Study Information Block

Study Information Sheet (SIS) for Luddy Hall VR Navigation User Study (IRB #1911941428)

This is your unique ID: ${e://Field/ResponseID}
Your cohort tag is: ${e://Field/cohort}

You are invited to participate in a research study of navigation in virtual reality (VR). You were selected as a possible subject because you are 18+ years old. Please note that subjects with an epilepsy diagnosis are not eligible. Please read this form and ask any questions you may have before agreeing to be in the study.

The study is being conducted by Andreas Bueckle (abueckle@indiana.edu), Dr. Patrick Shih (patshih@indiana.edu), and Dr. Katy Borner (katy@indiana.edu) from the Luddy School of Informatics, Computing, and Engineering at Indiana University.

STUDY PURPOSE

The purpose of this study is to explore how users navigate through a three-dimensional model of Luddy Hall on IU campus. We want to know if there are differences in completion time, task accuracy, and user satisfaction between a group of subjects who repeat the same set of navigation tasks twice (control) and a group of subjects that does so with an interventional treatment in-between (experiment). Additionally, we aim to understand what kinds of data visualizations can help users improve their own navigational performance in VR. To that end, we are collecting data on timing and task accuracy while also asking questions about the usability of the navigation methods presented in this user study.

NUMBER OF PEOPLE TAKING PART IN THE STUDY

If you agree to participate, you will be one of ~68 subjects who will participate in this research.

PROCEDURES FOR THE STUDY

If you agree to be in the study, you will be handed a surgical mask upon arrival at the research site and asked to wash your hands before and after the experiment. Further safety precautions may need to be implemented, pending policy changes from IU, the Luddy School of Informatics, Computing, and Engineering, or other entities.

You will come to our research site during a previously agreed upon timeslot. Then, you will complete a pre-questionnaire to gather basic demographic data as well as information about your current usage and comfort with data visualizations, 3D applications, and VR. Subsequently, you will be given a VR headset and controllers. You will then receive instructions on how to use your tools and be presented with a set of tasks. If we select you for the control cohort, you will perform these tasks twice with a brief break in-between. If you are part of the experiment cohort, after the first part, we will show you a selection of data visualizations you generated with your movements in VR, and ask you questions about them while recording your answers, and then repeat the tasks. Finally, you will be presented with a post-questionnaire where you can share ideas for improvement. The study will take approximately 30-60 minutes of your time. You will be recorded in audio and video for the remainder of the experiment, starting the moment you enter the VR experiment, and we will record your actions in the physical world and in the virtual space with video and audio.

PAYMENT

Upon completion of your participation in the study, you will receive $20 in Amazon.com gift cards. In order to receive this payment, you need to complete the survey in its entirety.

RISKS AND BENEFITS OF TAKING PART IN THE STUDY

The risks of participating in this research are discomfort answering questions about unfamiliar visualizations. Further, some users can experience discomfort from using VR (such as motion sickness). You may also tell the investigator if you need to take a break. There is no direct benefit to participation.

CONFIDENTIALITY

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in reports in which the study may be published and databases in which results may be stored.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the Indiana University Institutional Review Board or its designees, the study sponsor, and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP), etc., who may need to access your research records.

FUTURE USE

Information collected from you for this study may be used for future research studies or shared with other researchers for future research. If this happens, information which could identify you will be removed before any information or specimens are shared. Since identifying information will be removed, we will not ask for your additional consent**.**

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study, please contact researcher Andreas Bueckle at abueckle@indiana.edu. For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or to offer input, contact the IU Human Subjects Office at 812-856-4242 or irb@iu.edu.

VOLUNTARY NATURE OF THIS STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Your decision whether or not to participate in this study will not affect your current or future relations with the Luddy School of Informatics, Computing, and Engineering.

Demographics

Please answer the following questions below to help us understand your background and experience.

What is your native language?

- ☐ English
- ☐ other(s), please list:

What is your major/job title?

Please indicate your age:

- ○ 18-20
- ○ 21-30
- ○ 31-40
- ○ 41-50
- ○ 51-60
- ○ >60

Please indicate your gender:

- Male
- Female
- Identity not listed above
- I prefer not to answer

What is your height in inches?

0 10 20 30 40 50 60 70 80 90

Click to write Choice 1

Pre-Questions

Would you say that you are familiar with the following types of data visualizations?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	S

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	S
Tables	○	○	○	○	
Charts, such as pie chart or bubble chart	○	○	○	○	
Graphs, such as scatter graphs, bar graphs, or line graphs	○	○	○	○	
Maps	○	○	○	○	
Tree visualizations	○	○	○	○	
Networks	○	○	○	○	

Would you say that you are familiar with this building (Luddy Hall)?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Have you ever used a virtual reality headset (e.g. Oculus Rift, Playstation VR, Google Cardboard etc.)?

- ○ Yes
- ○ No

How many times have you used a virtual reality headset in the past?

Rarely ○ Occasionally ○ Often ○

Which device(s) did you use?

- ☐ HTC Vive/Vive Pro/Cosmos
- ☐ Playstation VR
- ☐ Oculus Rift, Rift S/Go/Quest
- ☐ Google Cardboard or similar
- ☐ I do not remember
- ☐ Other: [ ]

Did you play video games in the last 12 months?

- ○ Yes
- ○ No

How many hours a week do you play video games on average?

0 4 8 12 16 20 24 28 32 36 40

0 4 8 12 16 20 24 28 32 36 40

Average hours per week

Which device did you play video games on?

- [ ] Smartphone or handheld device
- [ ] Video game console
- [ ] Computer
- [ ] Other

First-person shooter (FPS) is a video game genre centered on gun and other weapon-based combat in a first-person perspective; that is, the player experiences the action through the eyes of the protagonist.

Among the games you played in the past 12 months: Were there any First Person Shooters?

- ○ Yes
- ○ No

Please describe your experience with 3D applications in general.

Have you ever used any 3D modeling or animation software?

- ○ Yes
- ○ No

Please mark all programs you have used:

- ☐ 3DS Max
- ☐ AutoCAD
- ☐ Maya
- ☐ Unity
- ☐ Unreal Engine
- ☐ Cinema4D
- ☐ ZBrush

☐ Other:

Are you primarily left-handed or right-handed?

○ Left-handed
○ Right-handed
○ I prefer not to answer

Are you far or near-sighted, or do you have any other vision impairments?

☐ Far-sighted
☐ Near-sighted
☐ Other:
☐ I prefer not to answer
☐ I do not have any vision impairments.

Are you color-blind? If so, please specify.

○ No
○ Yes, specifically:

○ I prefer not to answer

VR Trial 1

Please talk to the researcher now so they can prepare the VR equipment for you.
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Break

Thank you! Please take a 5-10 mins break.

Reflective Phase

Thank you for your input so far. We are now going to test a novel application where you can review your actions in the part of our experiment you just finished. First, we are going to briefly explain what this entails:

After reading this text, we will show you a data visualization of your prior actions. Specifically, we will show you a data visualization of the trajectories you performed through space. When inspecting your data, we want you to think about what you could improve in order to achieve two goals:

- Complete future, similar tasks with a faster completion time, and
- Find the shortest possible path to a task destination. You may achieve this by thinking what the optimal navigation method would be when you have the choice in future tasks.

First, we will let you practice a little bit by showing you data that is not your own. After that, we will show you how you performed.

Please step back now and let the researcher prepare this next part of the experiment.

This is your unique ID: ${e://Field/ResponseID}
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Thank you for looking at your own data. Please summarize your insights about your performance in VR.

Would you say that you navigated the 3D space efficiently in general?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that you navigated the 3D space efficiently when only walking was allowed?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree

- ○ Somewhat agree
- ○ Strongly agree

Would you say that you navigated the 3D space efficiently when only teleporting was allowed?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that you navigated the 3D space efficiently when only free-flying was allowed?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that you navigated the 3D space efficiently when you could switch between all three navigation

methods?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that the filters and checkboxes were useful when investigating your own trajectories through space?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that the bar graph was useful when investigating your own trajectories through space?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that the ability to move around the miniature 3D model was useful when investigating your own trajectories through space?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Would you say that color-coding was useful when investigating your own trajectories through space?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

After seeing this visualization of your own performance, would you say that you now have a strategy to achieve faster completion times of the next round of tasks?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

After seeing this visualization of your own performance, what would you do differently next time?

Building Check

You completed several tasks in this VR experiment. How many floors does the virtual building have in total? If you want to choose the lowest value, please move the slider to another number first, then back to the desired value.

1 2 3 4 5 6 7

Choose:

Out of all the floors, on how many of them did you perform tasks?

1 2 3 4 5 6 7

Choose:

How many tasks did you perform in total across the whole experiment?

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Choose:

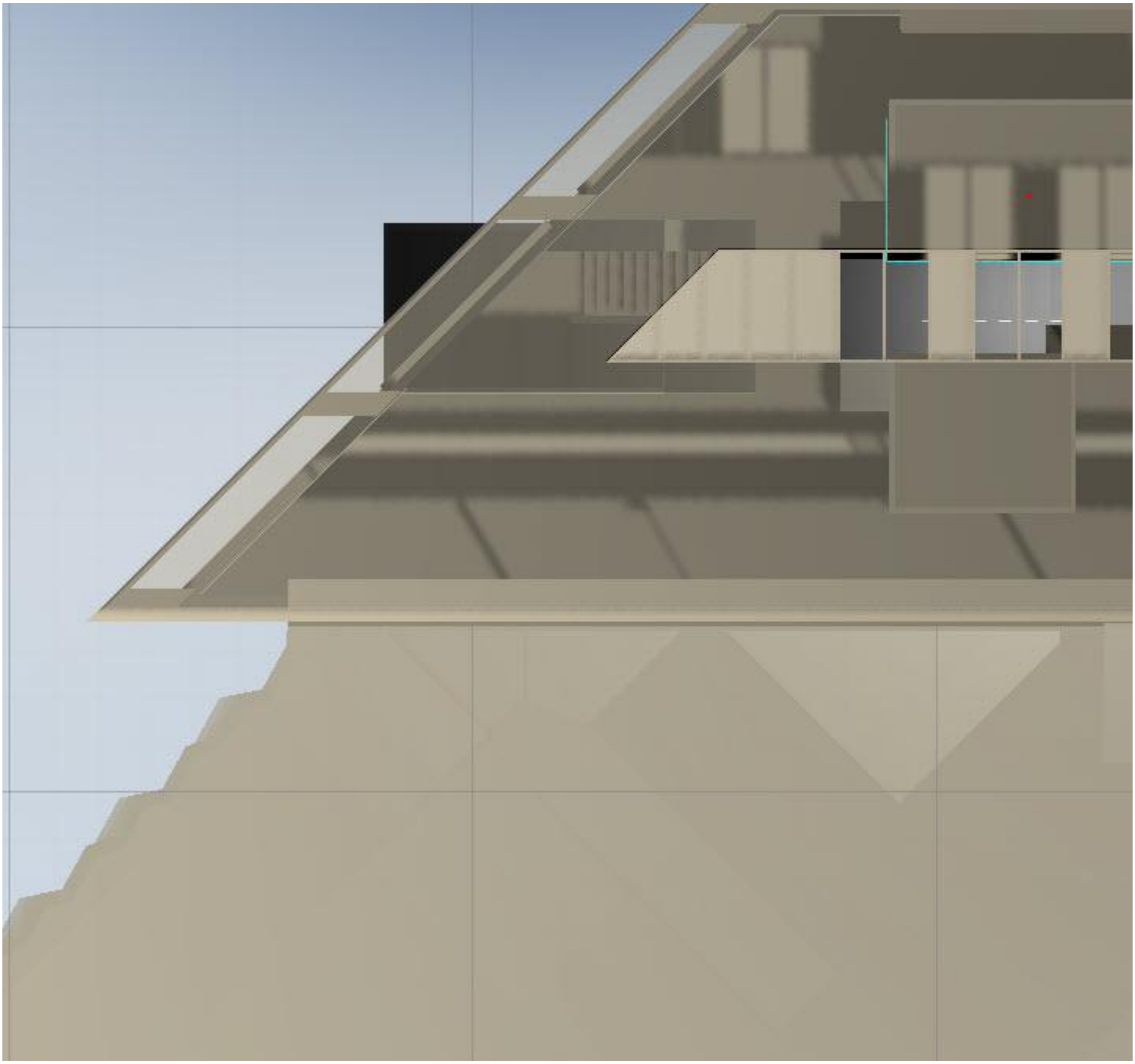
How many individual rooms did you visit? If you went to a room more than once, please count this as one visit.

1 2 3 4 5 6 7 8 9 10 11 12 13 14

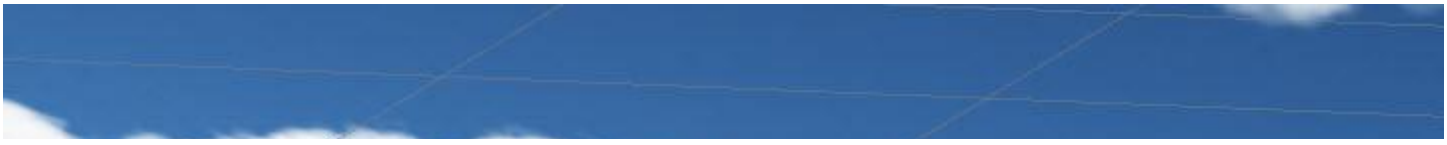
Choose:

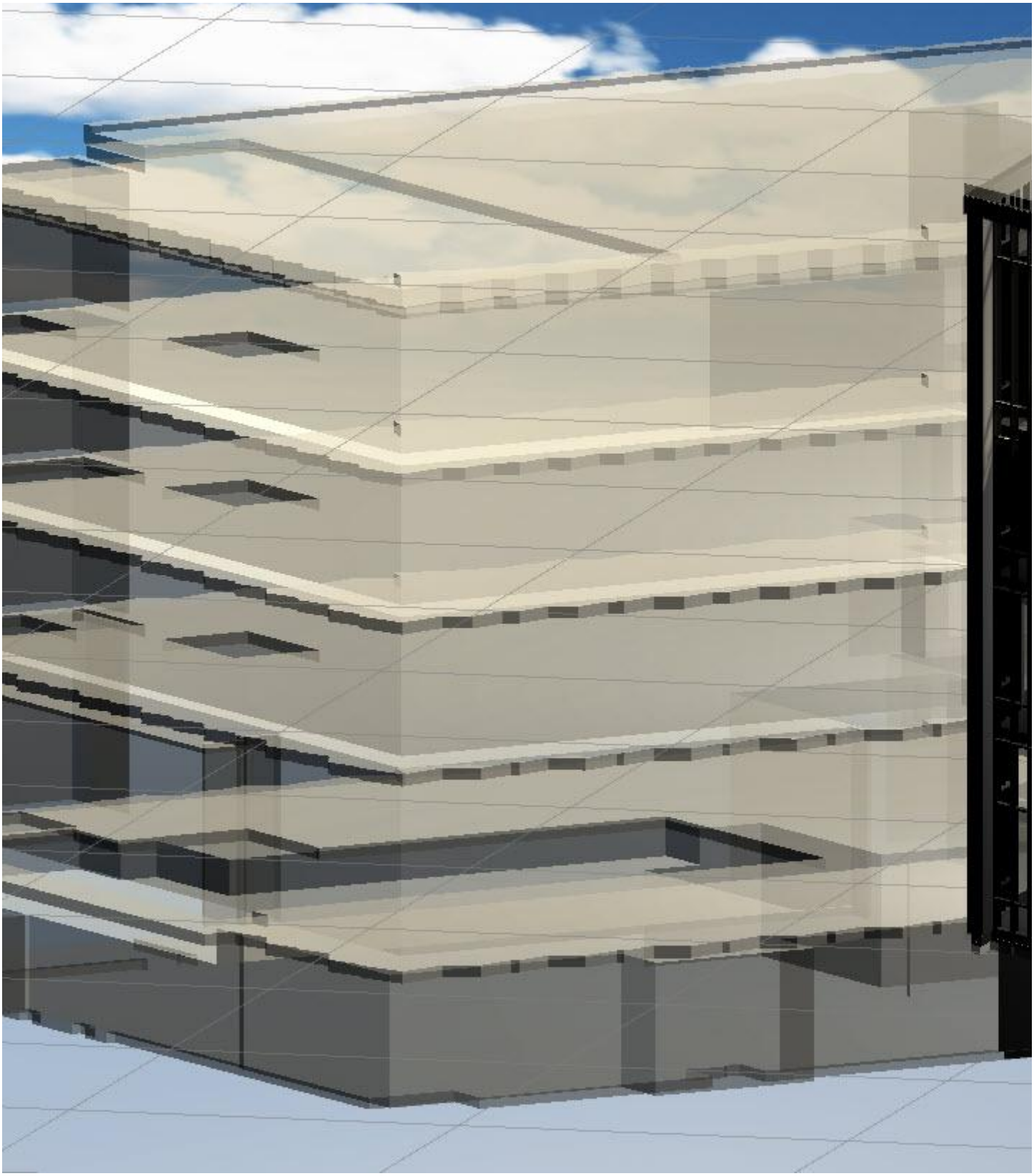
From memory, please tell us how many tasks you completed on each floor, but only count unique tasks, not repeated ones. If you want to choose the lowest value, please move the slider to another number first, then back to the desired value.

After every completed task, you were transported back to the same start position. In the 3D model view below, please indicate where you think this start position was. The little red dot just to the left of the center marks the location of your first task. This is a bird's eye view of the building.



Now please indicate that same start position in the image below. The little red exclamation marks the location of your first task. This is a side view of the building, slightly elevated.





VR Trial 2

Thank you. The researcher will now prepare the VR equipment for you so you can repeat your navigation tasks in VR.
This is your unique ID: ${e://Field/ResponseID}
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Post-Q

What strategy did you use to decrease your navigation completion time in the 2nd trial?

Would you say that you were completing the tasks faster in the 2nd trial than in the 1st trial?

- ○ Strongly disagree
- ○ Somewhat disagree

- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

Please provide reasons for your answer to the previous question.

Please rank the navigation methods in descending order, starting with your most favorite, ending with your least favorite:

Walk

Teleport

Free-fly

Please explain your ranked preferences above.

I feel...

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Accomplished	○	○	○	○	○
Satisfied with my work	○	○	○	○	○

Would you say that you liked these parts of the VR application?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Overall	○	○	○	○	○
the controls	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
the visual design	○	○	○	○	○
the instructions	○	○	○	○	○
hardware	○	○	○	○	○
pacing	○	○	○	○	○

Would you say that this VR application was easy to use?

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

What did you like about the VR experience?

What can be done to improve the VR experience?

How did you hear about this study? Please select all that apply:

- [ ] Word-of-mouth
- [ ] Email
- [ ] Instagram
- [ ] Facebook
- [ ] Twitter
- [ ] Other:
- [ ] I do not remember

During the course of this experiment, did you experience motion sickness?

- ○ Not at all
- ○ A little
- ○ Very much (sick)

Are we allowed to contact you for future virtual reality user studies? If yes, please enter your email address. Thank you!