INDIANA UNIVERSITY INFORMED CONSENT STATEMENT FOR

Optimizing 360-degree Video Delivery

Sponsored by Indiana University

You are invited to participate in a research study of Optimizing 360-degree Video Delivery. You were selected as a possible subject because you are at least 18 years old, are affiliated with IU Bloomington, and do not have epilepsy. Please read this form and ask any questions you may have before agreeing to be in the study.

The study is being conducted by Professor Feng Qian in the Computer Science Department, School of Informatics and Computing at Indiana University Bloomington. It is funded by Indiana University.

STUDY PURPOSE

As an important component of the virtual reality (VR) technology, 360-degree videos provide users with panoramic view and allow them to freely control their viewing direction during video playback. Usually, a player displays only the visible portion of a 360 video. Thus, fetching the entire panoramic video frame wastes bandwidth. In this research, we consider the problem of optimizing 360 video delivery over bandwidth-constrained networks. We propose a bandwidth-friendly streaming scheme that delivers only 360 videos' visible portion based on head movement prediction.

The central hypothesis for our proposed approach is, when watching a 360 video, users' head movement can be predicted (at least in the short term), so that the video player can fetch the predicted visible portion (instead of the entire panoramic frame) to save the bandwidth. We plan to leverage a user study to demonstrate this.

The key questions to be answered include:
+ In general, is users' head movement predictable during 360 video playback?
+ How large is the prediction window?
+ How does the predictability vary across different users?
+ How does the predictability vary across different video contents?

NUMBER OF PEOPLE TAKING PART IN THE STUDY

If you agree to participate, you will be one of about 300 subjects who will be participating in this research.

PROCEDURES FOR THE STUDY

If you agree to be in the study, you will do the following things.

You agree to come to our lab in Lindley Hall at Indiana University Bloomington campus. The overall experiment duration for each user will be short (watching several 360 videos for no longer than 30 minutes). Multiple users may be doing the study at the same time. Participation in this study is completely voluntary.

Figure 1: Samsung Gear VR Headset

We will provide you with a VR headset (Samsung Gear VR shown in Figure 1). The VR headset streams several 360 videos through a smartphone that is inserted into the headset. You will watch the videos sequentially. During the playback, you can freely move your head to see different portions of a panoramic scene.

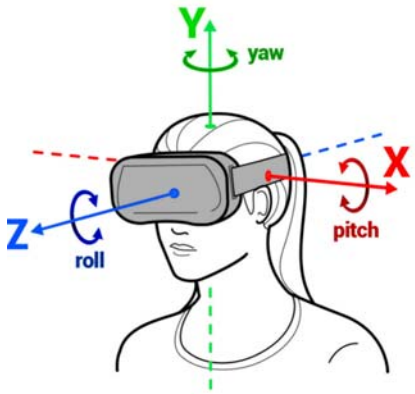

Figure 2: Pitch, yaw, and roll of head movement

Your head movement in terms of pitch, yaw, and roll (they correspond to the rotation along the X, Y, and Z axes respectively as shown Figure 2) will be recorded and used for later data analysis. After watching all videos, the experiment is done and you can leave our lab.

The videos were obtained from YouTube. None of them contains adult-only, violent, or illegal contents. The total running of the videos is less than 30 minutes. When one video ends, you can pause for an arbitrary amount of the time with the VR headset removed before watching the next video. This is controlled by a single button on the VR headset: when you press the button, the next video will start. At the end, you will see a screen indicating the end of the entire experiment.

RISKS OF TAKING PART IN THE STUDY

Some of you may feel uncomfortable when watching VR contents. This is known as "virtual reality sickness", which occurs when exposure to a virtual environment causes symptoms that are similar to motion sickness symptoms. The symptoms include general discomfort, headache, stomach awareness, nausea, vomiting, pallor, sweating, fatigue, drowsiness, disorientation, and apathy.

Virtual reality sickness may have undesirable consequences beyond the sickness itself. For example, prior research argued that flight simulator sickness could discourage pilots from using flight simulators, reduce the efficiency of training through distraction and the encouragement of adaptive behaviors that are unfavorable for performance, compromise ground safety or flight safety when sick and disoriented pilots leave the simulator.

Similar consequences could be expected for virtual reality systems. Although the evidence for performance decrements due to virtual reality sickness is limited, research does suggest that virtual reality sickness is a major barrier to using virtual reality.

At any time during the experiment, when you are feeling uncomfortable, you should stop the experiment immediately. Also, after watching one video, feel free to remove the headset and rest for an arbitrary amount of time. This helps reduce the likelihood of having VR sickness.

BENEFITS OF TAKING PART IN THE STUDY

Participating in this study provides no direct benefit to the subject.

CONFIDENTIALITY

Although we cannot guarantee absolute safety and confidentiality, we expect research involves no more than minimal risk due to three reasons. First, VR and 360 videos have already been commercialized and becoming popular in our daily life (e.g., for entertainment). Second, we are using off-the-shelf VR devices for experiments. Third, the user study is conducted in lab settings for a short duration instead of "in the wild".

We do not collect any personal information from you except for this informed consent sheet. Efforts will be made to keep your personal information confidential. 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.

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 Indiana University, 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.

PAYMENT

Every user who completes our study will be compensated with $10. We will pay you right after you finish the experiment. If you need to withdraw before completing the study we will compensate you $5.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study or a research-related injury, contact the researcher, Feng Qian, at 812-856-5521, or fengqian@indiana.edu. If you cannot reach the researcher during regular business hours (i.e., 8 a.m. to 5 p.m.), please call the IU Human Subjects Office at 812-856-4242 or 800-696-2949.

For questions about your rights as a research participant, to discuss problems, complaints, or concerns about a research study, or to obtain information or offer input, contact the IU Human Subjects Office at 812-856-4242 or 800-696-2949.

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. Leaving the study will not result in any penalty. Your decision whether or not to participate in this study will not affect your current or future relations with the Indiana University or the School of Informatics and Computing at IU.

SUBJECT'S CONSENT

In consideration of all of the above, I give my consent to participate in this research study.

I will be given a copy of this informed consent document to keep for my records. I agree to take part in this study.

Subject's Printed Name:_____

Subject's Signature:_____ **Date**:_____
(must be dated by the subject)

Printed Name of Person Obtaining Consent: _____

Signature of Person Obtaining Consent:_____ **Date**:_____