Announcements

- MP1 is extended due on Sep 15 @11:59pm.
- Today: Chapter 2, begin Chapter 3
Form Groups, Select Projects

- Groups of 3-5 for projects.
- Form groups by Sep 18, answer piazza@21
- Project ideas: supervised vs unsupervised
- Project teams and abstracts due on Oct 2 in class
Virtual Tours of UIUC Campus!

"THE ILLINOIS EXPERIENCE"

https://www.youtube.com/watch?v=1OesJmY-6yc

Contact: wang518@illinois.edu, Mia Wang
prof. Michelle Nelson, department of Advertising
vice chancellor Robin Kaler
Virtual Tours of UIUC Campus!

Project goals:

- Multiuser tours
- Film more locations
- Add interactivity with the content
- Model places on campus in 3D
- Help with research on perception of presence when touring campuses around the world
- Past research surprising results

Contact: wang518@illinois.edu, Mia Wang
prof. Michelle Nelson, department of Advertising
vice chancellor Robin Kaler
Teaching Empathy - Bias in Education and Student Learning

VR Education

https://www.youtube.com/watch?v=O7pi63GwUeg

Contact: santo3@illinois.edu, Craig Santo with prof. Anna Yershova
Virtual VR Education

Project goals:

• Add photorealistic light and textures
• VR concepts:
  Tracking: no tracking, latency, drift (vertical horizontal)
  Perception: monocular vs binocular, depth perception
    upside down world, vection, stationarity
  Resolution, frame rates, aliasing, jitter vs judder
• First office hours in VR!!!
• Device invariant experience: Google cardboard, phone or
  Oculus Rift.

Contact: santo3@illinois.edu, Craig Santo
with prof. Anna Yershova
Virtual Physics 211@UIUC Labs

https://www.youtube.com/watch?v=7CEZ7KgRItA

Contact: Adnan Rebei, rebei2@illinois.edu
prof. Jose Mestre, department of Physics
Virtual Physics 211@UIUC Labs

Project goals:

- Create a proof of concept for a PHYS219 Virtual Lab
- Help the physics department get their own VR lab!

Contact: Adnan Rebei, rebei2@illinois.edu
prof. Jose Mestre, department of Physics
VR Paddle Boarding

Let's explore the islands!

https://www.youtube.com/watch?v=PNUUbUI-ZgM

Contact: mhernand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health &Neuroscience
VR Paddle Boarding

Project goals:

- Hardware: connect Vive/Unity to the balancing platform.
- Hardware: Connect Vive controller to the paddle.
- Create a MUCH better water environment for paddling in Unity.

Contact: mhermand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health & Neuroscience
Walking After Stroke

Dr. Manuel Hernandez Lab
Treadmill allowing for data collection

Contact: mhermand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health & Neuroscience
Walking After Stroke

Project goals:

- DONE: Connect Vive/Unity to the treadmill.
- Create more and more realistic testing environments.
- Improve perception of presence within the experiences.

Contact: m hernand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health & Neuroscience
Empathy Towards Parkinson's Disease Patients

Dr. Manuel Hernandez Lab
Treadmill allowing for data collection

Contact: mhermand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health & Neuroscience
Empathy Towards Parkinson's Disease Patients

Project goals:

DONE: Hardware is all set up.

• Create better falling situations.
• Create MUCH better testing environments.

Contact: mhermand@illinois.edu
prof. Manuel Hernandez, Kinesiology & Community Health &Neuroscience
1. Foreign Language Learning

Project goals:
- Gather gaze heat map
- Analyze it to adjust the language learning lesson

2. Proxemics
   Personal space perspective

3. Wii balance platform

Contact: cameronmmerrill@gmail.com, Cameron Merrill
prof. Steve LaValle
Flight Simulator

https://www.youtube.com/watch?v=mrpqh8ZRLp4

Project goals:
- Add lighting and textures
- Professional looking, comfortable demo
- Maybe: add drone panoramas

Contact: blaksmatic@gmail.com, Blaks Zeng
prof. Anna Yershova, prof. Steve LaValle
Black lives Matter

3D con

Jewel
Projects Goals

Do not wait until the last minute (day, week) - professors are busy! Start contacting professors today.

Comfort

360 degree final video as a demo

Photorealism

Beat the 4K views of "Experience Illinois" video!!!
Inducing targeted behavior in an organism by using artificial sensory stimulation, while the organism has little or no awareness of the interference.
Depth Perception

Original Image

Left Eye View

Right Eye View

both views are merged in the brain to form a single image

→ monocular
What is Reality? Sensation and Perception

How do we perceive X?

X is

- depth
- color
- sound
- taste
- comfort
- presence
- yourself
- reality

VR

- pixel
- frames
- latency
Perception Process

- [Video](https://www.youtube.com/watch?v=kQxsTyNKtqg)
- [Video](https://www.youtube.com/watch?v=zVJV163Q2vw)

For average adult:
"The average number of neocortical neurons was 19 billion in female brains and 23 billion in male brains."
# Perception Process

<table>
<thead>
<tr>
<th>Sensory System</th>
<th>Modality</th>
<th>Stimulus Energy</th>
<th>Receptor Class</th>
<th>Receptor Cell Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatosensory</td>
<td>Touch</td>
<td>Tap, flutter 5–40 Hz</td>
<td>Cutaneous mechanoreceptor</td>
<td>Meissner corpuscles</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Touch</td>
<td>Motion</td>
<td>Cutaneous mechanoreceptor</td>
<td>Hair follicle receptors</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Touch</td>
<td>Deep pressure, vibration 60–300 Hz</td>
<td>Cutaneous mechanoreceptor</td>
<td>Pacinian corpuscles</td>
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<tr>
<td>Somatosensory</td>
<td>Touch</td>
<td>Touch, pressure</td>
<td>Cutaneous mechanoreceptor</td>
<td>Merkel cells</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Touch</td>
<td>Sustained pressure</td>
<td>Cutaneous mechanoreceptor</td>
<td>Ruffini corpuscles</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Proprioception</td>
<td>Stretch</td>
<td>Mechanoreceptor</td>
<td>Muscle spindles</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Proprioception</td>
<td>Tension</td>
<td>Mechanoreceptor</td>
<td>Golgi tendon organ</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Temperature</td>
<td>Thermal</td>
<td>Thermoreceptor</td>
<td>Cold and warm receptors</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Pain</td>
<td>Chemical, thermal, and mechanical</td>
<td>Chemoreceptor, thermoreceptor, and mechanoreceptor</td>
<td>Polymodal receptors or chemical, thermal, and mechanical nociceptors</td>
</tr>
<tr>
<td>Somatosensory</td>
<td>Itch</td>
<td>Chemical</td>
<td>Chemoreceptor</td>
<td>Chemical nociceptor</td>
</tr>
<tr>
<td>Visual</td>
<td>Vision</td>
<td>Light</td>
<td>Photoreceptor</td>
<td>Rods, cones</td>
</tr>
<tr>
<td>Auditory</td>
<td>Hearing</td>
<td>Sound</td>
<td>Mechanoreceptor</td>
<td>Hair cells (cochlea)</td>
</tr>
<tr>
<td>Vestibular</td>
<td>Balance</td>
<td>Angular acceleration</td>
<td>Mechanoreceptor</td>
<td>Hair cells (semicircular canals)</td>
</tr>
<tr>
<td>Vestibular</td>
<td>Balance</td>
<td>Linear acceleration, gravity</td>
<td>Mechanoreceptor</td>
<td>Hair cells (otolith organs)</td>
</tr>
<tr>
<td>Olfactory</td>
<td>Taste</td>
<td>Chemical</td>
<td>Chemoreceptor</td>
<td>Olfactory sensory neuronal</td>
</tr>
<tr>
<td>Gustatory</td>
<td>Taste</td>
<td>Chemical</td>
<td>Chemoreceptor</td>
<td>Taste buds</td>
</tr>
</tbody>
</table>

*vision* ~ Mathew
What is Reality? Sensation and Perception

Instructions
Count how many times the players wearing white pass the basketball.
Stimuli Fusion: Balance + Vision

Vection

Why is this important? Sea legs.

Vestibulo-ocular reflex (VOR)

Why is this important? Perception of stationarity.
How Does Our Brain Pieces Images Together?

https://www.youtube.com/watch?v=MHMvEMy7B9k

https://www.youtube.com/watch?v=2NcUkvIX6no
https://www.youtube.com/watch?v=eR2j-fh18mk
https://www.youtube.com/watch?v=3_dm7jSX4Cw
Stimuli Fusion: Balance + Vision

https://www.youtube.com/watch?v=G-IN8vWm3m0

0:32-2:30
Do You Trust Your Vision?

blind spot in each eye
Depth Perception:

https://en.wikipedia.org/wiki/Spinning_Dancer
Do You Trust Your Vision?

"visible" light
Psychophysics

Stevens' Power Law

Difference Threshold

The smallest amount of change in a physical stimulus that a person can detect 50% of the time. This is also called the “just noticeable difference.”

If someone turns the music up slowly, at what point do you notice it has become louder?

If you hold a handful of sand, and someone adds one grain at a time to the pile, when do you notice it has become heavier?

If your best friend trims a half inch off of their hair, will you notice the difference?
Adaptation
More Optical Illusions