

A person with long dark hair and a futuristic VR headset is shown in a cyberpunk-style environment. The background is dark with blue and orange neon lights, creating a high-tech, digital atmosphere. The person is wearing a dark jacket and has a serious expression.

Dr Fangcheng Zhong

Computational 3D Displays



UNIVERSITY OF
CAMBRIDGE

Outline

- Computational 3D displays
 - Stereoscopic displays
 - Varifocal displays
 - Multifocal displays
 - Optical see-through displays
 - Volumetric/autostereoscopic displays
 - Holographic displays
 - Light field displays
 - Voxel-based displays

Stereoscopic Displays



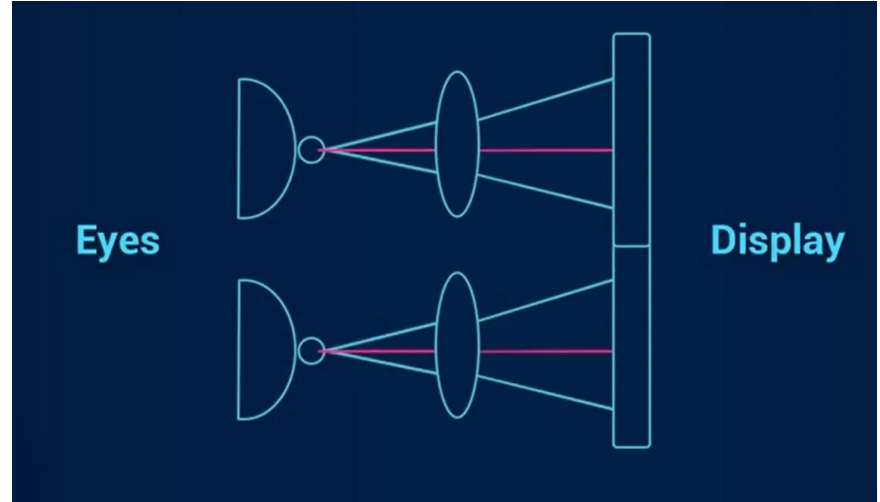
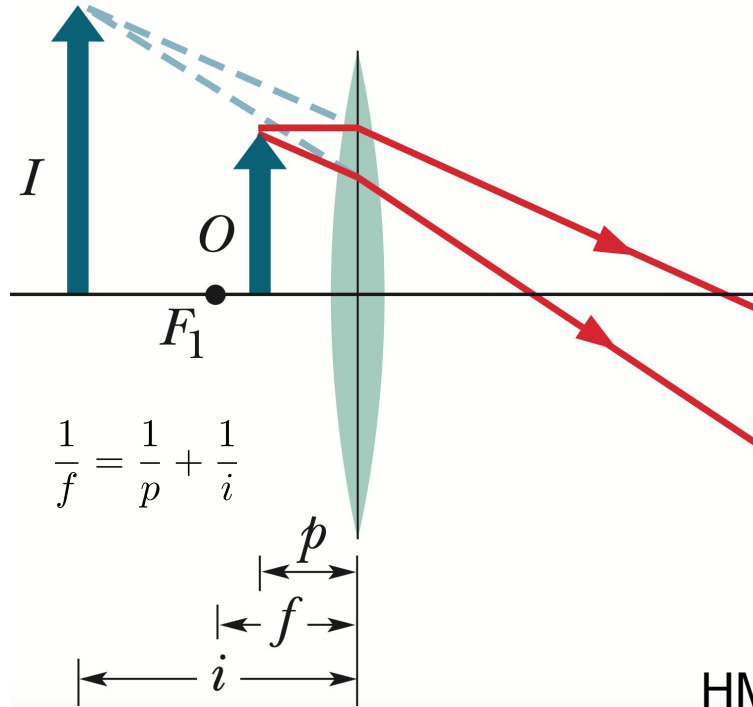
polarized glasses / 3D movies

Stereoscopic Displays



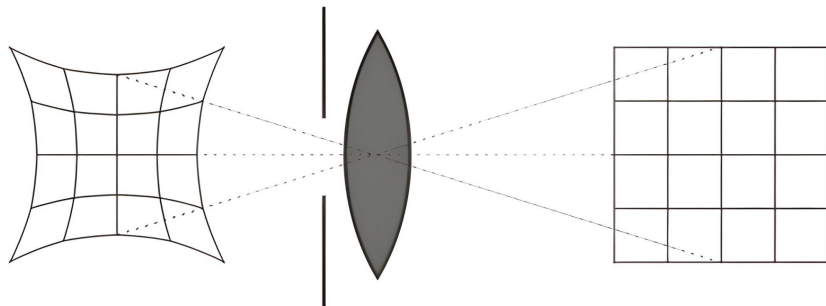
Head-Mounted VR Displays (HMDs)

Head-Mounted Displays

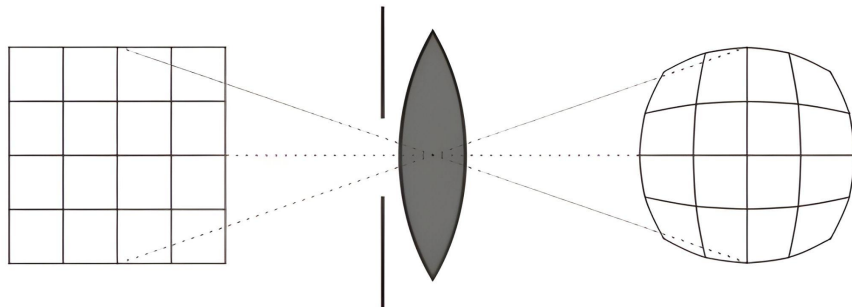


HMD Optics

Head-Mounted Displays

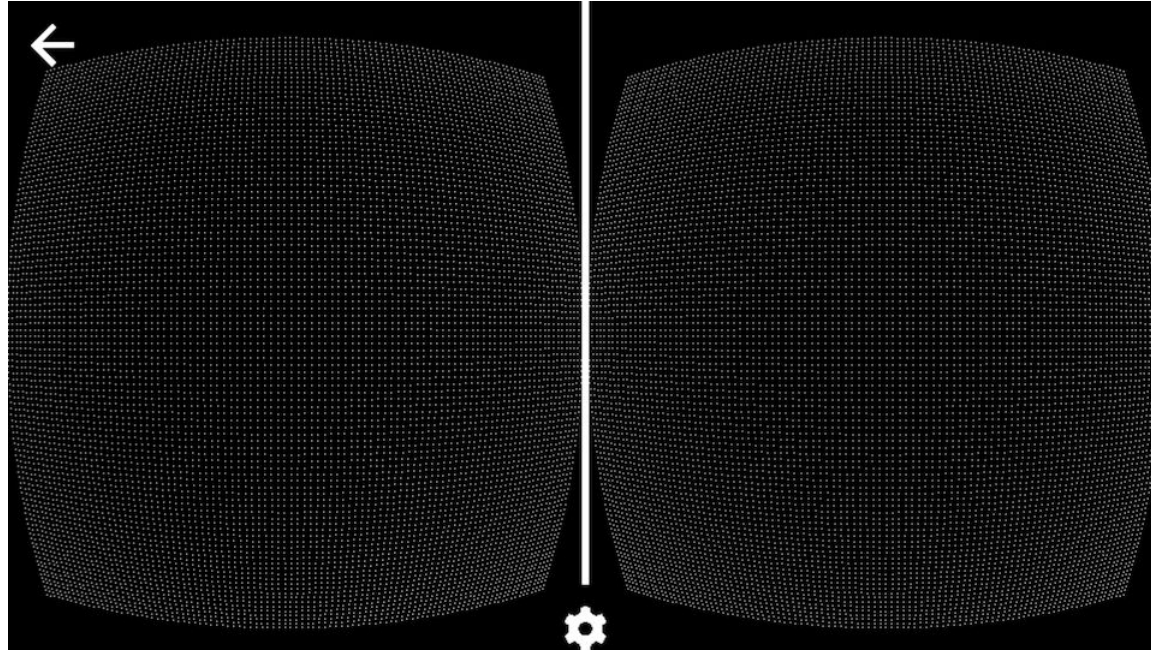


pincushion lens distortion



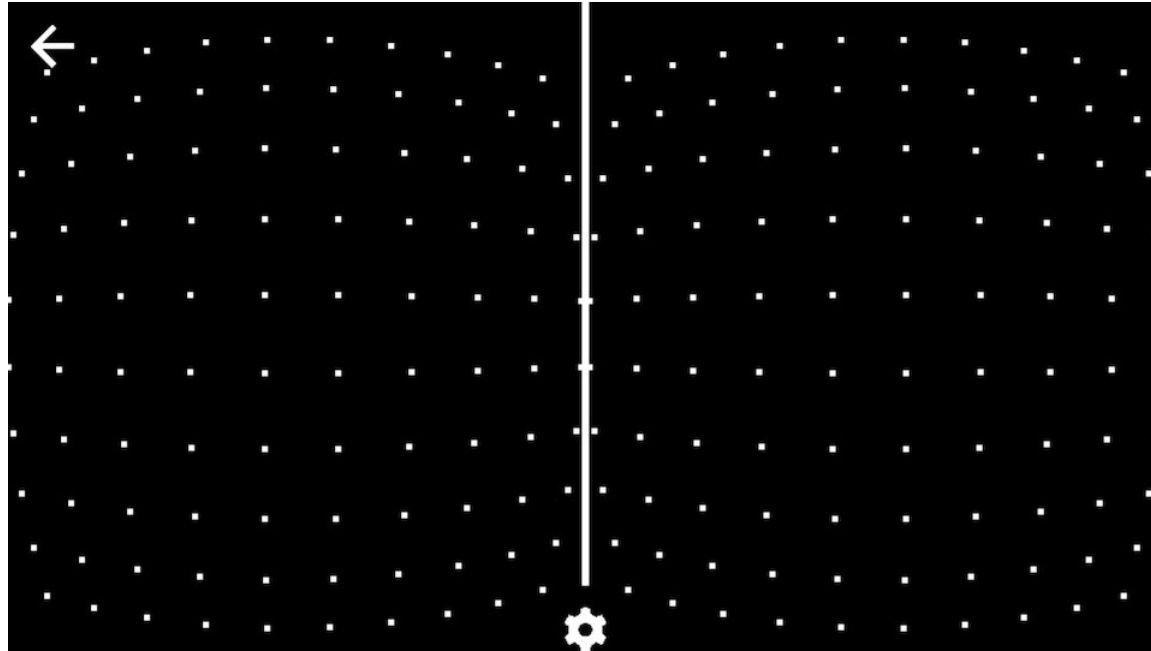
correction with a barrel distortion

Head-Mounted Displays



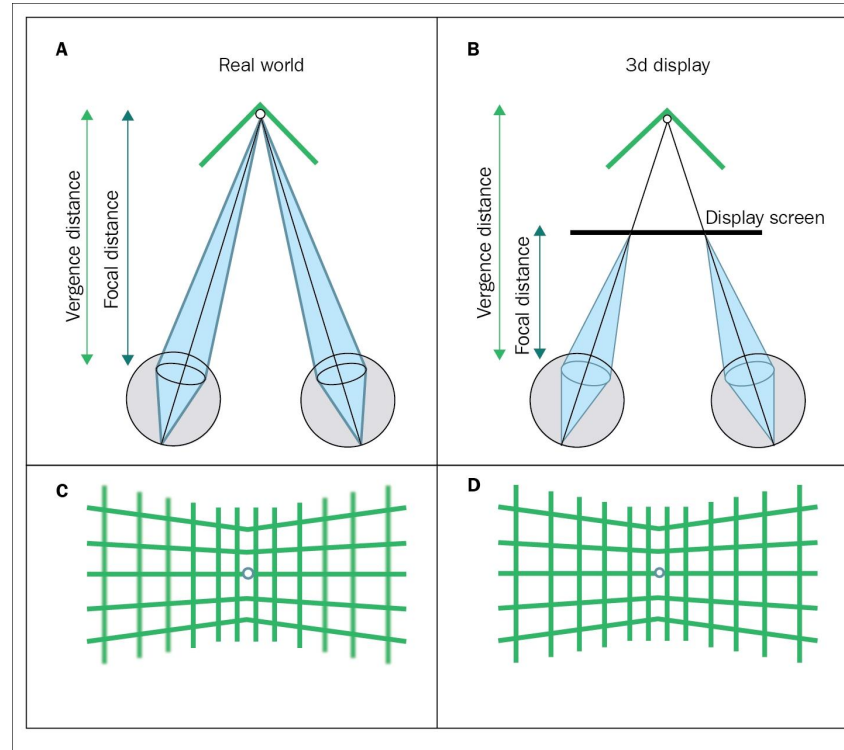
two-pass rendering

Head-Mounted Displays



vertex displacement

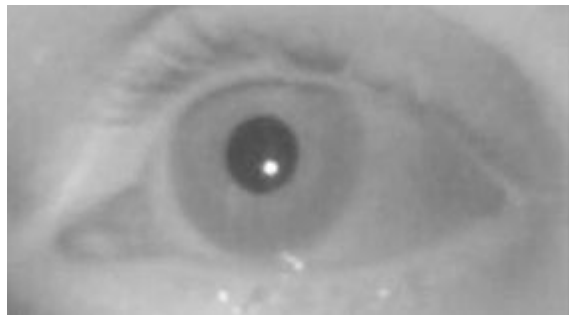
Vergence-Accommodation Conflicts



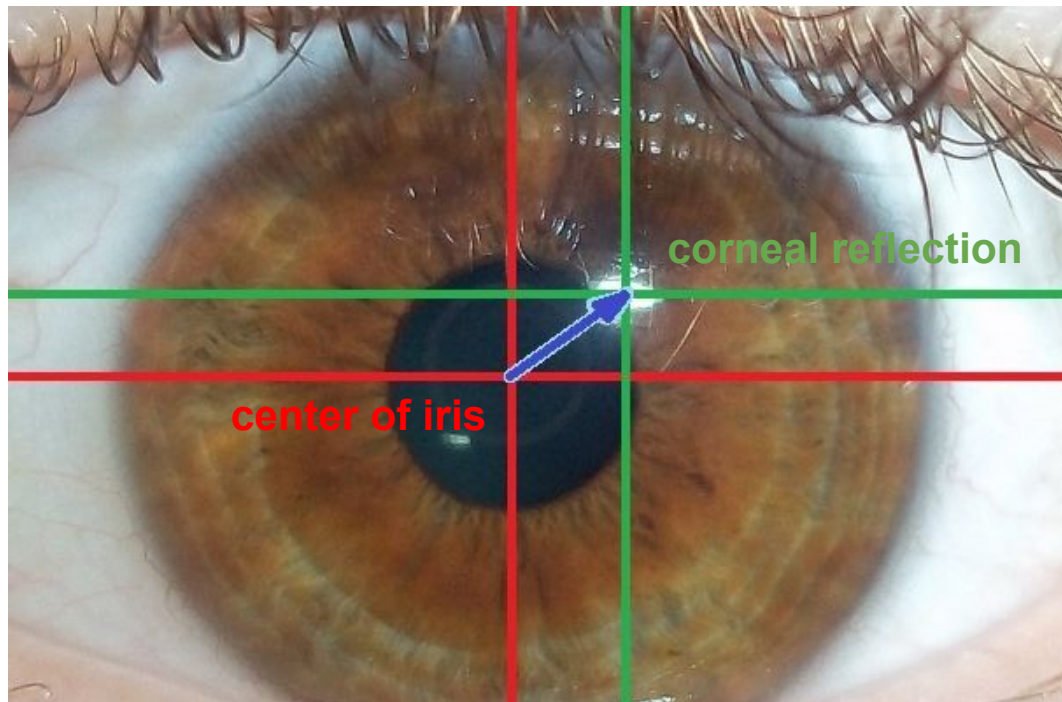
Varifocal Display



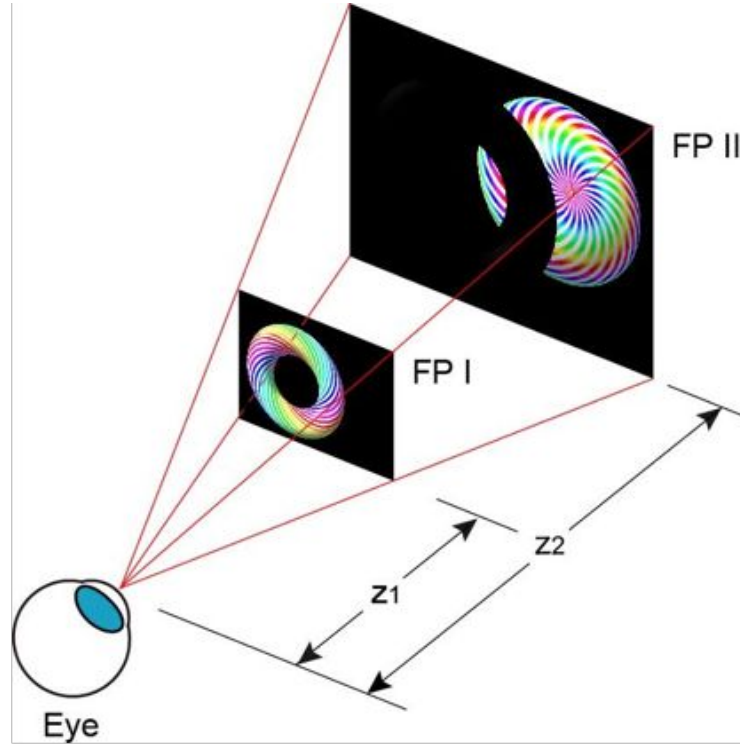
Gaze Tracking



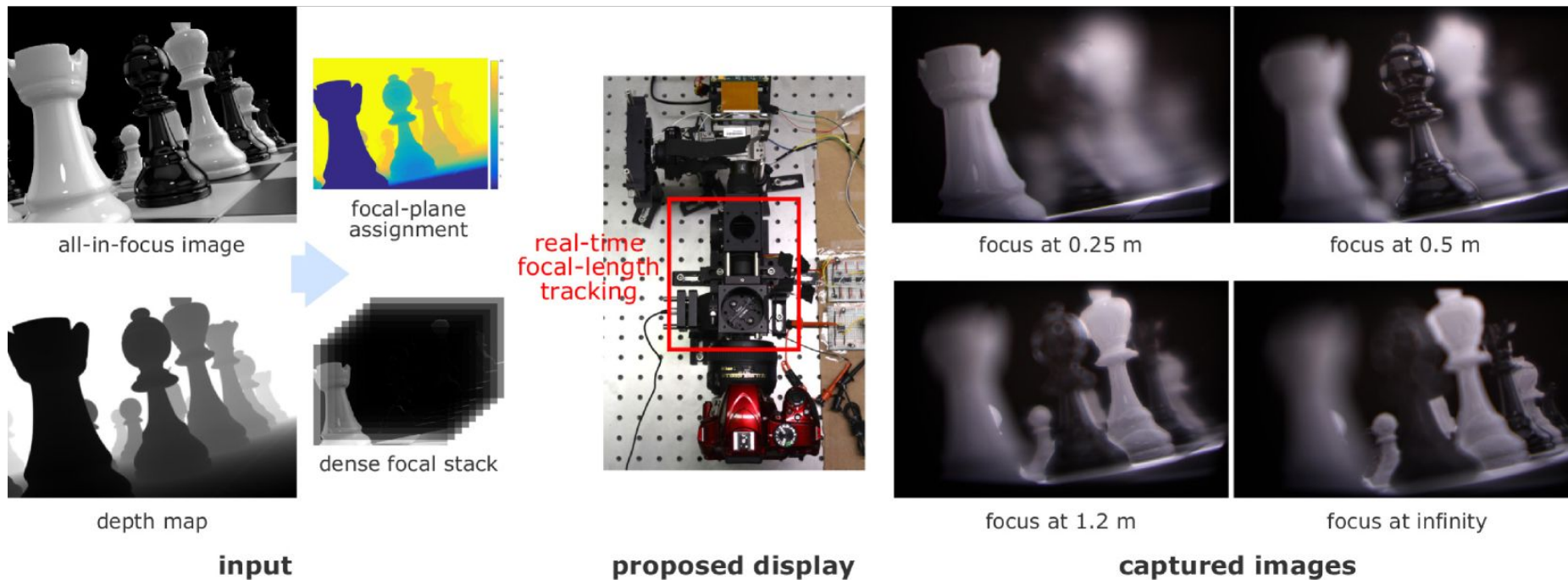
infrared light source



Multifocal Display



Multifocal Display



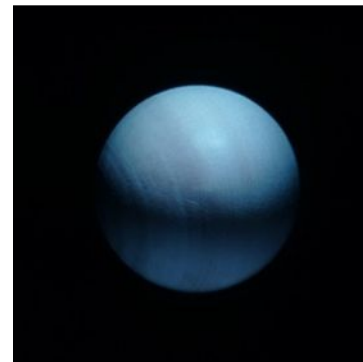
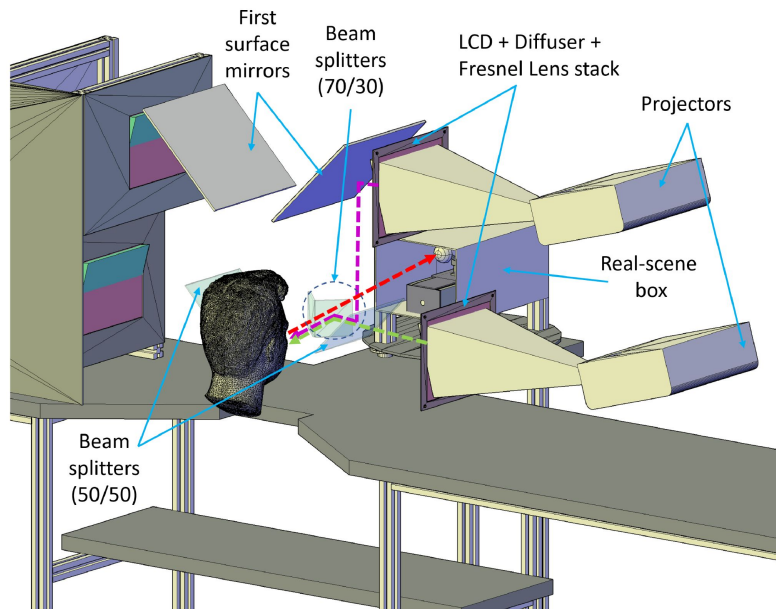
Multifocal Display



HDR Multifocal Display

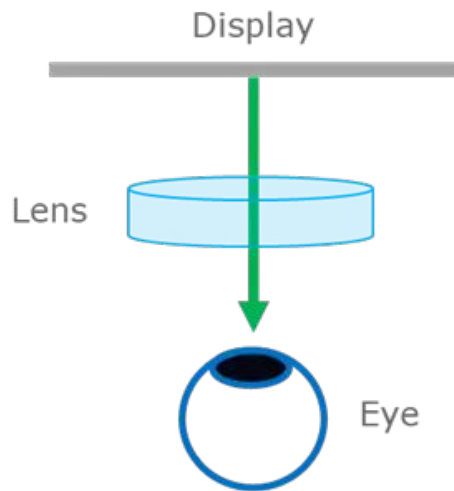


Optical See-through Displays

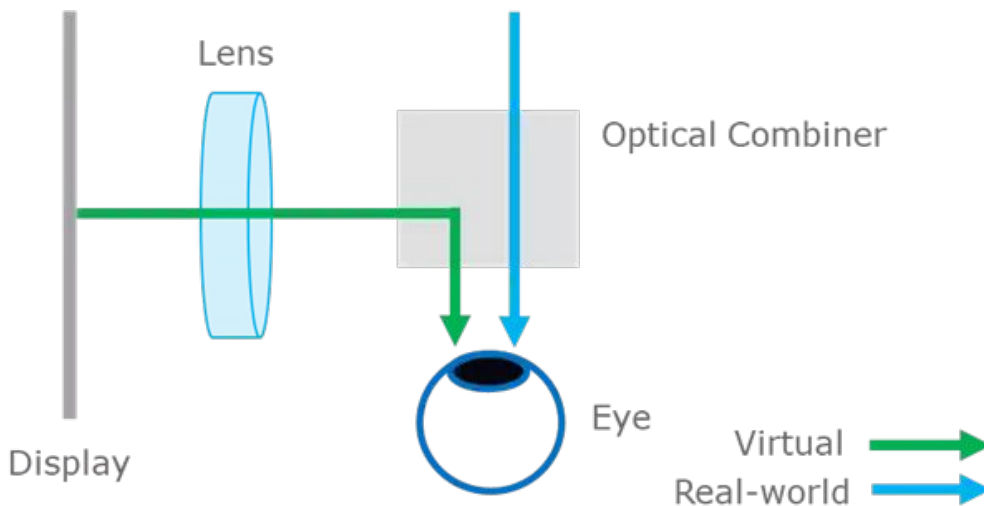


HDR Multifocal Display

Optical See-through Displays

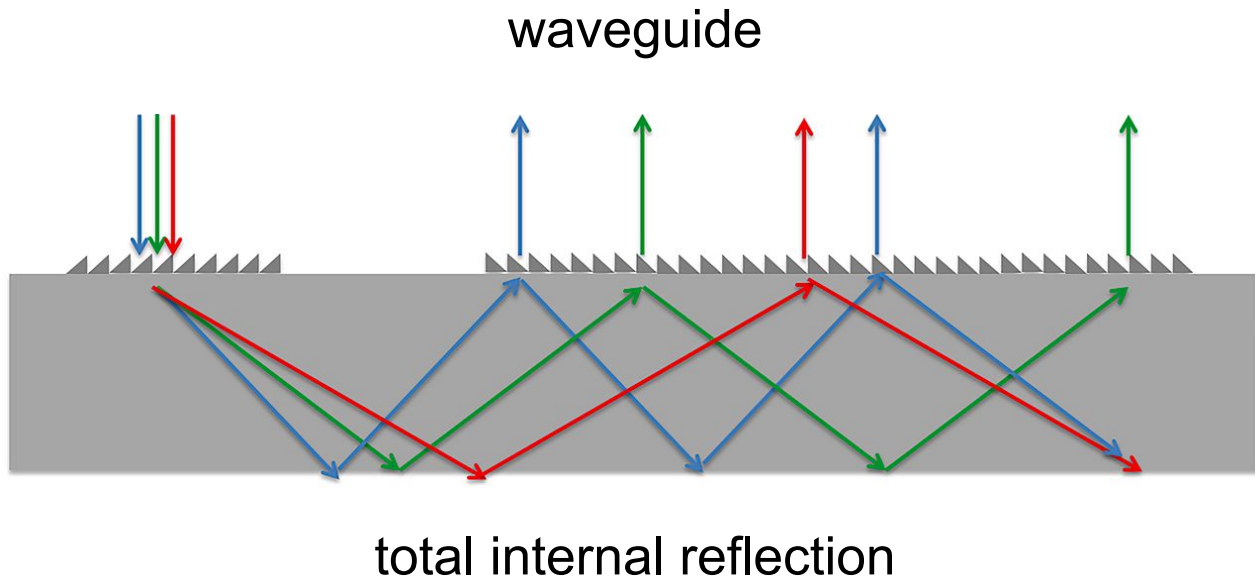


Passthrough XR

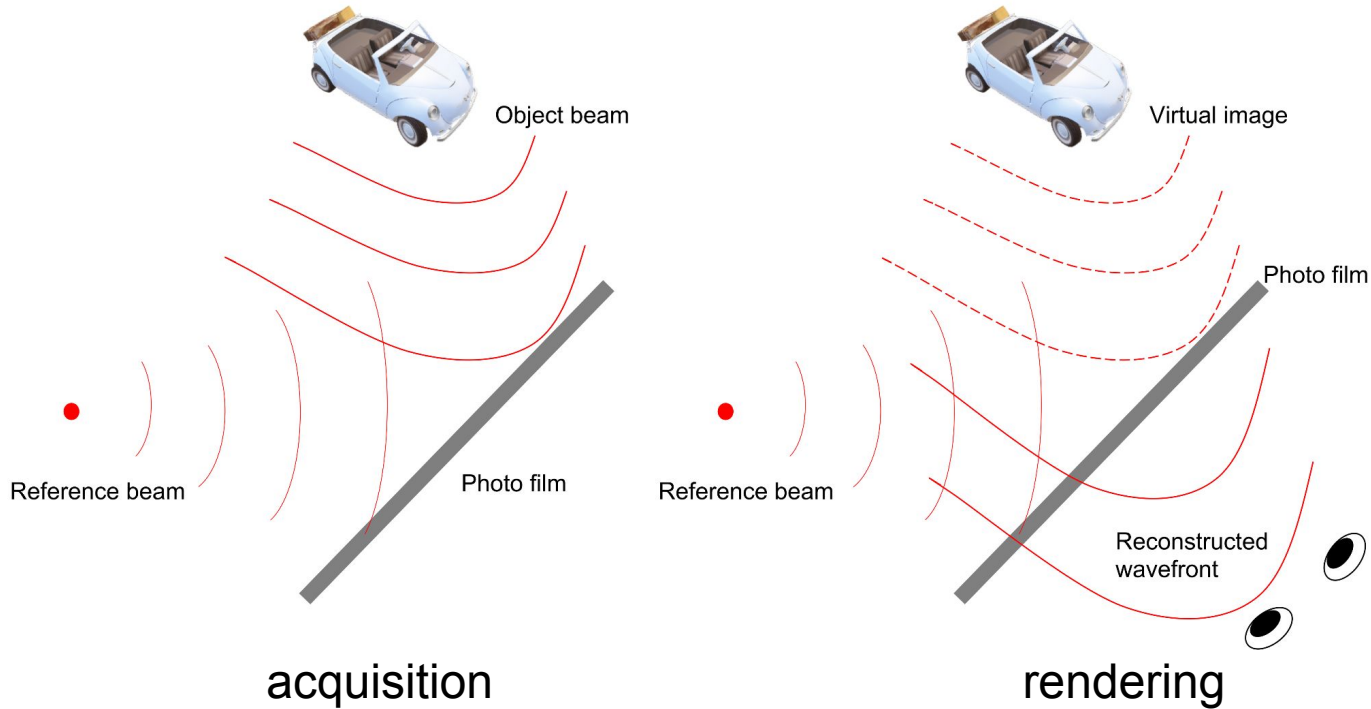


Optical see-through XR

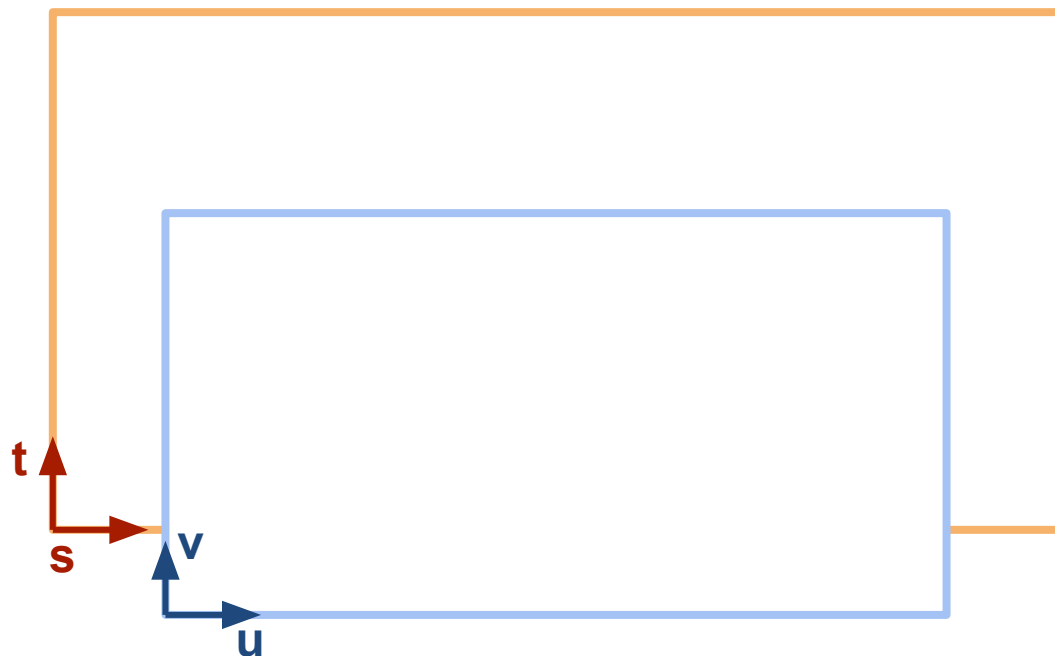
Optical See-through Displays



Holographic Display

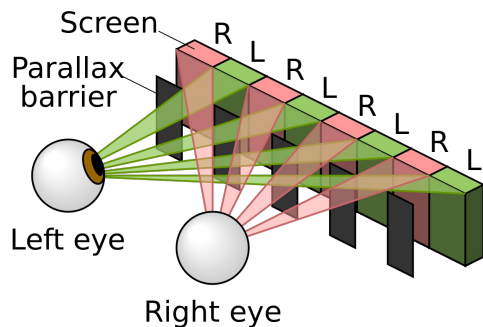


Light Field Displays

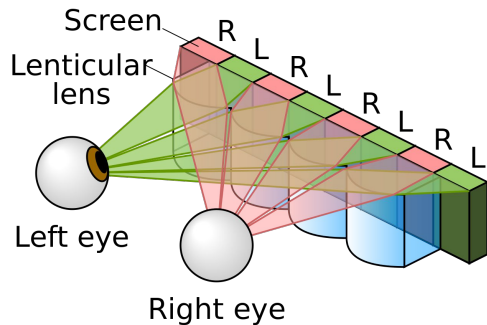


$f(u, v, s, t)$ position + directional light

Light Field Displays

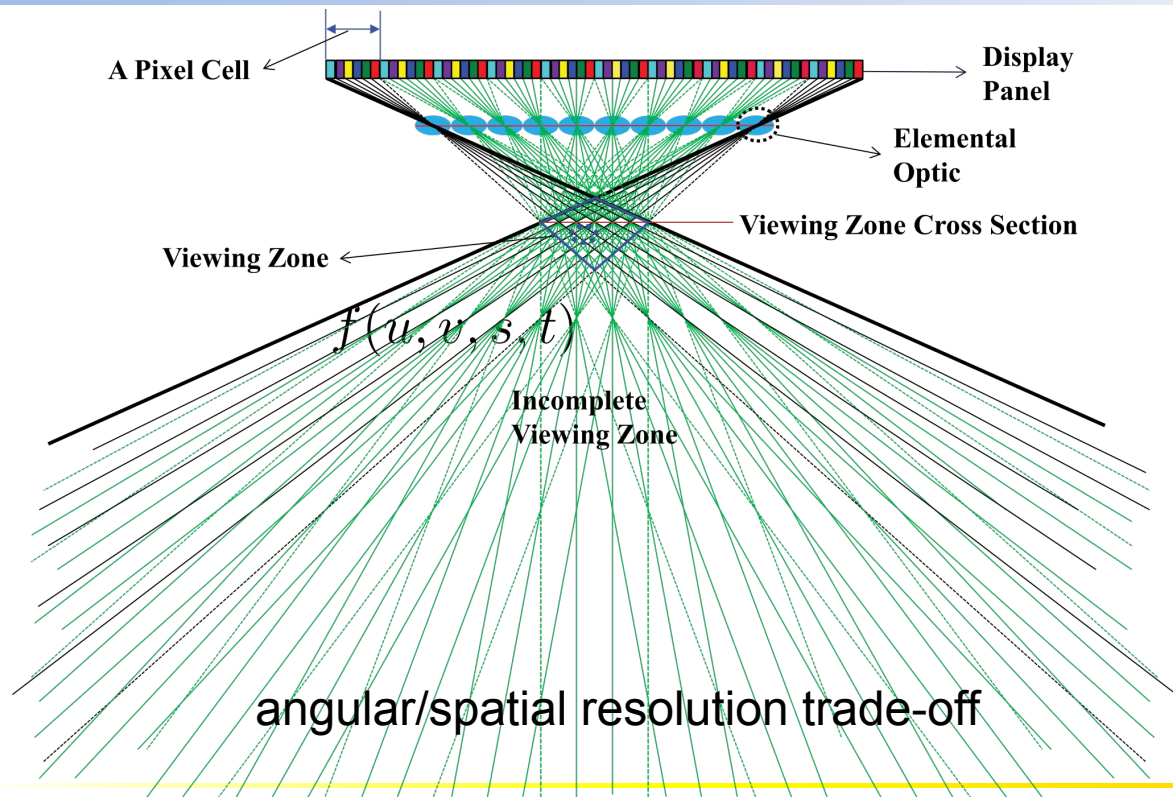


parallax barrier

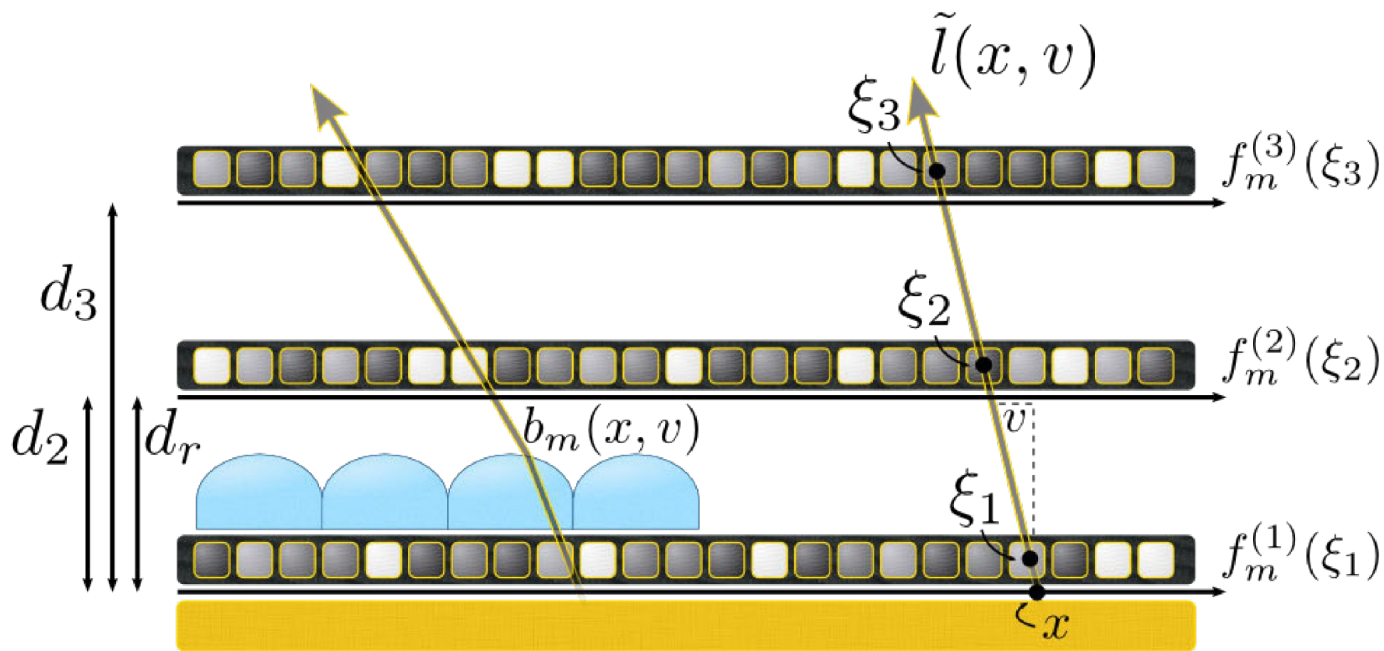


lenticular array

Light Field Displays

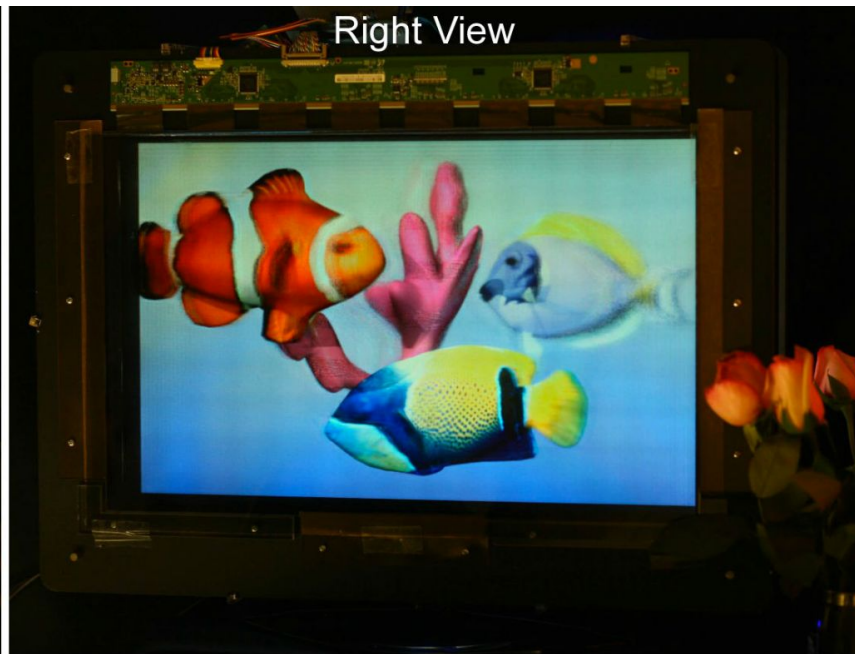
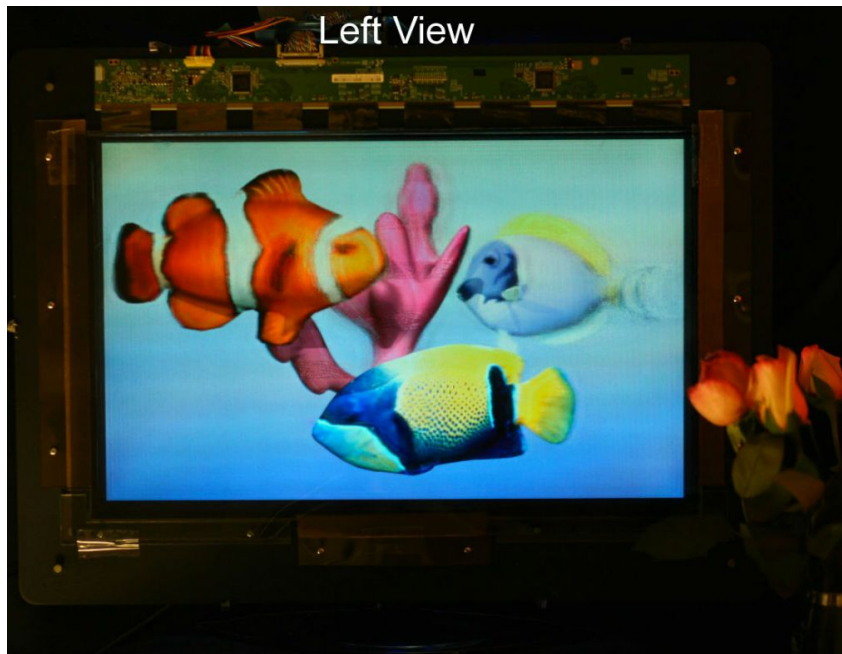


Light Field Displays

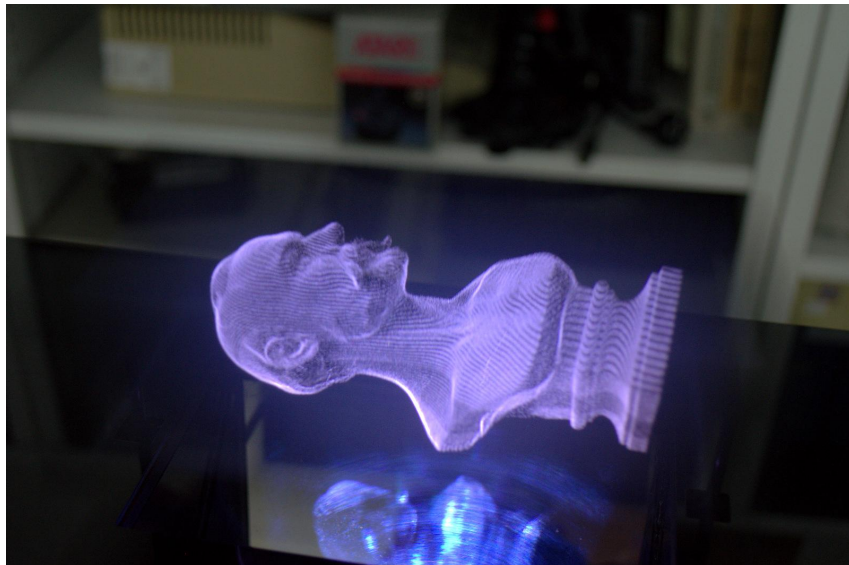


compressive light field displays

Light Field Displays



Voxel-based displays



- sweeping diffuser