Adaptive Staircase Experiment

Psy:310 Lab in Psychology

Professor Nithin George

The adaptive staircase method is a psychophysical procedure used in experimental psychology, mainly in perception experiments, to establish thresholds, visual or auditory, etc. For each stimulus presented, the participant is asked to describe his/her perception of the stimulus by answering a forced-choice question. If the participant gives a correct response for the trial, then the subsequent trial becomes more complex (stimulus is weakened or strengthened).  
If the participant provides an incorrect answer, then the probability (of the stimulus to occur) rises or the stimulus is made more accessible.  
The following literature describes several approaches for ascertaining the intensive value that signifies the cut-off point. The simplest is calculating the average values of certain stimuli administered after the series has attained its ultimate value. This means an assumption must be made to decide when the last level has been obtained. The technique that does not encounter this problem and gives a 50 % number is to calculate it.  
Stimulus, more significant than which, the proportion of responses ‘yes,’ is fifty percent.  
The main aim is to identify the intensity at which the participant can identify the stimulus in a given way (e.g., 50% or 75% of the time).  
Kuhn’s experiment is generally done in several trials, and as the staircase proceeds, it defines the exact threshold.  
To fine-tune this threshold, the staircase may reverse directions (either increase or decrease the intensity of the stimulus).

METHOD:

The participant was an undergraduate student, 20 years old, studying at Ahmedabad University. PsychoPy 2024.2 (py3.8) was used to develop the experimental configuration of this experiment. The dimensions of the display were that of a 14-inch monitor.

In this experiment, we used the staircase procedure to access the minimum intensity value of a stimulus for detection with an orientation discrimination task, which will result in participants responding correctly whether a particular grading was titled to the left or the right. The responses had to be indicated with the “left” arrow key if the stimuli were tilted towards the left and with the “right” arrow key otherwise. We started with polygon properties. Then, we moved to grating properties, changing the orientation to direction. Moving forward to keyboard properties, we changed the keys to the right and left and the correct answer to ‘corr\_resp.’

We then provided two routines, one for the beginning and the second for the end routine, by providing a 50:50 probability for beginning the routine, and for the end routine, we offered a code; if the answer is correct, then it will show 1 in our data and 0 if it is incorrect. We then ended the psychopy function by adding loop properties with a staircase loop.

We ended our experiment by running the experiment, where we could discriminate the orientation.

By ending the experiment, we received Excel data, and I calculated the absolute threshold with the mean formula. I received 14.5 as my absolute threshold value.

Tilt Intensity:

Key Response intensity:

Results:

The absolute threshold was reported to be 14.5, indicating that the participants could detect the presence of the signal. However, there were some responses that the participant could not identify.

References:

Zenner, A. (n.d.). The staircase procedure toolkit: Psychophysical detection ... <https://umtl.cs.uni-saarland.de/paper_preprints/zenner-staircase-toolkit-vrst-23-pre-print.pdf>

Cornsweet, T. N. (1962). The Staircase-Method in Psychophysics. *The American Journal of Psychology*, *75*(3), 485–491. <https://doi.org/10.2307/1419876>