Tutorial 2: Signal Detection Experiment

PSY310: Lab in Psychology

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GitHub link:

Introduction :

Orientation discrimination is a cognitive process that identifies the ability to distinguish differences in the orientation of visual stimuli. It refers to the capacity to recognize and differentiate between objects, patterns, or lines that are oriented at various angles relative to a reference axis.

A signal detection experiment is a type of perceptual study that investigates a person's ability to detect and distinguish between different meaningful signals/stimuli and background noise or irrelevant information. In this type of experiment, participants are shown a series of stimuli or signals, which can be both signals or sensory responses, and given the task of giving a binary response (yes or no) to indicate whether they believe a signal is present/absent in each trial. The brightness, volume, and other characteristics of the stimuli vary, and some contain the signal of interest while others do not.

The primary goal of the signal detection experiment is to evaluate an individual's ability to differentiate between signal present and signal absent trials while taking into account their perpetual sensibility and response bias. The two main indicators in signal detection theory are: -

1. **Sensitivity:** This measures the ability of the individual or observer to distinguish between signal present and signal absent trials based on the likelihood of correctly identifying a signal and its presence in the absence of a signal.
2. **Response bias:** This measures an individual's ability to respond yes or no in a binary task based on various factors such as personal preferences or a desire to minimize errors.

Method :

The experiment will be conducted by using a software called PsychoPy. The primary goal of this experiment is to quantify an individual's ability to differentiate between signal and noise and to provide insights into their sensory processing and decision-making abilities.

Participants :

The experiment was carried out by me as part of the PSY310 Lab in Psychology at Ahmedabad University.

Observation :

The total number of trials used was 200 trials for the signal detection experiment

Materials and Procedure :

- We received a video wherein the instructor explained the procedure before the experiment was performed. The application that we used was our personal laptop with the latest version of PsychoPsy.
- Following are the procedures for the staircase experiment on PsychoPy:

1. Open PsychoPy-2023
2. Stimuli >Polygon Properties > Basic >Name-Fixation ; Layout >Size[w,h]-$(10,10)
3. Grating Properties >Basic>Name-grating >time(s)-1.0 >Duration-0.3; Layout> orientation -$(tilt) > Size(w,h)-$(0.2,0.2) >set every repeat ;Apperance >Contrast-$ 0.3; Texture >Mask-gauss > Spatial frequency-$ 5; Data >remove the save onset/offset times
4. Responses >Keyboard >Key_resp Properties >Basic >Name-key_resp >time(s)-1.0 > Allowed Keys -$'up', 'down' ;Data > Click - Store correct > Correct answer-$corrAns

5. Custom >code Properties >Begin Experiment

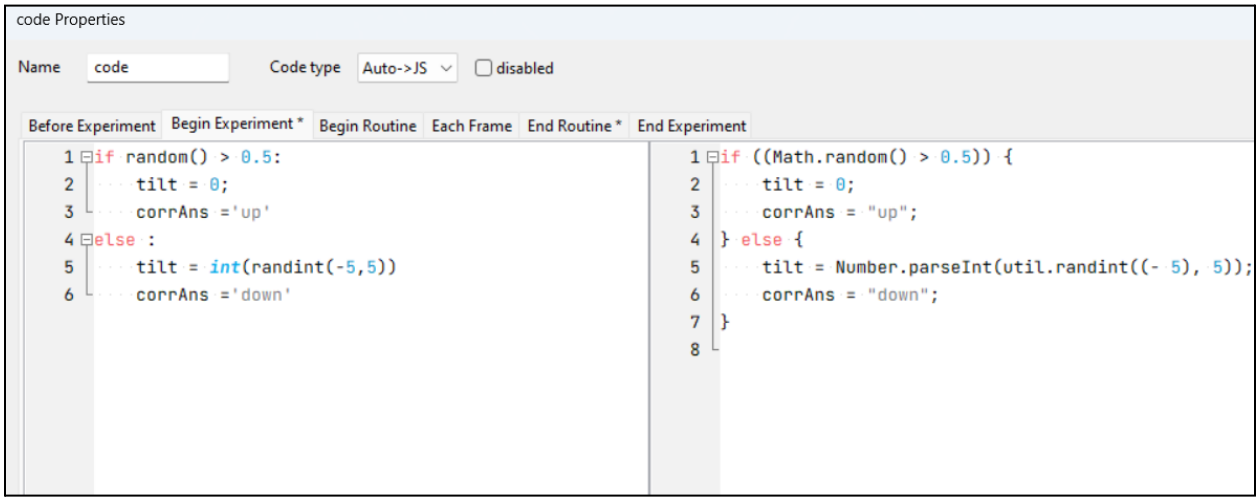


Table 2

6. Custom >code Properties > End Experiment

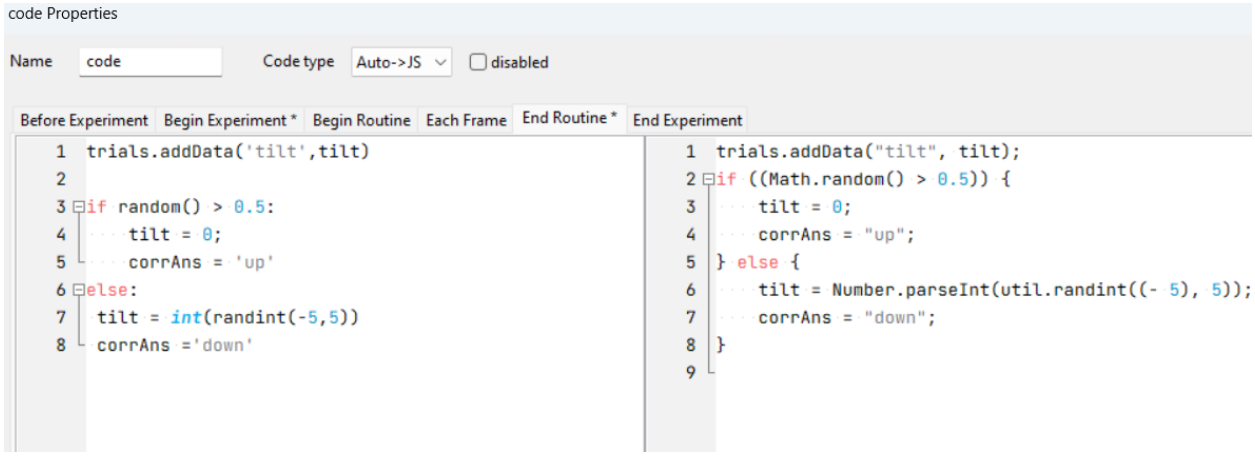


Table 3

7. Click on insert loop > Loop properties >Loop type-random > nReps - $ 200

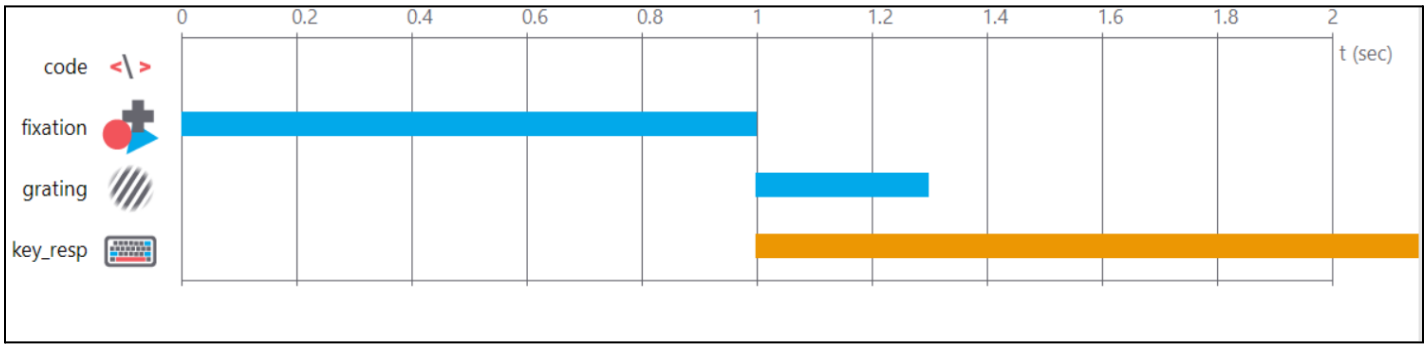
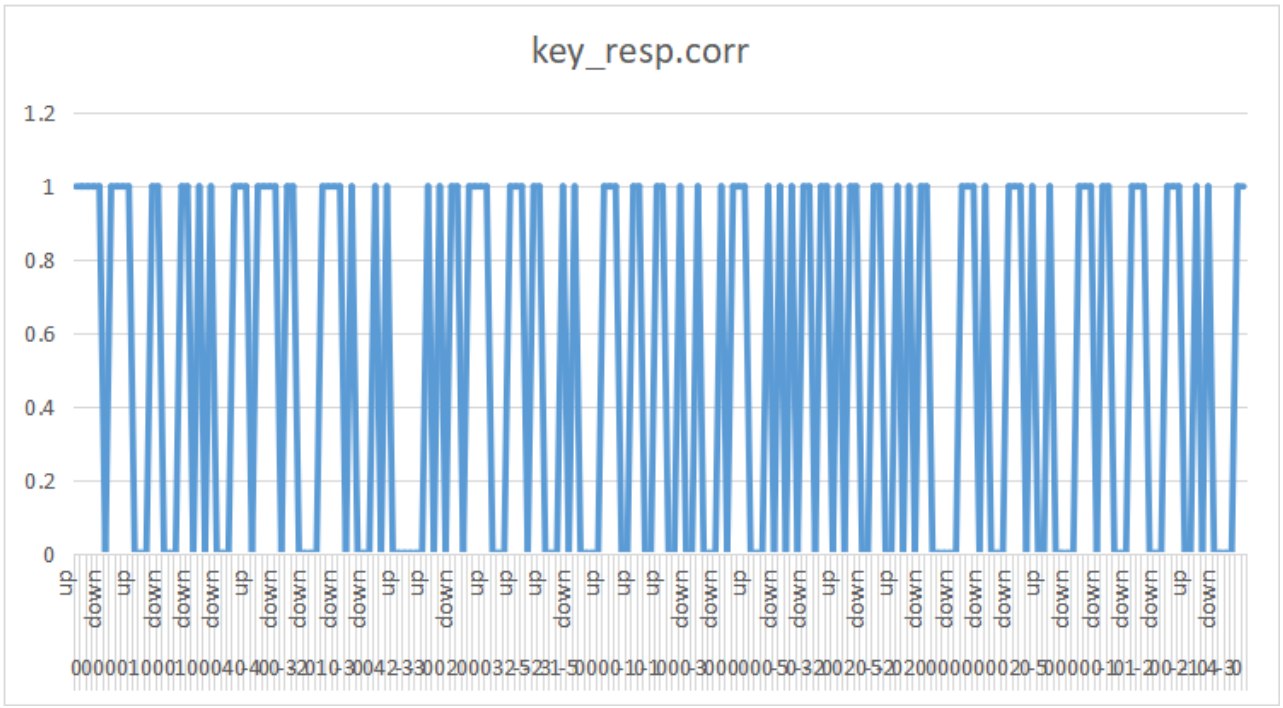


Table 1

8. Click on settings > save it as an adaptive staircase >window size (pixels)-$(1000,600)
9. Run the experiment >click left and right

Results

The graph indicates that :



Names	Values
Hit Rate	0.78
False Alarm rate	0.12
Correct answer	0.83

Discussion: -

The results of this signal detection experiment indicate that the individual's ability is very good as the participants can easily discriminate between the signal and noise with the balanced response criteria.