
VR User Behavior Analysis

Planned Timeline

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Introduction

Background

Dr. Prakash and his team made A taxonomy and Dataset for 360 Videos, which is a collection of 28 VR videos with content ranging from rhinos in the savanna to students walking at UTD. The dataset was initially created to address two main issues: viewport prediction and storytelling.

Viewport Prediction

Viewport Prediction was the main research topic led by Bryant as one of the four teams during ACM Research in Fall 2020. The two major goals were:

1. Proving a correlation between salient features and user viewports
2. Predicting user viewport using salient features (as well as video data)

We were able to successfully finish part 1 through various overlays that highlights the connection between salient features and the 30 users' viewports. For part 2, we made important progress in attempting to predict user viewports through image processing and machine learning. The results were very promising, but there were definitely room for improvements in that direction.

More information about the Viewport Prediction research can be seen at [the Github repository](#).

Storytelling

Traditional videos (such as a movie) are relatively easy to produce with regards to storytelling compared to VR videos. This is because the important scenes are directly in front of the users and the field-of-view is often quite limited to funnel attention. In addition, important characters or objects are often placed in the middle of the screen for the same reason.

In VR videos, the user is free to look at every direction; although this is great for immersion, it makes storytelling much harder as there is no "middle of the screen" to direct user attention. Thus, if we could successfully detect how people consume VR content through tracking their behavior, we could gain a better understanding of how to effectively guide user attention.

Research Focus

During this semester of ACM Research, our goal is to analyze user behavior through (but not limited to) the use of heat maps and viewport tracing throughout different frames. We are aiming to get a better understanding of areas-of-interests in VR videos as well as classifying different user behaviors.

Timeline

1. Week 1: Welcomes, description of topic, summary of previous semester
2. Week 2: Go over dataset and walk through important code on Github
3. Week 3: Learn about heat map generation with **seaborn** and basic numpy if necessary
4. Week 4: Work on generating heat maps from video frames
5. Week 5: Continue from Week 4
6. Week 6: Review results and record findings

Week 1

Objectives

1. Icebreakers and introductions (oh no)
2. Introducing project and background
3. Go over timeline and rough plan for the semester
4. Gauge skill level with different tools

Useful Links

1. VR Viewport Analysis Github
2. Main Research Paper from Dr. Prakash

Homework

1. None

Week 2

Objectives

1. Go through the dataset on Github so everyone understands where files are stored
2. Summarize VR Viewport Analysis results
 1. See Introduction on previous page
3. Go over goals for the semester
4. Miscellaneous housekeeping items

Homework

1. Research papers for your enjoyment (just kidding they're mandatory):
 1. A taxonomy and Dataset for 360 Videos
 2. Learning to Predict Where Humans Look
 3. Actors in VR Storytelling
2. Interesting reads (not mandatory)
 1. Examining VR Storytelling vs. Traditional Forms

Week 3

Objectives

1. Go over timeline again and revise if necessary
2. Check experience with Python/numpy/matplotlib/seaborn
3. Explore heat map generation in Python

Useful links

1. [Basic Matplotlib Heatmap](#)
2. [Seaborn Jointplot](#)

Homework

1. Try using frame data to generate single frame heat map (continued through Week 6)
2. Setup meeting outside of build night if necessary?
3. Brainstorm research directions (optional)