



COMP210: Interfaces & Interaction

2: Session title here

Immersion

Immersion is the objective degree to which a VR system and application projects stimuli onto the sensory receptors.

- ▶ Extensiven
- ▶ Matching
- ▶ Surrounding
- ▶ Vividness
- ▶ Interactability
- ▶ Plot

Perceptual Modalities

Sight, hearing, touch, proprioception, balance/motion, smell and taste.

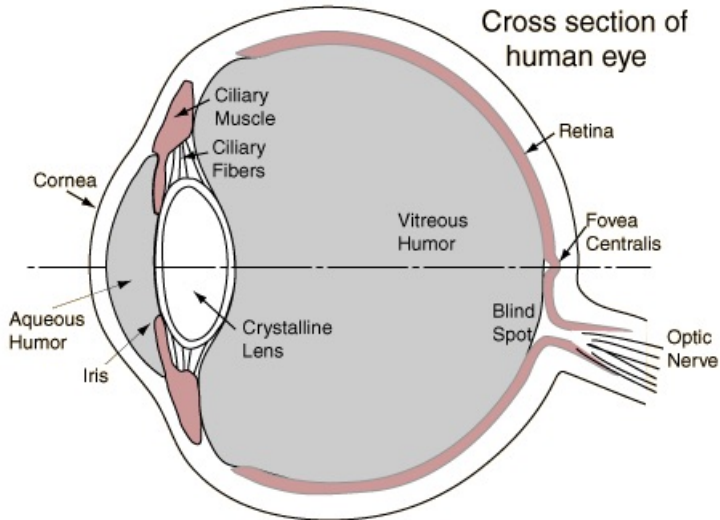


Figure:

Cones and Rods

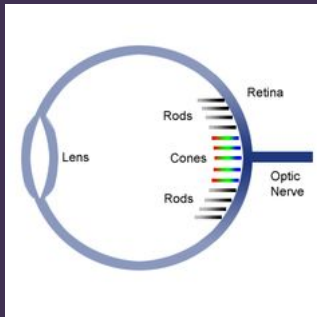


Figure: The retina is covered in two types of photoreceptors, cones and rods. Cones are responsible for vision in ideal conditions and rods are responsible for low light levels and non-ideal conditions.

Central vs. Peripheral Vision

Central

- ▶ has high visual acuity,
- ▶ optimised for bright daytime conditions, and
- ▶ is color sensitive.

Peripheral Vision

- ▶ is color insensitive,
- ▶ is more sensitive to light than central vision in dark conditions,
- ▶ is less sensitive to longer wavelengths (i.e., red),
- ▶ has faster response and has more sensitive to fast motion and flicker, and
- ▶ is less sensitive to slow motions.

Field of View and Field of Regard

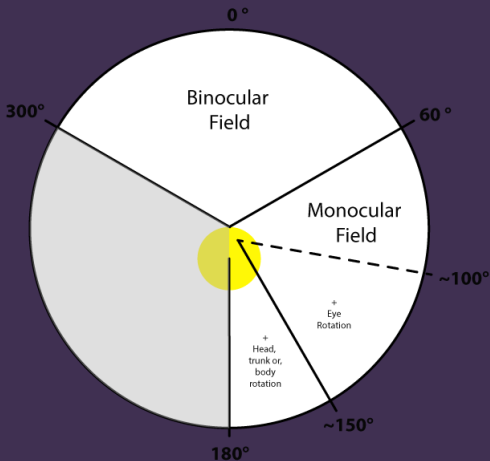


Figure: Horizontal field of view of the right eye with straight ahead fixation (looking towards the top of the diagram)

Visual Pathways

Arc Seconds & Minutes

Arc Seconds & Minutes

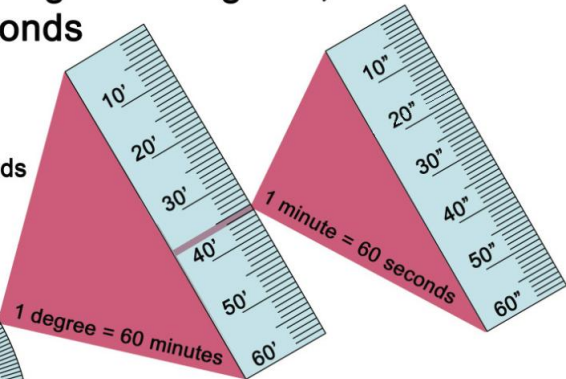
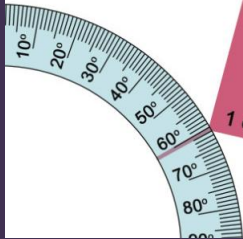
Measuring Angles in Degrees, Arcminutes and Arcseconds

One Circle:

360° degrees

21,600' minutes

1,296,000" seconds



Acuity

Visual Acuity is the ability to resolve details and often measured in visual angle.

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A fifty pence coin held up at 81 meters away has an angle of acuity of one arc min (1/60th of a degree).

In perfect conditions a human can see a line as thin as 0.5 arc sec (1/7200th of a degree).

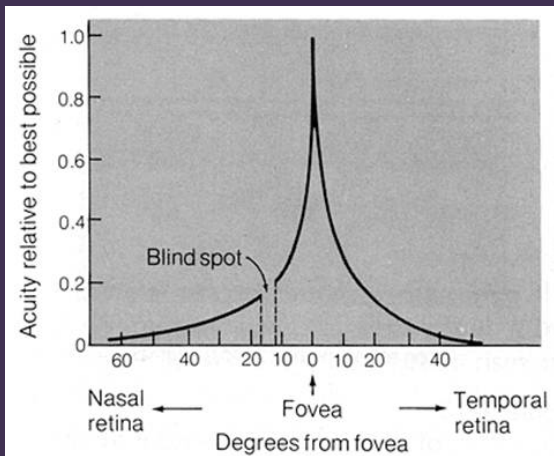


Figure: Visual acuity is much better at the fovea.

The evidence suggests that given stereoscopic vision with each eye able to see 210° (including rotation) a display would need horizontal vision of 378,000 pixels for each eye to match what we see in reality.

Obviously, this is an extreme analysis and there are ways that we can work around these limitations.

VR Lenses



The diagram illustrates the optical principle of a VR headset. On the left, a bright yellow sun-like sphere emits parallel blue light rays. These rays pass through a green lens element within a circular headset frame. The rays then converge and focus onto a small yellow dot on the back of a stylized human eye, which is shown in cross-section with red internal structures. Below the diagram, the word "INFINITY" is displayed next to an infinity symbol.

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How Lenses for Virtual Reality Headsets Work

VR Cover

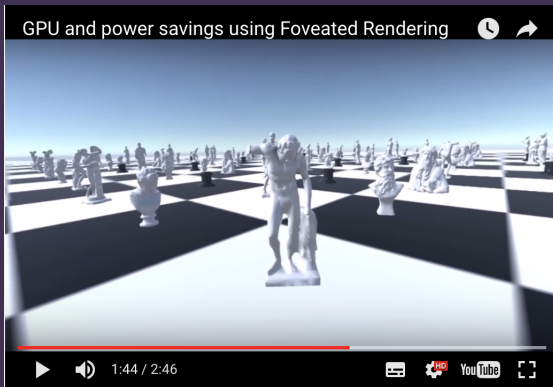
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Foveated Rendering



Eye Tracking Demo