

Movement on Visual Perception in Humans through Visual Illusions

CMSC838C Final Project Proposal
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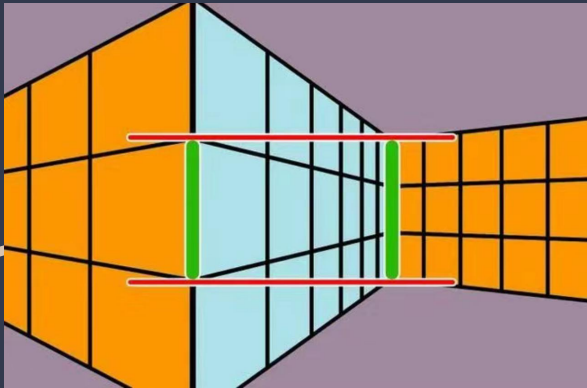
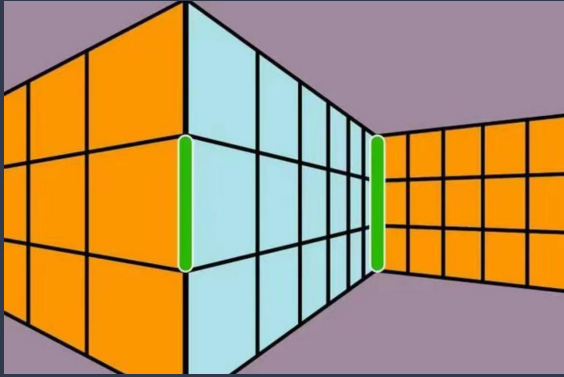
Research Objective

(Motivation)



- Recent work by (Guitchounts, 2020; Saleem et al., 2020) show there is a significant interplay and correlation between body movement and human visual motion perception.
- The body and visual perception correlation has not been well studied for illusions, particularly under an immersive environment.
- Study the correlation between body movement and visual motion perception, whether would cause any positive or negative feelings to users.
- Can be used to improve the design choices for VR applications, such as virtual touring, game playing.

Background Concepts



- Visual illusions have been widely used in the field of **visual psychophysics** to investigate the mechanisms underlying human perception.
- Guitchounts's study found that image-processing circuits in the primary visual cortex of animals are more active when they are moving.
- Results propose that brain needs to coordinate perception and action.
- Knowing when a sensory input is caused by one's own action or by something external is crucial for understanding the environment.

Research Hypothesis

Research Question:

Can body movement induce stronger neural illusion perception signaling in humans?

Why important:

Understanding the correlation between movement and visual perception illusion can be leveraged to enhance the user experience in VR applications.

Pros: Creating more realistic and convincing VR experiences.

Avoid the cons: Help designers optimize their application design to reduce motion sickness. (Motion sickness in VR is often caused by a mismatch between the visual information and the user's physical motion)

Experiment Procedures

Participants will be asked to stay in sitting position or walking on a treadmill

An original/unmodified illusion image will be presented to the participant.

After observing the illusion for a minutes, the participant will see a virtual slider to adjust the image.

The goal of adjustment is to nullifying the illusion.

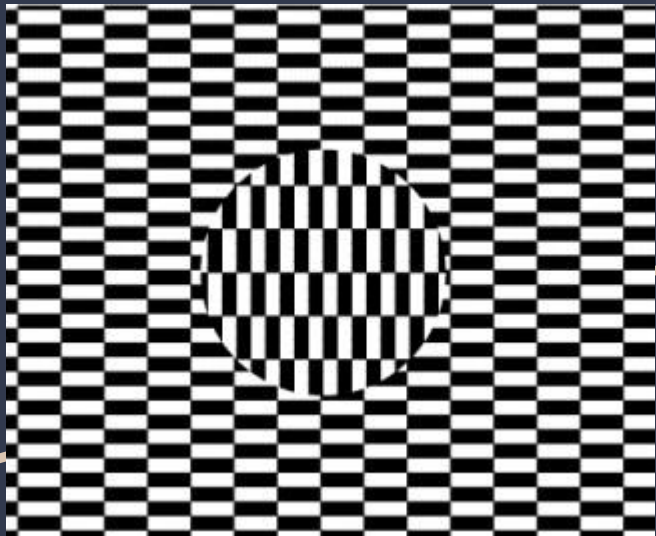
The value that nullifying the illusion is recorded for later statistical analysis

Eye movement is also recorded.

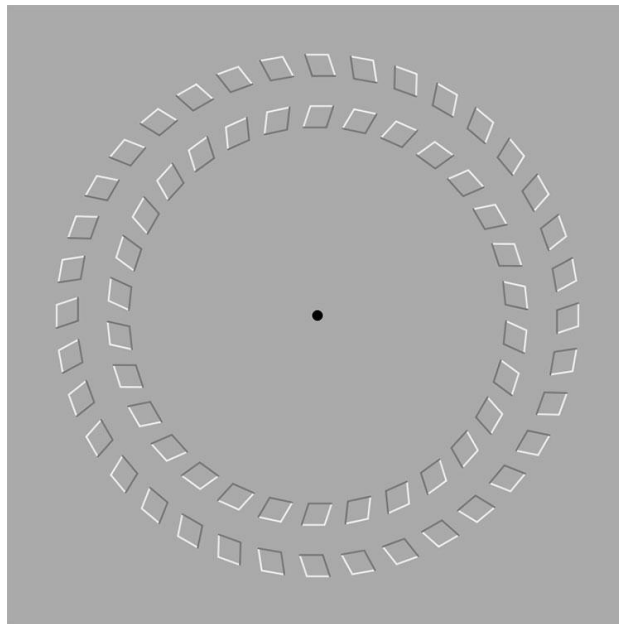
Visual Illusions

Examples

Ouchi Illusion



Wheel Illusion

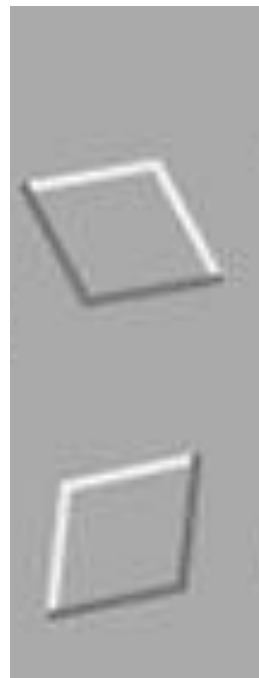


How illusion?

Ouchi Illusion



Wheel Illusion



Nullifying Illusion

Ouchi:

- Change Contrast color
 - Black - white to Dark gray - light gray
- Width-height ratio
 - Changing from rectangular to square

Wheel Illusion:

- Change contrast color
 - Making black and white border close to background color
- Slightly counter rotating the wheels

Data Collection & Analysis

1. Illusion threshold and eye tracking data will be collected for analysis
2. Conduct paired t-test to confirm or reject null hypothesis

Timeline

Submit IRB application April 1st.

Recruit Participants (if IRB approved) April 10th

Finish VR Development April 15th.

Conducting Experiments April 15th - April 30th

Result Analysis and Report Writing May 1st - May 10th.