

Visceral Interfaces for Privacy Awareness of Eye Tracking in VR (Supplementary Material)

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ABSTRACT

The Supplementary Material presents the survey measures deployed at each stage of our user study (Figure 3 of the main paper) in Sections 1 through 5, and provides visualizations of the results data for participants willingness to share data with different entities in Section 6.

1 D1 QUESTIONS

1. What is your participant ID?
2. With what gender do you identify?
 - Woman
 - Man
 - Non-binary
 - Prefer not to say
 - Other...
3. What is your ethnicity?
 - Hispanic or Latino
 - American Indian or Alaska Native
 - Asian
 - Black or African American
 - Native Hawaiian or Other Pacific Islander
 - Caucasian or White
 - Multiracial
 - Prefer not to say
 - Other...
4. What is your age?

1.1 VR Experience

1. Have you used a virtual-reality headset before?
2. Estimate the number of hours you have used head-mounted virtual or augmented reality in the last month (e.g., Oculus/Meta Quest).
3. Estimate the number of hours you have used 3D applications (including video games) in the last month.
4. Which of the following applications have you used virtual reality for? _____

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1.2 Privacy Concerns

The following prompts were adapted from Kumaraguru and Cranor [3].

1. Which of the following do you believe has ever disclosed your personal medical information in a way that you felt was improper?
 - Health insurance companies
 - A clinic or hospital that treated you or a family member
 - Public health agencies
 - Your employer or a family member's employer
 - A doctor who has treated you or a family member
 - A pharmacist who filled a prescription for you or a family member
 - N/A
2. Have you personally ever been the victim of what you felt was an improper invasion of privacy, or not?
 - Yes, I have been a victim
 - No, I have not been a victim
 - I don't know
 - Do not wish to answer
3. Which of these statements do you think is true?
 - Consumers have lost all control over how personal information is collected and used by companies.
 - Most businesses handle the personal information they collect about consumers in a proper and confidential way.
 - N/A

2 P1 QUESTIONS

A subset of the privacy attitudes (Whom and Where) were used from Steil et al. [4].

2.1 VR Concerns

Asked on a 5-point Likert scale (Strongly Disagree, Slightly Disagree, Neutral, Slightly Agree, Strongly Agree).

1. I am concerned about virtual reality technology in terms of social acceptability (e.g., how I am perceived by other people).
2. I am concerned about virtual reality technology in terms of mental comfortability (e.g., increase/decrease mental workload).

3. I am concerned about virtual reality technology in terms of physical comfortability (e.g., increase/decrease physical workload).
4. I am concerned about virtual reality technology in terms of privacy.

2.2 Eye-Tracking Experience, Privacy Attitudes, and Concerns

1. I am familiar with eye-tracking technology.
2. I understand how eye-tracking technology works.
3. I am concerned about eye-tracking technology in terms of social acceptability (e.g., how I am perceived by others).
4. I am concerned about eye-tracking technology in terms of mental comfortability (e.g., increase/decrease mental workload).
5. I am concerned about eye-tracking technology in terms of physical comfortability (e.g., increase/decrease physical workload).
6. I am concerned about eye-tracking technology in terms of privacy.

3 S1 QUESTIONS

The standard NASA-TLX was used in addition to the following questions on a 5-point Likert scale (Strongly Disagree, Slightly Disagree, Neutral, Slightly Agree, Strongly Agree) unless otherwise noted. Questions ending with (*) denote open-ended questions where participants could provide short answers.

1. It felt like the accept icon seamlessly responded to my head movements.
2. It felt like the accept icon seamlessly responded to my eye movements.
3. I felt I had control over my decision to accept the permissions request.
4. I was annoyed by having to rotate my head as part of the request.
5. I feel the head rotation was effective at bringing attention to eye tracking.
6. It felt like the time I needed to look at the accept icon to proceed was...
 - Very Slow
 - Somewhat Slow
 - Just Right
 - Somewhat Fast
 - Very Fast
7. Please provide additional feedback on how the presented interface could be improved for a user. (*)

4 S2/3 QUESTIONS

Standardized NASA-TLX and Simulation Sickness Questionnaire (SSQ) [2] were used. We also based the interface attitudes questions were with an adaption of the attitudes questions from Kalyanaraman and Sundar [1]. The following questions were asked on a 5-point Likert scale (Strongly Disagree, Slightly Disagree, Neutral, Slightly Agree, Strongly Agree) unless otherwise noted. Questions ending with (*) denote open-ended questions where participants could provide short answers.

1. I would leave this eye-tracking interface (tendril/icon) enabled if it was a default setting.
2. I would actively choose to enable this eye-tracking interface (tendril/icon).
3. I would like the ability to easily toggle the eye-tracking interface (tendril/icon) off and on.
4. I would choose to enable the eye-tracking interface (tendril/icon) within all VR applications.
5. The eye-tracking interface (tendril/icon) distracted me from my task.
6. Explain what was distracting about the eye-tracking interface (tendril/icon). (*)
7. The eye-tracking interface (tendril/icon) informed me of which objects I was looking at.
8. Explain how the eye-tracking interface (tendril/icon) did indicate which objects you looked at. (*)
9. The eye-tracking interface (tendril/icon) made me aware that I looked at objects I otherwise would not have realized I glanced at.
10. Explain how the eye-tracking interface (tendril/icon) made you aware of objects you otherwise would not have noticed. (*)
11. Please provide additional feedback on how the presented eye-tracking interface (tendril/icon) could be improved for a user. (*)

5 POST-EXPERIMENT SURVEY

We again asked the privacy attitudes (Services, Whom and Where) questions from Steil et al. [4]. The following additional questions were asked on a 5-point Likert scale (Strongly Disagree, Slightly Disagree, Neutral, Slightly Agree, Strongly Agree) unless otherwise noted. Questions ending with (*) denote open-ended questions where participants could provide short answers.

5.1 Interface Preferences and Thoughts

1. Which eye-tracking interface did you prefer during the VR viewing task? (Ask the experimenter if you are unsure of the names)
 - Icon
 - Tendril
 - No preference
2. Please explain what factors influenced your decision on eye-tracking interface preference. (*)

5.2 Eye-Tracking Data Sharing

1. I recommend that VR users try out these interfaces, or similar ones, before enabling eye tracking.
2. I recommend that VR platforms provide interfaces like these that relay information about collected eye-tracking data.
3. I recommend that VR platforms should legally be required to provide interfaces like these to users.
4. I recommend that VR platforms enable interfaces like these by default for all users.
5. Please provide additional feedback on how the presented interfaces could be improved or modified to better fit your needs as a user. (*)

5.3 Eye-Tracking Experience, Privacy Attitudes, and Concerns

1. I am familiar with eye-tracking technology.
2. I understand how eye-tracking technology works.

6 ADDITIONAL FIGURES ON NASA-TLX

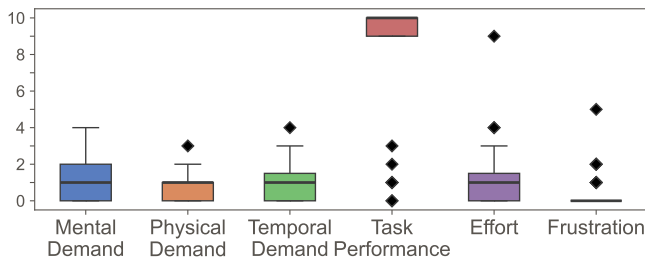


Figure 1: NASA-TLX scores for the Permissions Request interface. The interface incurred low demand on the user and allowed the user to perform their intended task. For performance, several outliers were observed that were a result of the participants misinterpreting the scale values for this dimension.

7 ADDITIONAL FIGURES ON WILLINGNESS TO SHARE DATA

Table 1: The full list of data sharing questions.

Survey Question (SQ)	Would you agree to...
SQ1	share your eye-tracking data in general?
SQ2	share your eye-tracking data with government agencies (non-health)?
SQ3	share your eye-tracking data with a government health authority?
SQ4	share your eye-tracking data with a local company?
SQ5	share your eye-tracking data with an international private company?
SQ6	share your eye-tracking data with a domestic private company?
SQ7	maintain eye-tracking data yourself (e.g., home cloud)?
SQ8	share your eye-tracking data with an employer's internal user?
SQ9	share your eye-tracking data with research institute?
SQ10	share your eye-tracking data in exchange for benefits?
SQ11	share your eye-tracking data to support VR applications (e.g., games, entertainment)?
SQ12	share your eye-tracking data to support further VR development (e.g., hardware)?

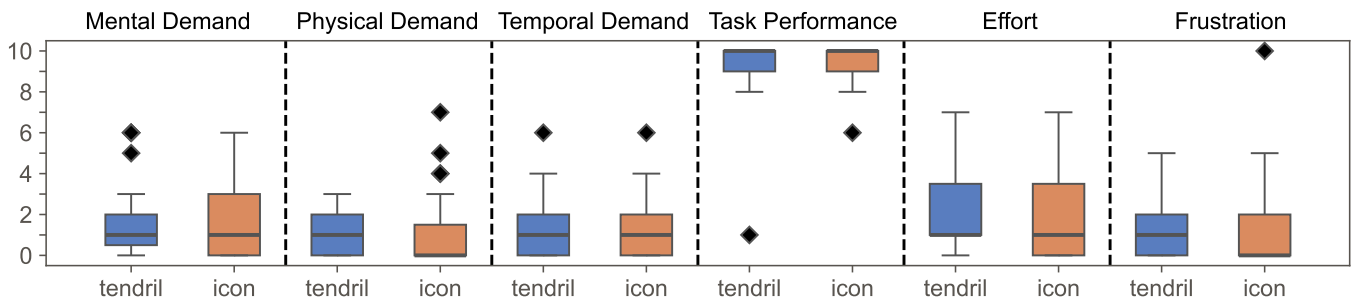


Figure 2: NASA-TLX score results from the Tendril/Icon interfaces.

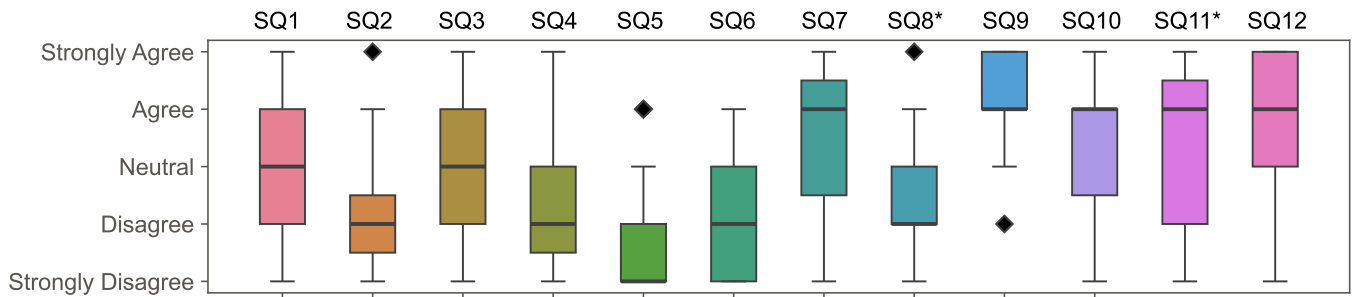


Figure 3: User willingness to share eye-tracking data for different applications after primer video, before exposure to interfaces. Significant differences ($p < 0.05$) indicated with an asterisk (*).

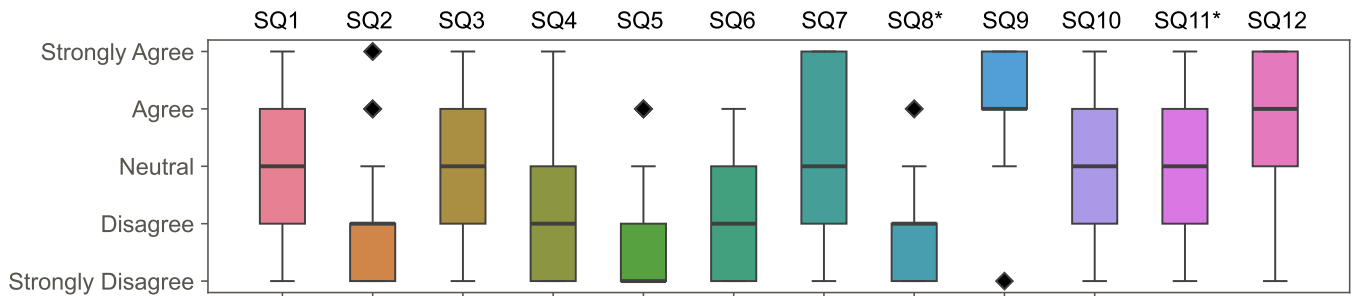


Figure 4: User willingness to share eye-tracking data for different applications after exposure to interfaces. Significant differences ($p < 0.05$) indicated with an asterisk (*).

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