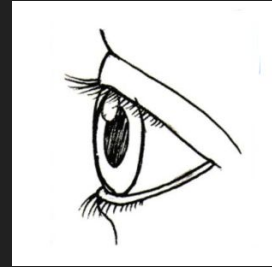# CS 498 VR

Lecture 4 - 1/29/2018

Slides here: go.illinois.edu/VRlect4

Warm up

- What is an IMU?

- What are the three components of an IMU?

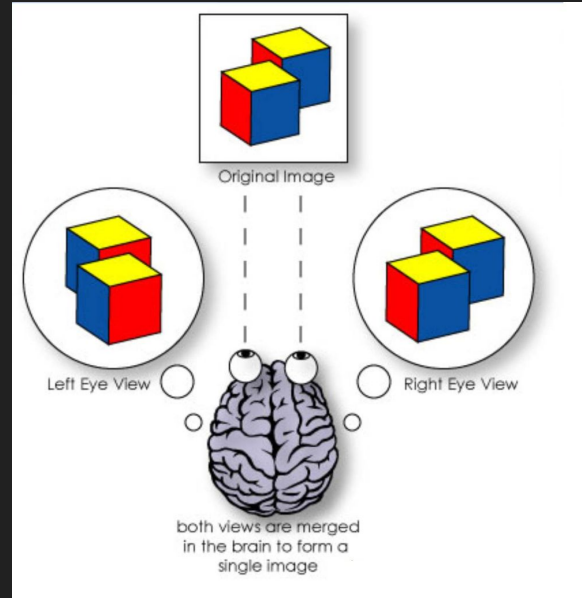- What is the Virtual World Generator?

Waum up - Tracking Hardware

Inducing targeted behavior in an organism by using artificial sensory stimulation, while the organism has little or no awareness of the interference

Sensation & Perception
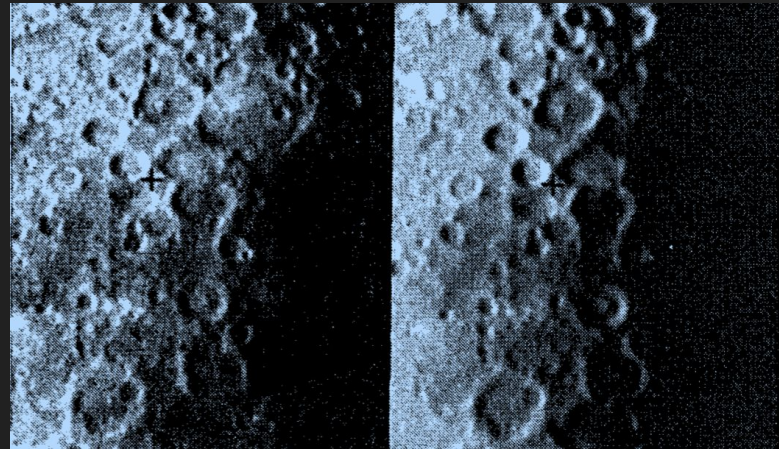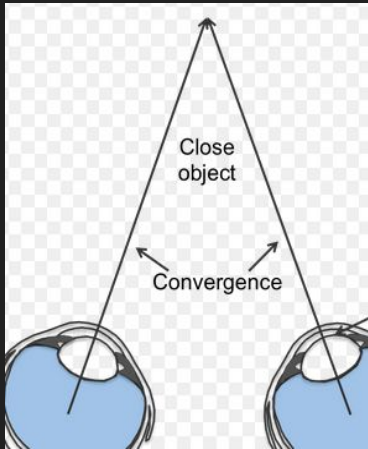
Depth Perception?

Binocular cues

Convergence

Stereoscopic disparity / Binocular disparity

Shadow Stereopsis

Monocular Cues

Relative Size

Absolute Size and Familiar Size

Elevation (w.r.t. horizon)

Texture Gradient

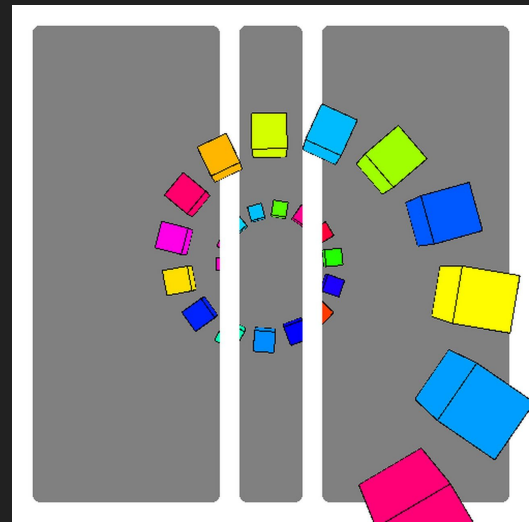Motion Parallax (demo)

Monocular Cues

Aerial Perspective

Linear Perspective

Overlap (or Interposition) ([demo](#))

Shading and Lighting

Accommodation

What is Reality? Sensation and Perception

How do we perceive X?

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

Perception Process

https://www.youtube.com/watch?v=kQxsTyNKtqg
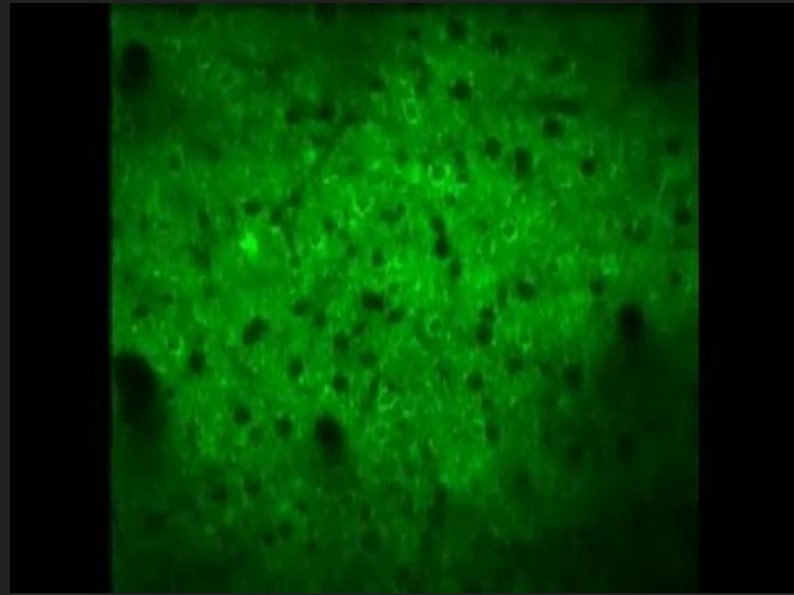
https://en.wikipedia.org/wiki/List_of_animals_by_number_of_neurons

| Human | 21,000,000,000 | For average adult "The average number of neocortical neurons was 19 billion in female brains and 23 billion in male brains." | |

Perception Process

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

Stimuli Fusion: Balance + Vision

Vection

Why is this important? Sea legs

https://youtu.be/RbOQFIo3g44

Vestibulo-ocular reflex (VOR)

Why is this important?

Perception of stationarity
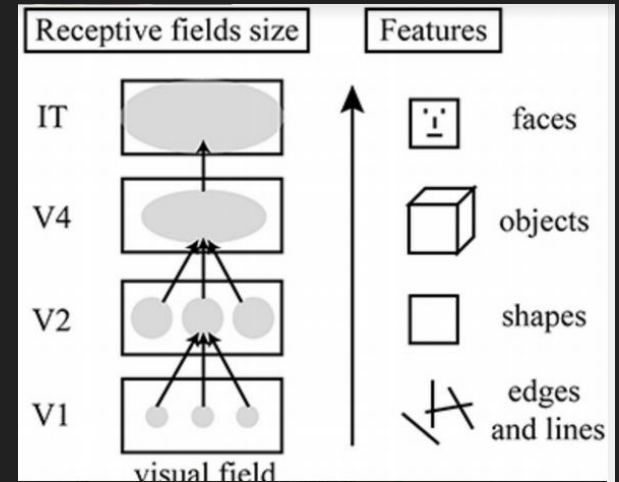
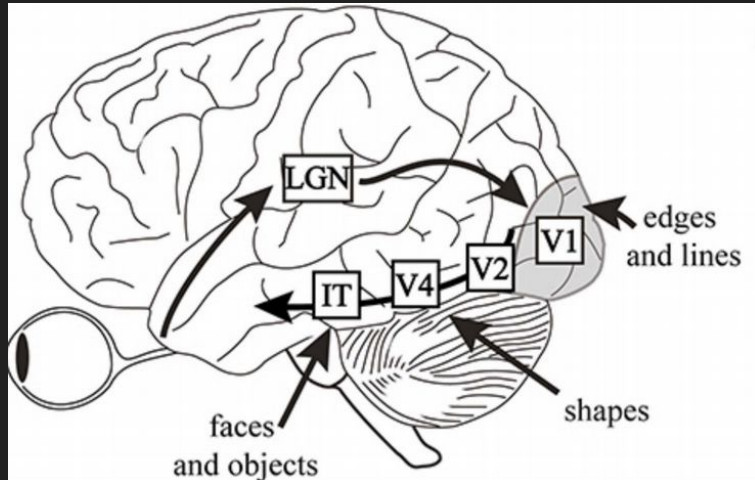https://youtu.be/mIbyNq8KedQ

Vection (Definition)

Vection is the sensation of movement of the body in space produced purely by visual stimulation.

Stimuli Hierarchical Processing
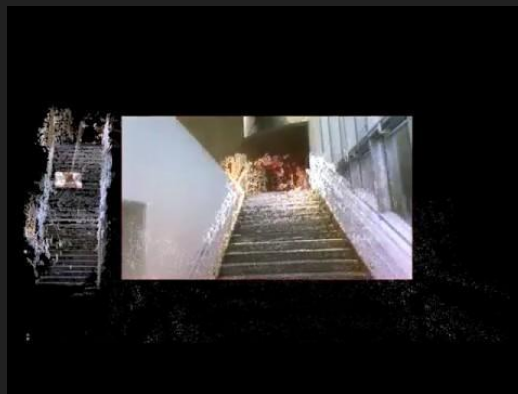

https://youtu.be/A4QcyW-qTUg

How Does Our Brain Piece Images Together?

https://youtu.be/MHMvEMy7B9k
https://youtu.be/2NcUkvIX6no
https://youtu.be/eR2j-fh18mk
https://youtu.be/3_dm7jSX4Cw

Stimuli Fusion: Speech Processing

https://www.youtube.com/watch?v=G-IN8vWm3m0 (0:32-2:30)

Review

- What is a monocular cue?

- What is a binocular cue?

- What is vection?

Reminder about homework & expectations

- Lectures will be recorded, but why not come to class?

- Read the book! It's free and explains things well

- Check Piazza often - updates about class, deadlines, etc

- MP's are to be done in pairs, class projects are in groups of 3 to 5

- There are only 20 computers and 200 students, so start on your MP's early or you might have trouble getting on a computer!

Class Projects

- Coolest part of this course → you get to create a real VR experience!

- Projects are large part of your final grade & give you chance to boost it if you struggle with the MP's or exams

- We will be announcing next Monday what opportunities there are to work on supervised projects

- Look up the VRProjectMania Facebook page to see what students have done in past semesters - you could get featured if you do well!

- Don't make another first person shooter, escape room, or maze… use this opportunity to see what has already been developed and create the killer app!

Note..

You do not need to be a CS major to do well in this course!

➢ For MP's, work with someone who codes

➢ Talk to the TA's, they're super helpful

Homework

- Lavalle, CH 2.1

- MP1 - Part 1 is due at midnight

  MP1 - Part 2 is due a week from today

VIRTUAL REALITY

Steven M. LaValle