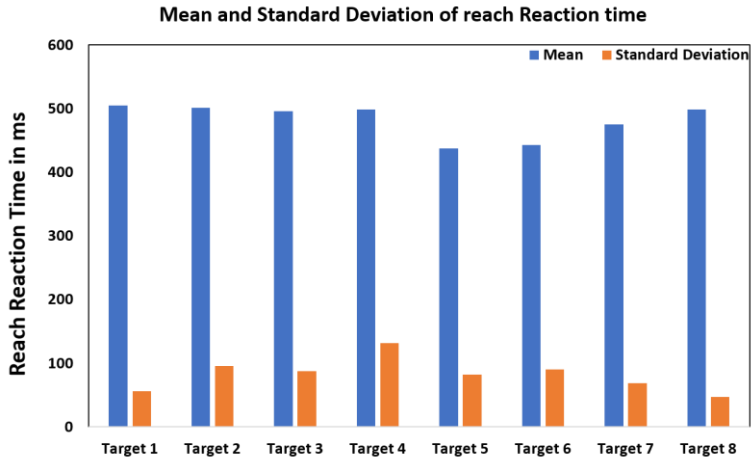

Figure 4: Mean and Standard Deviation of reach reaction time

Target numbers 1,2,7,8 → Appears top of the x-axis

Target numbers 3,4,5,6 → Appears bottom of the x-axis

When the animal notices the target, the movement begins and because of this we conclude that the ocular movement influences the reach reaction time based on target location.

Another observation was that the reaction time is based on the angular position of the target. There seems to be two groups (targets 2 and 3, which correspond to angular distances of 150 degrees and 190 degrees, respectively) with longer reaction times. The groups with the quickest reaction times are targets 5 and 6 (which correspond to angular distances of 350 degrees and 310 degrees, respectively).

7# Monitor Refreshing Time….

The monitor used for this experiment has certain delay in projecting the new targets every trials. The figure 5 shows the latency of the monitor. We found that the refreshing rate of the monitor is **52.88 Hz**.

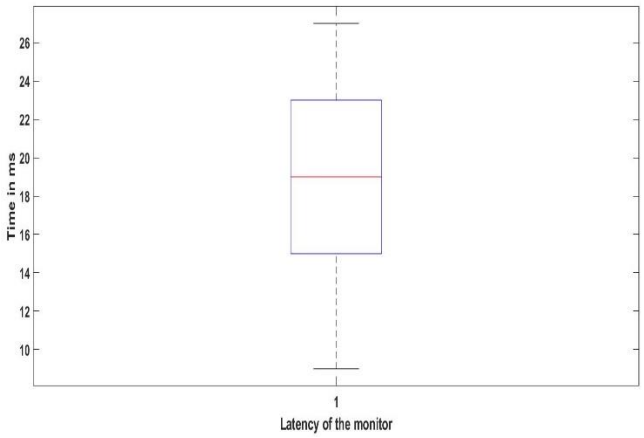

Figure 5: Box plot of monitor latency

8# Eye position of the animal at all trials….

The average of all the eye positions based on target location is shown in the figure 6

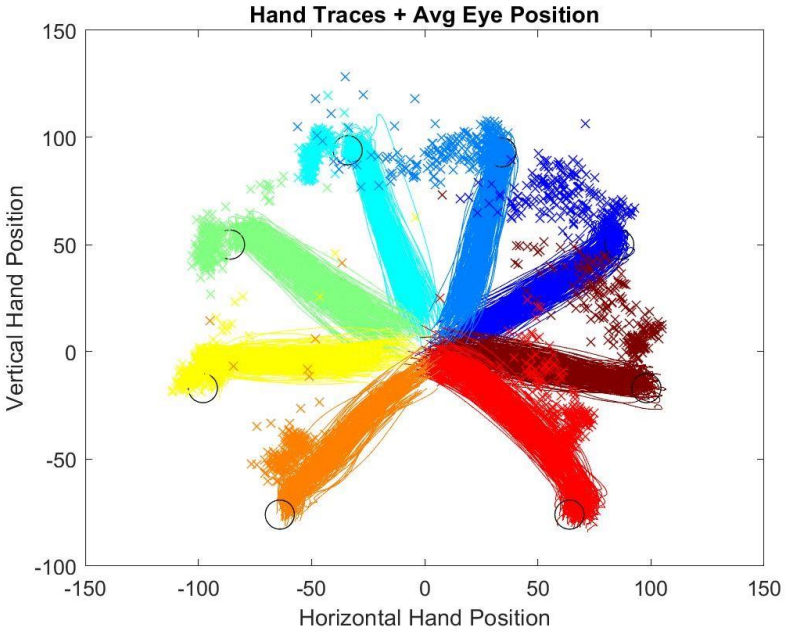

Figure 6: Representation of Eye position

Part – II – Neural Data Analysis

1# For one trial, plot rasters for the four cells alongside the behaviour

From figure 7, we observed that eye movement is noisier than the hand movement.

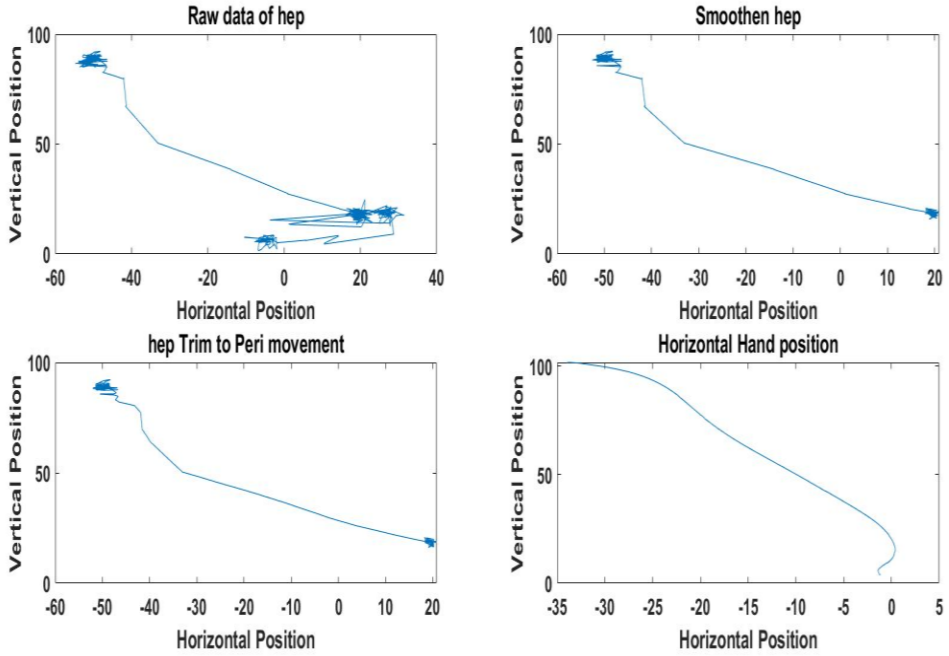

Figure 7: Analysis of single trial of hand and eye position

The raster plot gives the information about the neural activity We tried in other trials and we observed that during movement more spikes activity is there.

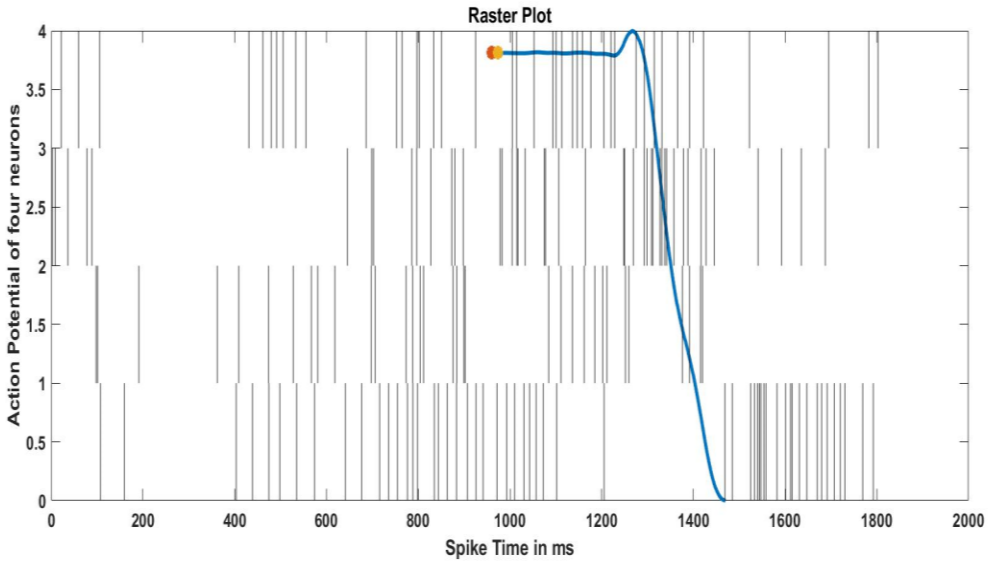

Figure 8: Rastser plot of 4 cells on a trial

2# PSTH Curve

The figure shows the PSTH of four cells along all the trials occur at the upper right corner target. A rough estimate for neural latency from looking at the figures is around 40-50 ms from the time the cue is actually presented on the screen.

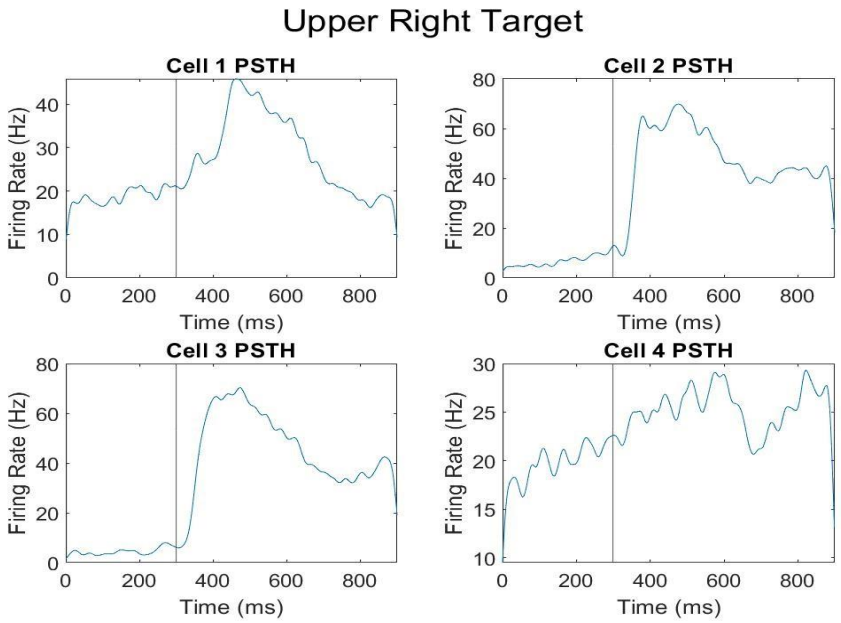

Figure 9: Peri Stimulus Time Histogram

This can be accounted for by the multiple chemical synapses that the signal from the stimulus must traverse from the outside world to visual cortex in order to modulate the firing rate of the neurons.

3# Tuning Curve

The tuning curve shows higher firing rate for the movement happens towards the target appears at lower right corners. The firing rate is in seconds.

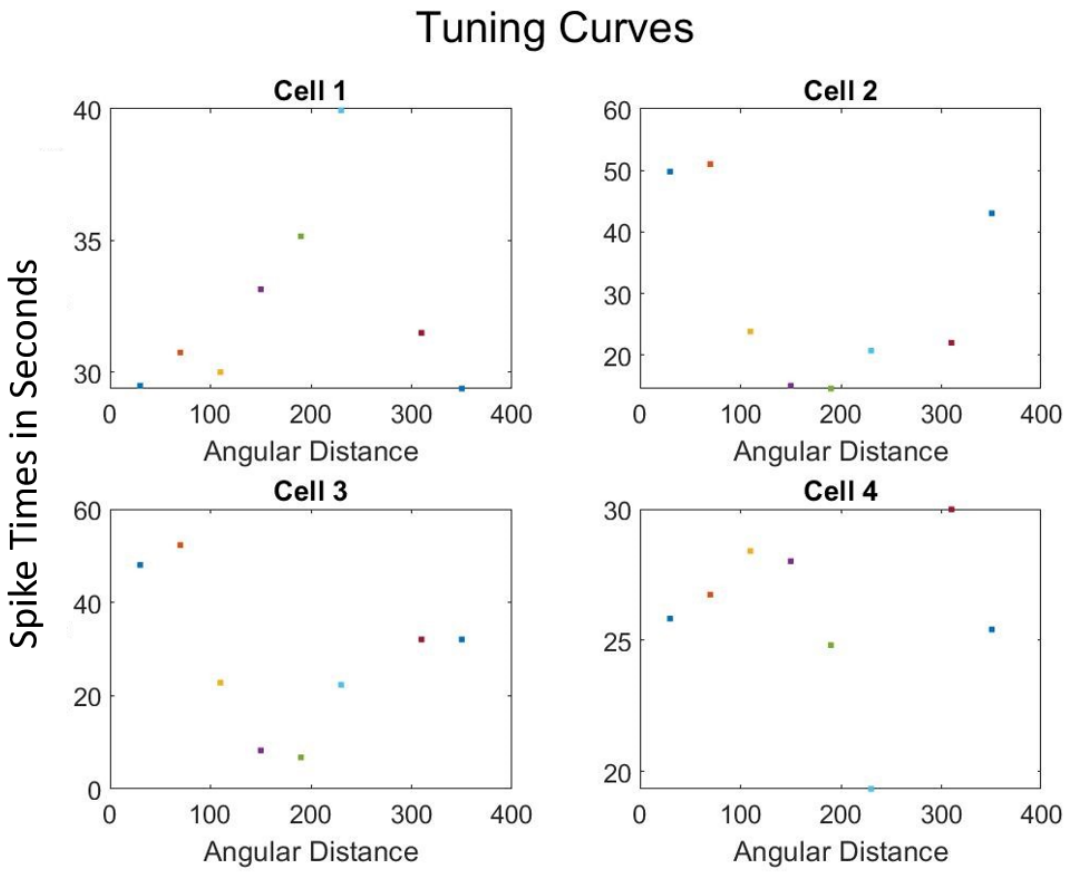

Figure 9: Tuning Curve points of four cells