

CMSC 498W

Lecture 6

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Human Perception and VR Pipeline

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# Traditional Senses

- Sight
- Hearing
- Taste
- Smell
- Touch

# Non-Traditional Senses

- Temperature
- Pain
- Kinesthetic
- Acceleration

# Haptics

## Simulation of skin senses

- Touch
- Temperature
- Pain

# VR Simulation

- VR worlds generally do not simulate all senses
- Mismatch between information from different senses can cause
  - Loss of immersion
  - Sickness

# Taste



*"Maybe they couldn't figure out what to make chicken taste like, which is why chicken tastes like everything!"*  
-Mouse, The Matrix

# Taste

## Five basic tastes

- Sweet
- Sour
- Salty
- Bitter
- Umami (meaty)

# Taste



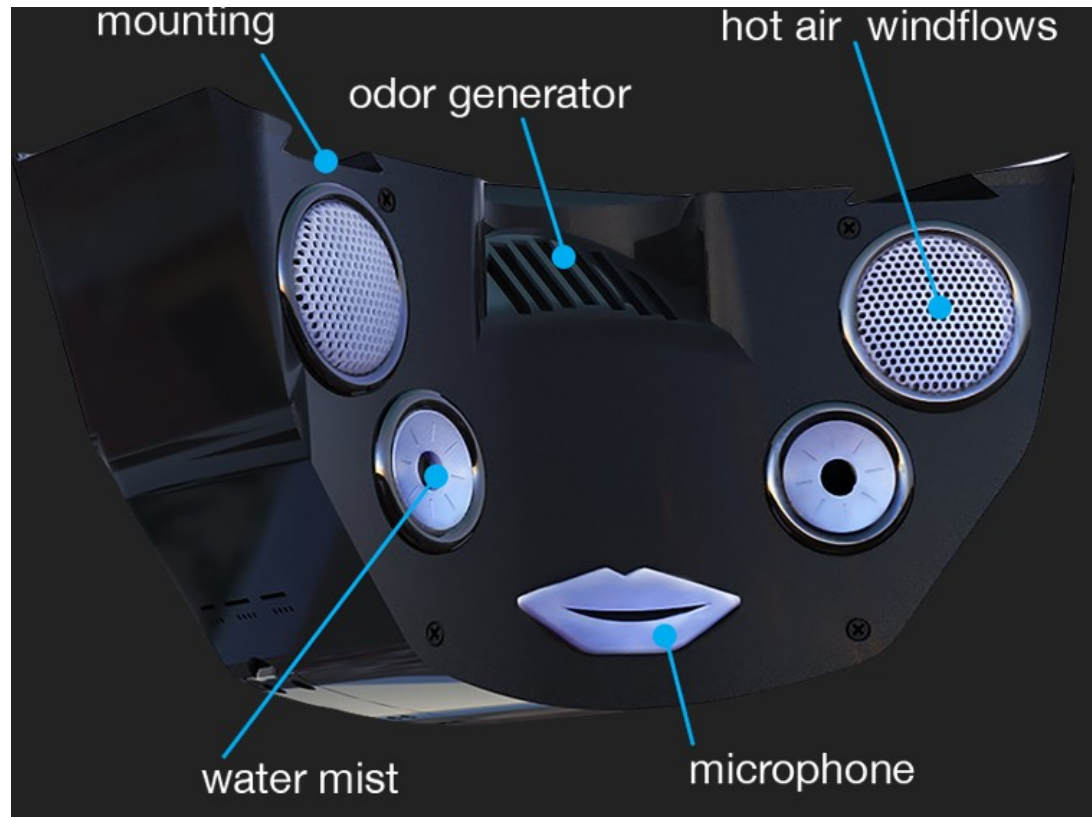


# Taste



<http://www.nimesha.info/digitaltaste.html>

# Smell



<http://vrworld.com/2015/03/11/feelreal-brings-sense-of-smell-to-virtual-reality/>

# Pain

Do we want it?



“Games of Pain: Pain as Haptic Stimulation in Computer-Game-Based Media Art”. Laso

# Pain



*Legshocker*

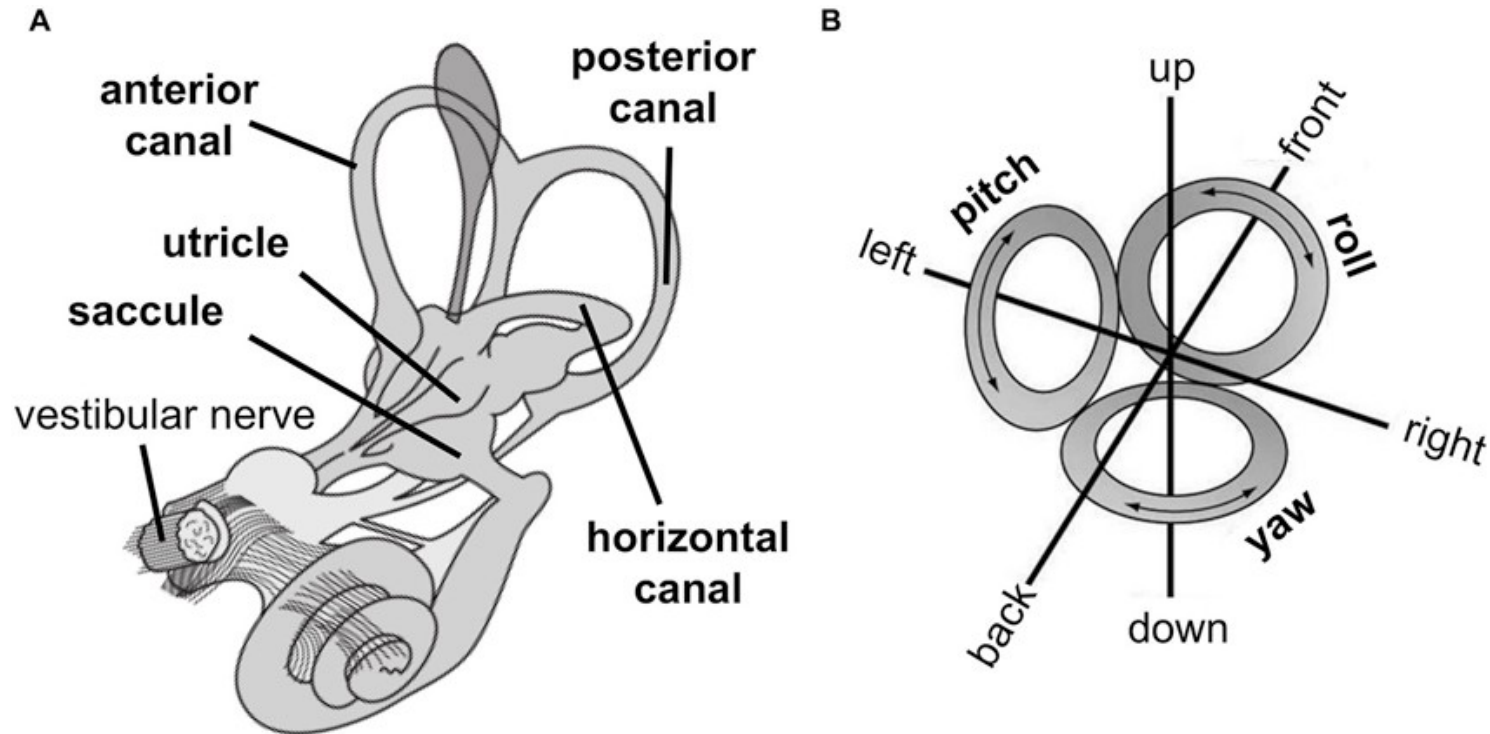
“Games of Pain: Pain as Haptic Stimulation in Computer-Game-Based Media Art”. Laso

# Kinesthetic



<http://theavtimes.com/2013/07/27/dui-checkpoint-results-for-palmdale-lancaster/>

# Acceleration



“The vestibular system: a spatial reference for bodily self-consciousness”. Pfeiffer et al.



# Acceleration



Full Flight Simulator

<https://www.flickr.com/photos/superjetinternational/5997843034/>

# Acceleration



Human Centrifuge

<http://www.wyle.com/content/CapabilityB.aspx?Human+Centrifuge>



# Simulator Sickness

- “Symptoms of discomfort that arise from using simulated environments”
- Caused, in large part, by sensory mismatch
- Primary culprits
  - Sight
  - Kinesthetic
  - Acceleration

# Simulator Sickness

## Causes of mismatch

- Non-simulated senses
- Senses simulated out of sync (lag)
- Sub-sense mismatch
  - Convergence/Accommodation conflict in Sight

# Simulator Sickness

## Oculus Best Practices

[https://developer.oculus.com/documentation/intro-vr/latest/concepts/bp\\_app\\_simulator\\_sickness/](https://developer.oculus.com/documentation/intro-vr/latest/concepts/bp_app_simulator_sickness/)