Maze Experiment

Jacob Augustine
Colorado State University
Fort Collins, Colorado
jtaugust@rams.colostate.edu

Tyler Dansby
Colorado State University
Fort Collins, Colorado
tsdansby@rams.colostate.edu

Nick Kaliher
Colorado State University
Fort Collins, Colorado
nkaliher@rams.colostate.edu

Experimental Design

Before the experiment starts the researcher will determine the constraints and info for the participant. The constraints are: participant number, maze type (egocentric/allocentric/both), condition (A, B, or C), timeout per maze, number of attempts, and number of perfect runs. Only one of the following needs to be completed to move to the next maze: timeout, number of attempts or perfect attempts. For the experiment, the user will run through fifteen mazes with the constraints set while listening and responding to audio cues. If the researcher selected both egocentric and allocentric the user will complete an egocentric maze then an allocentric maze of the same design before moving to the next maze. The mazes are split into three sections of five mazes each in a randomized order. Each set of five has a separate audio type. They will run through five mazes with allocentric audio cues, five with egocentric audio cues and five with no audio cues (in that order). The goal of the experiment is to test the efficiency of maze solving with separate audio cures and no audio cues. The experiment seeks to see whether the audio cues reduce the performance on the maze solving. Once the experiment is complete the user will complete a survey. The survey currently asks for gender and number of hours of video games played a week.

Literature Review

The first research paper, titled Multiple Resources and Mental Workload written by Christopher D. Wickens[3], discusses multiple resource theory and how it can be used as a guideline in design, as well as a way of predicting workload overload. Multiple resource theory suggests that humans only have so many resources available at a certain time, that is, we can only really focus on tasks that utilize different mental operations. An example of this is how we are able to listen to music and drive at the same time. Wickens goes on to talk about the results, which indicate that there is a strong correlation between what the theory predicted and the resulting data. This research is related to our experiment, given that it investigates MRT and how well people are able to accomplish tasks while multitasking. On the other hand, we are expanding on the current research on MRT by adding both egocentric and allocentric (or exocentric) perspectives in both the visual and auditory tasks required.

The second research article is Navigation in virtual environments using head-mounted displays: Allocentric vs. egocentric behaviors by Hadziq Fabroyir and Wei-Chung Teng[1]. This experiment used virtual reality headsets to show virtual virtual environments in both egocentric and allocentric perspectives. There were also multiple types of input tested with participants using either a game pad or a multi-touch screen to navigate and complete given tasks. What was found is that there was a difference in preference and performance based off of both gender and gaming experience. Females would often favor allocentric perspectives and tasks while males preferred egocentric. Also if a user was said to have past gaming experience they would almost always perform better in the egocentric environments. This experiment is different from what we will be doing as we will only be using one form of input for the user. Instead of testing forms of input we will be testing how their ability to solve a maze in different perspectives changes when given an audio cue to solve as well. We will be seeing how performance changes when a user has to multitask when solving a visual maze and an audio riddle. We will then be comparing it when they are just solving the maze as well as testing participants in different perspectives. This experiment conducted in this article gives us good ground of what to expect and we will see if we experience similar results between gender and video game players.

The third research paper is Allocentric and Egocentric Spatial Representations: Definitions, Distinctions, and Interconnections by Roberta L. Klatzky [2]. This paper was the first to create a formal definition for egocentric and allocentric perspectives. It also discusses how the brain interprets and derives these different perspectives. There are also empirical studies included on how well a person performs within the differing spatial views. This article is relevant to our research because it was the first to thoroughly describe the egocentric and allocentric view from the human perspective. This article shows how the human mind processes information differently through egocentric and allocentric viewpoints. This paper's research is different from ours because Klatzky focused on general definitions and in depth analysis on the views. Our research seeks to determine if egocentric and allocentric perspectives and tasks effect and persons performance on solving a maze. By differing the view and tasks of the participant on egocentric and allocentric, our research can show which has the greatest effect on multitasking.

Early Draft Design

As of right now, we have a version of the application which is nearing completion of its initial design. The menu screens, including the title screen, maze creator screen, constraints screen, consent screen, instructions screen, and survey screen are all done. Currently, not all of the constraints have an effect; however, this should be implemented very soon. The maze creator can be used as it is now to add a new maze to the experiment, whether that be the developers or the researchers making those additions. The scenes have been linked together, which currently allows the user to move on from the menu scene to a specified maze scene, chosen in the constraints. When the user loads a maze scene, a random maze is selected and generated in an egocentric or allocentric perspective, again depending on the constraints selected. Movement in both perspectives is complete. The egocentric, or first person, movement allows the player to press the W key to move and rotate their camera to the left or right with the A and D keys, respectively. The allocentric, or top down, movement allows the player to move up, left, down, and right, with the W, A, S, and D keys. In both movement types, the player will move automatically to the next specified intersection upon one key input. Our next goal is to complete the constraints so that they all have their desired effect on the experiment, as well as automated data collection.

REFERENCES

[1] Hadziq Fabroyir and Wei-Chung Teng. 2018. Navigation in virtual environments using head-mounted displays: Allocentric vs. egocentric behaviors. *Computers in Human Behavior* 80 (2018), 331–343.

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