Visceral Notices and Privacy Mechanisms for Eye Tracking in Augmented Reality: Supplemental Material

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A Supplementary Material

References

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Table 1: Attitudes towards eye-tracking data collection to support specific purposes.

Question	Would you agree to share eye-tracking data ...
ETE-Q1	for early detection of mental and psychological disease like dementia or Parkinson's?
ETE-Q2	to enable hands-free interaction with displays and in AR?
ETE-Q3	to type letters or select a button by gaze interaction or interact with items or people in AR more naturally?
ETE-Q4	to identify detailed information about specific things you looked at (e.g., which person in the room you looked at most, how long you looked at a product, etc.)?
ETE-Q5	to improve interactions with user interfaces and devices (e.g., to make them more intuitive or faster)?
ETE-Q6	so that apps and websites can provide more user-friendly content?
ETE-Q7	to analyze your reading ability and suggest ways to improve your skills or adjust the appearance of reading material (e.g., enlarging text, highlighting current line)?
ETE-Q8	to analyze and improve your learning skills?
ETE-Q9	to monitor your stress level and to provide early-stage healthcare intervention?
ETE-Q10	to identify your interests (e.g., what you like or dislike and guide you in shopping assistance or to steer advertisement)?
ETE-Q11	to identify patterns in activities for purposes like activity tracking, lifelogging, or self-quantifying? (e.g., reading, watching TV, playing a video game, computer work, etc.)?
ETE-Q12	to analyze your shopping behavior on websites or within shopping malls to improve product placement?
ETE-Q13	in exchange for benefits?

Table 2: Familiarity and Understanding

Question	Rank how strongly you disagree or agree with these statements.
FaU-Q1	I am familiar with eye-tracking technology.
FaU-Q2	I understand how eye-tracking technology works.

Table 3: Eye-Tracking Privacy Attitudes

Question	Please rank your willingness to share your eye-tracking data with the following groups.
ETPA-Q1	In General
ETPA-Q2	Government Agencies (non-health)
ETPA-Q3	Government Health Authority
ETPA-Q4	Local Company
ETPA-Q5	International Private Company
ETPA-Q6	Domestic Private Company
ETPA-Q7	Yourself (e.g., home cloud)
ETPA-Q8	Employer's Internal User
ETPA-Q9	Research Institute
ETPA-Q10	To support VR applications (e.g., games, entertainment)
ETPA-Q11	To support VR development (e.g., hardware)

Table 4: Eye-Tracking Concerns

Question	I am concerned about ...
ETC-Q1	eye-tracking technology in terms of social acceptability (e.g., how I am perceived by others).
ETC-Q2	eye-tracking technology in terms of mental comfortability (e.g., increase/decrease mental workload).
ETC-Q3	eye-tracking technology in terms of physical comfortability (e.g., increase/decrease physical workload).
ETC-Q4	eye-tracking technology in terms of privacy.

Table 5: Motion Sickness Questionnaire. The symptoms listed were based on the motion sickness diagnostic criteria derived from research published by the National Library of Medicine [1] [2].

Question	Select how much each symptom below is affecting you right now from none to severe.
MSQ-Q1	General Discomfort
MSQ-Q2	Fatigue
MSQ-Q3	Headache
MSQ-Q4	Eye Strain
MSQ-Q5	Difficulty Focusing
MSQ-Q6	Sweating
MSQ-Q7	Nausea
MSQ-Q8	Difficulty Concentrating
MSQ-Q9	Fullness of Head
MSQ-Q10	Blurred Vision
MSQ-Q11	Dizzy
MSQ-Q12	Stomach Awareness

Table 6: Revised User Experience Questionnaire

Question	Scale	Adjective Pair
UEQ-Q1	Attractiveness	Attractive / Unattractive
UEQ-Q2	Attractiveness	Annoying / Enjoyable
UEQ-Q3	Attractiveness	Good / Bad
UEQ-Q4	Attractiveness	Unpleasant / Pleasant
UEQ-Q5	Dependability	Unpredictable / Predictable
UEQ-Q6	Dependability	Obstructive / Supportive
UEQ-Q7	Dependability	Secure / Not secure
UEQ-Q8	Efficiency	Inefficient / Efficient
UEQ-Q9	Efficiency	Impractical / Practical
UEQ-Q10	Novelty	Inventive / Conventional
UEQ-Q11	Novelty	Conservative / Innovative
UEQ-Q12	Perspicuity	Complicated / Easy
UEQ-Q13	Perspicuity	Not understandable / Understandable
UEQ-Q14	Perspicuity	Easy to learn / Difficult to learn
UEQ-Q15	Stimulation	Boring / Exciting
UEQ-Q16	Stimulation	Not interesting / Interesting

Table 7: Post-Block Survey Questions. The questions listed are based on the NASA Task-Load Index (TLX) survey developed by the Human Performance Group at NASA Ames Research Center [3].

Title	Endpoints	Descriptions
MENTAL DEMAND	Low / High	How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
PHYSICAL DEMAND	Low / High	How much physical activity was required (e.g., pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding, slow or brisk, slack or strenuous, restful or laborious?
TEMPORAL DEMAND	Low / High	How much time pressure did you feel due to the rate or pace at which the tasks or task elements occurred? Was the pace slow and leisurely or rapid and frantic?
EFFORT	Low / High	How hard did you have to work (mentally and physically) to accomplish your level of performance?
PERFORMANCE	Good / Poor	How successful do you think you were in accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance in accomplishing these goals?
FRUSTRATION LEVEL	Low / High	How insecure, discouraged, irritated. stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during the task?

Table 8: Post-Visualization Questionnaire

The eye-tracking interface (tendril/icon) was...	**Response Format**
Appealing	Strongly disagree - strongly agree
Useful	Strongly disagree - strongly agree
Exciting	Strongly disagree - strongly agree
High quality	Strongly disagree - strongly agree
Interesting	Strongly disagree - strongly agree
Sophisticated	Strongly disagree - strongly agree
Eye-Tracking Interface Usage	**Response Format**
I would leave this eye-tracking interface (tendril/icon) enabled if it was a default setting.	Strongly disagree - strongly agree
I would actively choose to enable this eye-tracking interface (tendril/icon).	Strongly disagree - strongly agree
I would like the ability to easily toggle the eye-tracking interface (tendril/icon) off and on.	Strongly disagree - strongly agree
The eye-tracking interface (tendril/icon) distracted me from my task.	Strongly disagree - strongly agree
Explain what was distracting about the eye-tracking interface (tendril/icon).	Open-ended
The eye-tracking interface (tendril/icon) informed me of which objects I was looking at.	Strongly disagree - strongly agree
The eye-tracking interface (tendril/icon) made me aware of objects I had glanced at without realizing.	Strongly disagree - strongly agree
Explain how the eye-tracking interface (tendril/icon) made you aware of objects you didn't realize you were looking at.	Open-ended
Please provide additional feedback on how the presented eye-tracking interface (tendril/icon) could be improved for a user.	Open-ended

Table 9: Privacy Mechanism Comfort

Question	**Which of the following data types are you comfortable sharing? (Select all that apply.)**
PMC-Q1	Raw Gaze Data (Direct and unprocessed gaze data)
PMC-Q2	Gaussian Noise (Introducing random variations to gaze data using Gaussian distribution)
PMC-Q3	Temporal Downsampling (Reducing the frequency of capturing and processing gaze data)
PMC-Q4	Smoothing (Reducing changes in gaze direction by averaging the data)

Table 10: Interface and Mechanism Preferences and Thoughts

Question	**Response Format**
Which eye-tracking interface did you prefer during the AR viewing task?	(1) Icon (2) Tendril (3) No preference
Please explain what factors influenced your decision on eye-tracking interface preference.	Open-ended
Which privacy mechanism did you feel safest using during the AR tasks?	(1) Gaussian Noise (2) Temporal Downsampling (3) Smoothing (4) No preference
Please explain what factors influenced your decision on privacy mechanism preference.	Open-ended

Table 11: Eye-Tracking Recommendations

Question	**I recommend that ...**
ETR-Q1	AR users try out these interfaces, or similar ones, before enabling eye tracking.
ETR-Q2	AR platforms provide interfaces like these that relay information about collected eye-tracking data.
ETR-Q3	AR platforms should legally be required to provide interfaces like these to users.
ETR-Q4	AR platforms enable interfaces like these by default for all users.