

Maze Experiment Proposal

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Project Description

Our project is focused on making a maze navigator with audio tasks to measure multitasking performance of solving these cues while navigating the maze. The research assistant will open up the program and be able to set a variety of parameters for the experiment. These include maze type (egocentric or allocentric), condition group, number of attempts, time out of maze trial, and number of successful attempts till the next maze. After this, there will be a consent screen for the participant, and then instructions detailing how they will move about each maze and progress through the experiment. The participant will go through the same maze multiple times until either they time out, they run out of attempts, or they have completed it successfully multiple times in a row without error. The next maze is then randomly selected by their condition group. There will also be auditory tasks set in the maze that the participant will have to answer via key press while solving the maze. Once the trials have been completed the user will fill out a short survey. All of the data will be put into an excel sheet - participant ID, data type (D: training, T: testing, S: survey), maze type, maze number, attempt number, errors made in the maze, all movement made, time movement was made, maze location, and survey data - so that the researcher can view them later.

Project Technology

This project will be entirely software focused. Only a laptop (not high performance) will be required to run this software and conduct the experiment. To create the software for the experiment, we will be using Unity. Unity is a cross platform gaming engine that is used by animators, developers, artists and researchers. It has hundreds of built in tools, large libraries, and an active community to keep the product alive. We chose Unity to lessen the learning curve and take advantage of the pre-existing tools/libraries.

Project Motivation

We chose to help with this research primarily because of our groups' shared interest in gaming, but also because the experiment itself was intriguing. Colleen Patton, the Ph.D. student in Psychology conducting this research, is interested in examining Multiple Resource Theory (MRT). MRT proposes that we use different resources when processing information, whether that be visually, auditorily, or another way. By combining this way of taking different forms of information at the same time with alternate frames of reference, being egocentric or allocentric, she wants to know how an individual arrives at the best possible decisions.

Project Deliverable

The goal of this project is to provide the researcher with an environment that can be used to test participants on their ability to navigate a maze from an allocentric or egocentric perspective, while also performing audio tasks in a similar fashion. The completed application will ask for the participants' consent, run the experiment, and output the results to a CSV file for the researcher to view after a trial is over. In addition to this, the researcher will have the ability to create and add mazes to the experiment from within the application. We wish to prepare this product to be online for the next group to complete.

Expected Result

We would expect to have a functional Unity project where all the requirements stated above are met. In terms of research results, we agreed that there is likely to be a decrease in productivity/efficiency while the auditory cues are active. We believe this decrease will be there but will probably be pretty small or too small to count as a deficit in efficiency.

COVID-19 Update

Once classes had gone online we had met with the professor and Colleen to discuss what all would need to be changed. It was agreed that from a coding standpoint the project was sufficient, it just needed to be completed and given to Colleen. It was decided that we would no longer be performing the experiment with participants due to our current progress and the unavailability of in-person experiments. We discussed how our group would need to produce a lot of documentation to prepare for the next group to complete it, as well as suggestions as to how the experiment could be put completely online.

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 cues 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.



Figure 1. Beginning load in screen as it is shown in Unity.



Figure 2. Constraints Screen used by the researcher.

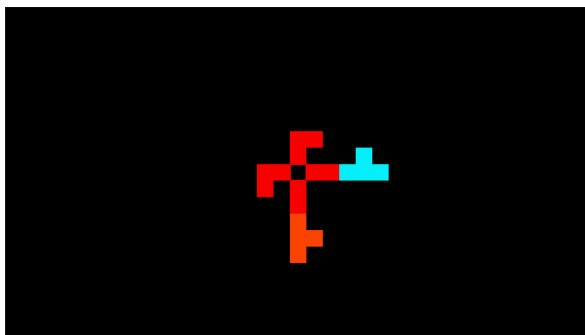


Figure 3. Screenshot of Allocentric Maze (notice how it is blacked out besides available intersections)

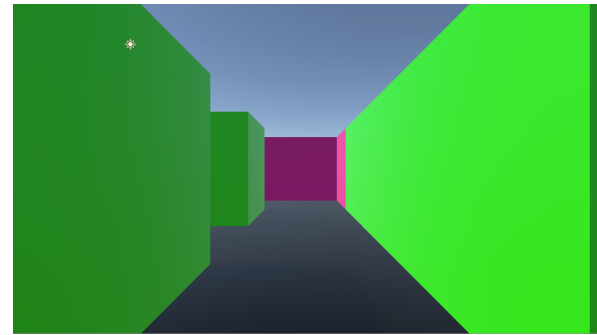


Figure 4. Screenshot of Egocentric Maze

Condition	Audio Type		
	Allocentric	Egocentric	None
	A 1-5	6-10	11-15
	B 11-15	1-5	6-10
C	6-10	11-15	1-5

Figure 5. Latin-Square of Conditional Tests for Experiment.

Participant	DataType	MazeType	MazeNum	AttemptN	Mover	Error	AudioCue	Time	MazeLoc	Gender	VideoGame
1	D	Ego	5	1	Rotate Le	0	0	4/9/2020	(1 : 1)		
1	D	Ego	5	1	Forward	0	49	4/9/2020	(5 : 1)		
1	D	Ego	5	1	Forward	0	49	4/9/2020	(11 : 1)		
1	D	Ego	5	1	Rotate Le	0	49	4/9/2020	(11 : 1)		
1	D	Ego	5	1	Forward	0	49	4/9/2020	(11 : 7)		
1	D	Ego	5	1	Rotate Ri	0	49	4/9/2020	(11 : 7)		
1	D	Ego	5	1	Forward	0	49	4/9/2020	(13 : 7)		
1	T	Ego	5	1	Forward	0	0	4/9/2020	(5 : 3)		
1	T	Ego	5	1	Rotate Le	0	0	4/9/2020	(5 : 3)		
1	T	Ego	5	1	Forward	0	0	4/9/2020	(5 : 1)		
1	T	Ego	5	1	Rotate Le	0	0	4/9/2020	(5 : 1)		
1	T	Ego	5	1	Forward	0	0	4/9/2020	(11 : 1)		
1	T	Ego	5	1	Rotate Le	0	0	4/9/2020	(11 : 1)		
1	T	Ego	5	1	Forward	0	20	4/9/2020	(11 : 7)		
1	T	Ego	5	1	Rotate Ri	0	20	4/9/2020	(11 : 7)		
1	T	Ego	5	1	Forward	0	20	4/9/2020	(13 : 7)		
1	T	Ego	5	2	Forward	0	0	4/9/2020	(5 : 3)		
1	T	Ego	5	2	Forward	0	0	4/9/2020	(3 : 3)		
1	T	Ego	5	2	Rotate Le	0	0	4/9/2020	(3 : 3)		
1	T	Ego	5	2	Rotate Le	0	0	4/9/2020	(3 : 3)		
1	T	Ego	5	2	Forward	1	0	4/9/2020	(5 : 3)		
1	T	Ego	5	2	Rotate Ri	1	0	4/9/2020	(5 : 3)		
1	T	Ego	5	2	Forward	1	0	4/9/2020	(5 : 1)		
1	T	Ego	5	2	Rotate Le	1	0	4/9/2020	(5 : 1)		
1	T	Ego	5	2	Forward	1	21	4/9/2020	(11 : 1)		
1	T	Ego	5	2	Rotate Le	1	21	4/9/2020	(11 : 1)		
1	T	Ego	5	2	Forward	1	21	4/9/2020	(11 : 7)		
1	T	Ego	5	2	Rotate Ri	1	21	4/9/2020	(11 : 7)		
1	T	Ego	5	2	Forward	1	21	4/9/2020	(13 : 7)		
1	D	Allo	5	1	Down	0	0	4/9/2020	(1 : 3)		
1	D	Allo	5	1	Left	0	0	4/9/2020	(1 : 1)		
1	D	Allo	5	1	Down	0	24	4/9/2020	(5 : 1)		
1	D	Allo	5	1	Down	0	24	4/9/2020	(11 : 1)		
1	D	Allo	5	1	Right	0	24	4/9/2020	(11 : 7)		
1	D	Allo	5	1	Down	0	24	4/9/2020	(13 : 7)		
1	T	Allo	5	1	Down	0	0	4/9/2020	(9 : 3)		
1	T	Allo	5	1	Right	0	0	4/9/2020	(9 : 5)		
1	T	Allo	5	1	Up	0	48	4/9/2020	(5 : 5)		
1	T	Allo	5	1	Right	0	48	4/9/2020	(5 : 7)		
1	T	Allo	5	1	Down	0	48	4/9/2020	(7 : 7)		
1	T	Allo	5	1	Right	0	48	4/9/2020	(7 : 9)		
1	T	Allo	5	1	Up	0	48	4/9/2020	(1 : 9)		
1	T	Allo	5	1	Right	0	48	4/9/2020	(1 : 11)		
1	T	Allo	5	1	Down	0	48	4/9/2020	(3 : 11)		
1	T	Allo	5	1	Down	0	48	4/9/2020	(9 : 11)		
1	T	Allo	5	1	Left	0	48	4/9/2020	(9 : 10)		
1	T	Allo	5	1	Down	0	48	4/9/2020	(11 : 10)		
1	T	Allo	5	1	Right	0	48	4/9/2020	(11 : 13)		
1	T	Allo	5	1	Down	0	48	4/9/2020	(13 : 13)		
1	T	Allo	5	1	Left	0	48	4/9/2020	(13 : 7)		
1	T	Allo	5	2	Down	0	0	4/9/2020	(9 : 3)		
1	T	Allo	5	2	Up	0	0	4/9/2020	(5 : 3)		
1	T	Allo	5	2	Left	0	45	4/9/2020	(5 : 1)		
1	T	Allo	5	2	Down	0	45	4/9/2020	(11 : 1)		
1	T	Allo	5	2	Right	0	45	4/9/2020	(11 : 7)		
1	T	Allo	5	2	Down	0	45	4/9/2020	(13 : 7)		
1	S	Allo	5	2	Down	0	45	4/9/2020	(13 : 7)	Male	16

Figure 6. Example csv file of participants movements.

SURVEY

Please answer the following questions:

What is your gender identity?

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to say

On average, how many hours a week do you spend playing video games?

hours/week

NEXT

Figure 7. Screenshot of survey screen.