Vice VRsa study protocol

Intro: Welcome participant and explain purpose of study

- Introduction.
- Provide consent form and have participant sign (if not already done). Ask for consent to record.
- **Start recording**
- Do you have any questions before we get started?
- Before we look at the first scenario, I'd like to understand more about your situation and would like to ask you to fill out a pre-study questionnaire
- **Provide link to pre-study questionnaire [Vice VRsa pre-study questionnaire attached]**

Intro interview

- **Ask the following questions during call**
- Now I have a few more questions.
- What professional work do you do, or have you done, in VR (if any at all)? *
    - What applications are you using?
- How often do you use VR for socializing*
    - Which apps?
- How often do you play games in VR? *
    - What kind of games?
- In what physical environments are you using or have you used VR?
    - Office use? Home use? Public?.

Main study

- **Open first scenario and share screen**

Scenario 1 (privacy and awareness)

Note: prompts are being used when the participant gets stuck or does not provide enough answers

- **Take the participant to the beginning of scenario 1**
- For the following scenario, please imagine the setup where you are a VR user, wearing a head-mounted device. You're working in an open-plan office and there might be other people nearby.
- **Play video clip of scenario 1**
    - *<Voiceover: Here we see a user, working in virtual reality. He's currently on a call with other people in VR, where they are discussing confidential information about a new car's design. Another person is standing nearby and records the VR user with his phone. Because the VR user was immersed in VR, he did not notice anyone being around him. >*
- I have a few questions regarding the scenario you just saw:
    - Have you ever been in a situation where you did a task / something in VR where you felt you wouldn't want to be observed by others?
        - Prompt (if yes): Can you describe the situation for me? Where were you? Who was the other person(s)?
        - How did you ascertain your privacy?

        - Prompt: (if no): How would you imagine communicating with a passerby that you need privacy?
    - Do you keep an awareness of your surroundings while immersed in VR?
        - Prompt (if yes): how do you do that?
        - Prompt (if no): Why not?
    - Are there certain tasks you could imagine require more privacy and if so, which ones?
        - Prompt: Can you elaborate more on the specific tasks?
        - Prompt: Why does this task require privacy or why not?
        - Prompt: Who would you be most concerned with overlooking your task?

Scenario 2 (overhearing others and awareness)

- **Place video clip of scenario 2**
    - *<Voiceover: Here we see the same user on the right working in VR. Two other people are standing nearby, having a conversation. They assume that the VR user can't hear them. The VR user is turning his head, which the other two notice. But it's not clear whether the head turning was part of user's interaction in VR or had anything to do with the bystanders. >*
- I have a few questions regarding the scenario you just saw:
    - Have you ever been in a situation where you have observed a VR user?
        - Prompt (if yes): Can you describe the situation?
        - Prompt (if yes): Did you know what the VR user was doing?
        - Prompt (if yes): Did you feel like the VR user knew about your presence?
        - Prompt (if yes): Did you know how much privacy the VR user wanted?
        - Prompt (if yes): Did you adapt your behavior?
        - Prompt (if yes): How did the VR user react to your presence?
        - Prompt (if no): Have you ever been in a situation where you observed someone working on privacy sensitive tasks (not VR related)?
            - Prompt (if yes): Did you realize that you were potentially intruding on their privacy?
            - Prompt (if yes): How did they react?
            - Prompt (if yes): How did you react?
    - And the other way around: Have you ever been in a situation where you were working somewhere (not in VR) on a privacy relevant task, and you felt someone else was watching you?
        - Prompt (if yes): Can you describe the situation for me? Where were you? Who was the other person(s)?
        - How did you ascertain your privacy?
        - Prompt: (if no): How would you imagine communicating with a passerby that you need privacy?

Scenario 3 (green mode)

I now want to show you videos of some concepts that we've developed. I'll pause after each video and ask you some questions.

These concept videos demonstrate how a system could provide awareness to people inside VR about other people's presence, as well as providing awareness for bystanders about what a VR user can see about their surroundings.

The system works in four different modes, which are green, yellow, orange, and red, each indicating the desired level of privacy. Where green is the least privacy sensitive mode, and then through yellow and orange, with red being the most privacy sensitive mode.

For the first video, please imagine you're the VR user and you are playing a game. You don't mind anyone observing you. In fact, you want to encourage others to join you in playing the game. So you set your privacy mode to the green level. In this green mode, the system shares a live stream of your VR experience to the nearby public display. The following video demonstrates how the green mode works.

- **Play video of Green Mode**
    - *<video shows a VR user playing beat saber or watching a 360 video>*
        - *Voiceover: Here we have the VR user playing the game Beat Saber. In the green privacy mode, what the VR user sees inside his VR headset is live streamed to the display next to him. The system also projects a green circle on the floor. The VR user also wears an LED enabled vest, which also lights up in green. Now a colleague walks by the user and sees the VR user play the game.*
        - *Here we have a recording of the view inside VR: the system displays which privacy mode is selected in the top right corner. There are four modes available, ranging from green to red. Currently the green mode is selected.*
    - Have you ever been in a situation where you wanted other people to see what you're doing inside VR?
        - Prompt (if yes): Can you describe the situation?
        - Prompt (if no): Can you imagine a situation where it might be useful that other people see what you are working on or doing inside VR?

Scenario 4 (yellow mode)

For the next video, I would like to ask you to imagine that you are a VR user again and are currently in a meeting in VR. The meeting is not confidential and can be known to others. However, you don't want any bystander to see what exactly you're doing or talking about. So, you set the privacy mode to yellow. The following video demonstrates how the system works in this mode.

- **Play video of yellow mode**
    - *<video shows the halo mode in action>*
        - *Voiceover: In the yellow mode, the VR user stands in a projection of a yellow circle. I've been informed that the circle here looks like it's green when shared over Zoom, so for this scenario, please amplify the color yellow in your mind. The LEDs on the vest light up in yellow And the content of the public display has changed.*
    - **Questions for public display**
        - Tell me what kind of information you're seeing on the public display?
            - Prompt: what is shown on the top half of the display
            - Prompt: what is shown on the bottom half of the display?
        - Explanation for public display information:
            - The upper half of the public display shows the name of the meeting and its duration, but not any live stream.

            - In the lower half of the display any bystander can see what features of the surrounding are currently being recorded. In this case it is the presence and distance that is being recorded.
        - As a bystander, what could you do with this kind of information?
    - **Continue video.**
        - *Voiceover: The bystander here can see the display and the VR user. Inside VR, we can see in the top right corner that the privacy mode selected is the yellow mode. On the left you also see a green circle that increases in size.*
    - **Questions for green circle**
        - Tell me what kind of information you're seeing?
            - Prompt: what information do you, as the VR user, see about your surroundings?
            - Prompt: What do you think this green circle indicates? what information is encoded in the green circles you see on the sides of the VR view?
            - Prompt: What do you think the size of the circle indicates?
            - Prompt: Why is the circle on the left side of the screen?
    - **Explain green circle (continue video)**
        - *Voiceover: The green circle on the side of the screen indicates the distance and position of the bystander. We call this a halo. The side of the screen where the halo appears, indicates to which side of the VR user a bystander is located, and the size indicates the bystander's distance. Larger circles mean that they are closer.*
    - **Questions after video ended**
        - Where do you think this information about bystander's location is coming from?
        - What could you, as the VR user, do with this information?
            - Prompt: If you wanted more privacy, how would you ascertain your privacy? / How would you get more privacy from the bystander?
        - How useful would this information be to understand if there is a bystander?

Scenario 5 (orange mode video)

For the next scenario, please imagine again you are the VR user. You are currently in a meeting in VR, and you don't mind if other people know about it, but you don't want bystanders to know about the meeting's contents and with whom it is. You select the orange privacy mode. The following video demonstrates the orange mode.

- **Play video of orange mode**
    - *<video shows the radar mode in action>*
    - *Voiceover: Again, here we have an orange circle projected on the floor. The LEDs on the vest light up in orange color. And the public display shows this screen here. Again, I'll stop here and would like to ask you a few questions.*
- **Questions for stop point**
    - Tell me what kind of information you're seeing on the public display?
        - Prompt: What do you see at the top half of the screen?
        - Prompt: What do you think the circle at the bottom means?
    - What do you think would happen next?
- **Continue video**

    - *Voiceover: In the orange mode, the top half of the screen show just a general notice about the type of activity the VR user is doing. The bottom half shows what is being recorded of the surrounding area. So in this case, the location of anyone in the surrounding is being recorded and shown on this radar view. The red circle here indicates the bystander's location. And this is what it looks like inside VR.*
    - *And this is what it looks like inside VR. On the top right we see the orange privacy mode is selected. On the top left you can see a radar view appear, where the red dot again represents where a bystander is. I'll stop here again to ask a few questions.*
- **Questions**
    - Tell me what kind of information you're seeing?
        - Prompt: what information do you see about your surroundings?
        - Prompt: what information is encoded in the radar view?
    - What could you do with this information?
        - Prompt: If you wanted more privacy, how would you ascertain your privacy? / How would you get more privacy from the bystander?
    - How useful would this information be to understand if there is a bystander and their whereabouts?

Scenario 6 (red mode)

So far we've seen:

- the green mode, where the bystander can see the full VR content on the public display;
- the yellow mode, where the bystander can see the context of the VR user's activity without seeing the full live video stream. The VR user is being made aware of a bystander through a green halo / a green circle on the side of the screen, which indicates a bystander's rough distance and location.
- and the orange mode, the bystander can see the general type of activity the VR user is doing, but no details. The VR user on the other hand sees the green halo on the side of the screen as well as a radar view indicating the bystander's location.

There is also a red mode.

- How would you imagine this red mode to work?
- What tasks would this red mode be best suited to?

So now I'll show you the red mode. For the last scenario, please imagine that you are working on a highly sensitive task. In this scenario, you are doing a design review of a new car model, with several remote collaborators dialed in via video conferencing. You don't want any information in your meeting to be seen and overheard at all, so you select the red mode. The following video demonstrates the red mode inside VR.

- **Play video of red mode**
    - *<video shows the passthrough mode in action>*
    - *Voiceover: Here we have the red mode. You can see that the VR user is again in a call with two colleague, doing a design review of a car model. After the green halo appears on the side, the user turns their head. I'll stop here again and for a few questions*
- **Questions**
    - Tell me what kind of information you're seeing?
        - Prompt: what information do you see about your surroundings?

        - What is the image of the person?
        - Where is this information coming from?
    - What could you do with this information?
        - Prompt: how would you ascertain your privacy?
    - How useful would this information be to understand if there is a bystander?
    - As the VR user, how useful would you find it to know who is in you surrounding?
        - Prompt: Do you think seeing the identify of the bystander would help you to understand whether you want to regulate your behavior to be more privacy aware?
        - Prompt: Can you imagine a situation where your desired level of privacy changes depending on the person around you?
- **Continue video**
    - *Voiceover: here we have the outside view. Again, we have the red circle, and the LEDs light up read. The public display shows a warning to the bystander at the top, and at the bottom we see that the full video is being recorded. And we see what is being shown in VR, that is a cropped-out version of the bystander. The bystander sees both, the VR user and the public display. They then realize that they might be intruding the VR user's privacy and can step back and give the VR user some privacy.*
- **Questions**
    - As a bystander, could you imagine a situation where you would change your behavior based on what is shown on the display? Reminder, this is what is shown.

Exit interview questions

- Having seen all the techniques (that are the live stream to the public display in the green mode, the halo circle in the yellow mode, the radar view in the orange mode, and the video feed of the bystander in the red mode), I have some general questions.
- First, I'd like to ask you to indicate your level of agreement for each feature. **[Vice VRsa post study questionnaire attached]**
- Now I have some more questions.
    - As a VR user, can you think of any scenario, where you could imagine yourself using such a system?
    - As a person walking past a VR user, could you imagine a situation where this system might be useful, so knowing what the VR user can see about you?
    - How do you think such a system would be useful to understand about the presence of any bystanders?
    - As a bystander, how useful do you think it is of seeing what's being recorded about you?
    - How do you think this system could help you protect your privacy?
    - Are there any other thoughts you wanted to share or anything I didn't ask about?
- Thank you for sharing your experiences and give us feedback on our system.
- Do you have any questions about the study?