

Réalité Augmentée

Ensimag 3a
2010-2011

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Augmented Reality

Réalité mixte

Environnement
réel

Réalité
augmentée

Virtualité
augmentée

Environnement
virtuel =
réalité virtuelle

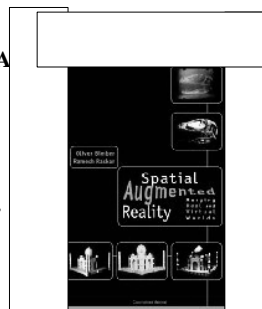
D'après Milgram



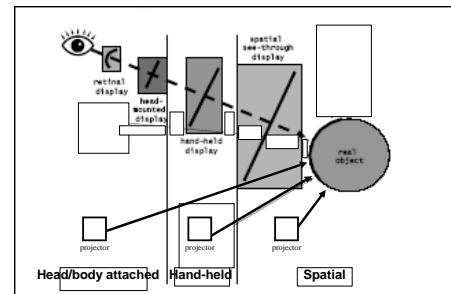
Augmented Reality

**Spatial Augmented Reality: A
Modern Approach to
Augmented Reality**
A.K. Peters

Oliver Bimber, Bauhaus University,
Weimar, Germany
Ramesh Raskar, Mitsubishi Electric
Research Labs, USA



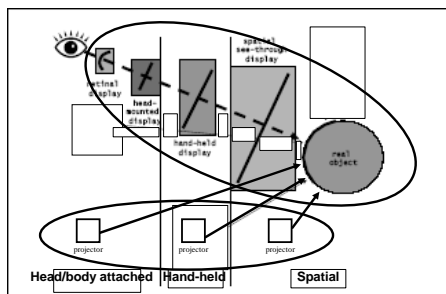
Augmented Reality



D'après O. Bimber



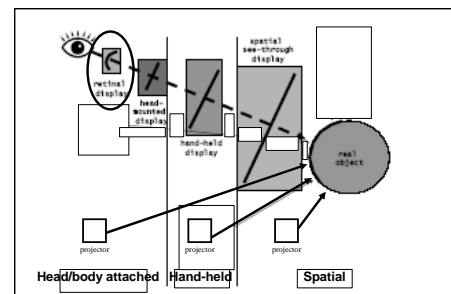
Augmented Reality



D'après O. Bimber



Augmented Reality

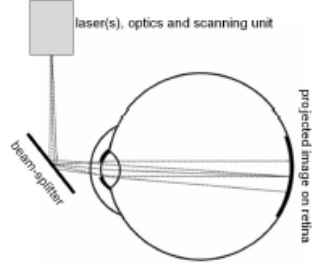


D'après O. Bimber



Augmented Reality

Retinal displays



D'après O. Bimber

Augmented Reality

Retinal displays

Pros:

- High brightness and contrast
- Low power consumption (make them well suited for mobile outdoor applications)
- Support mobile applications
- Support multi-user applications



D'après O. Bimber

Augmented Reality

Retinal displays

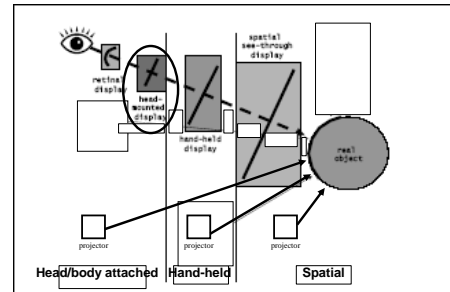
Cons:

- Only monochrome (red) images
- The sense of ocular accommodation is not supported
- Stereoscopic versions do not exist



D'après O. Bimber

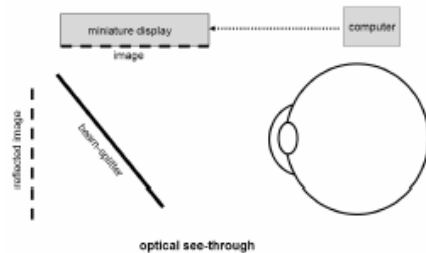
Augmented Reality



D'après O. Bimber

Augmented Reality

Optical See-through Head-Mounted Displays



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Augmented Reality

Optical See-through Head-Mounted Displays



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Augmented Reality

Optical See-through Head-Mounted Displays

Pros:

- HMD: Currently the dominant display technology for AR
- Support mobile applications
- Support multi-user applications



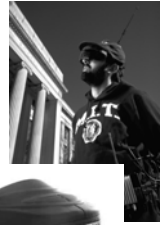
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Augmented Reality

Optical See-through Head-Mounted Displays

Cons:

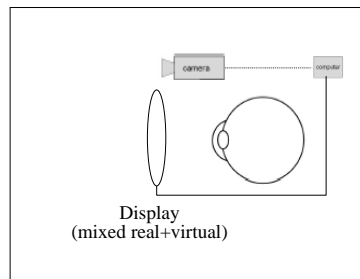
- Lack of resolution
- Limited field of view
- Heavy optics and vs. ergonomic devices
- No occlusion (virtual in front of real)



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Augmented Reality

Video See-through Head-Mounted Displays



Augmented Reality

Video See-through Head-Mounted Displays

Pros:

- HMD: Currently the dominant display technology for AR
- Support mobile applications
- Support multi-user applications
- Occlusions



Augmented Reality

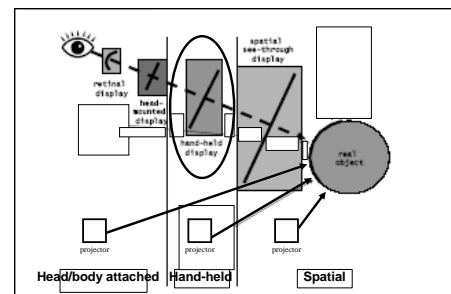
Video See-through Head-Mounted Displays

Cons:

- Lack of resolution
- Limited field of view
- Heavy optics and vs. ergonomic devices



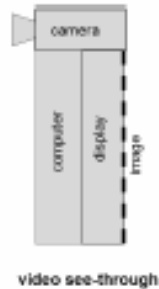
Augmented Reality



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Augmented Reality

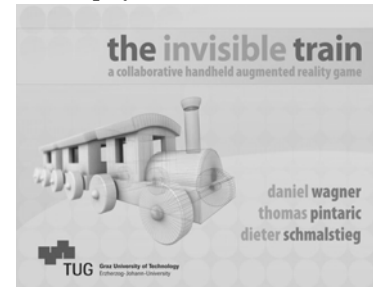
Video See-through Hand-Held Displays



Daniels O. Bimber

Augmented Reality

Video See-through Hand-Held Displays



Augmented Reality

Video See-through Hand-Held Displays

Graz, Austria



Augmented Reality

Video See-through Hand-Held Displays

Pros:

- Alternative to HMDs for mobile applications
- Consumer devices such as UMPC, PDAs and cellphones
- Support mobile applications
- Support multi-user applications



Augmented Reality

Video See-through Hand-Held Displays

Cons:

- Image analysis and rendering components is processor and memory intensive
- Limited screen size of most hand-held devices restricts the covered field-of-view
- Optics and image sensor chips of integrated cameras in consumer hand-held devices in targeted to other applications and consequently provide a limited quality for image processing tasks
- Do not provide hand-free working



Augmented reality

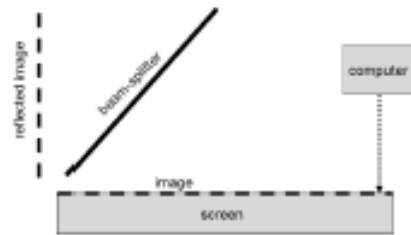
Video See-through Hand-Held Displays

MagicBook
HIT Lab. NZ

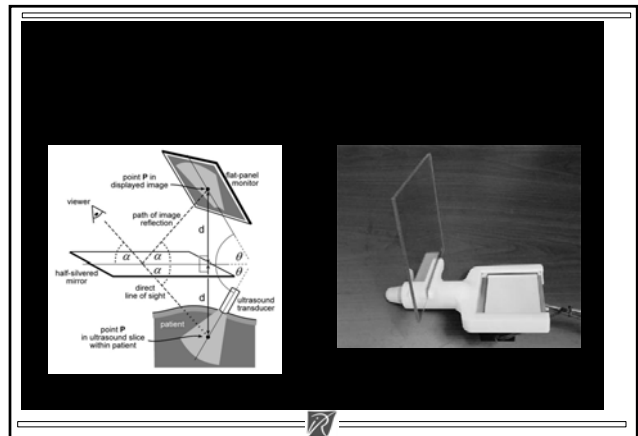


Augmented Reality

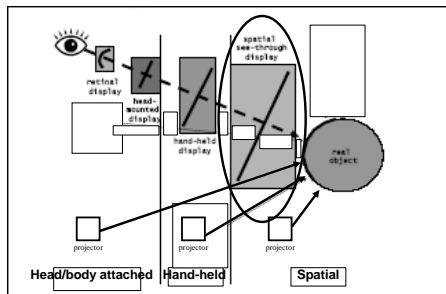
Optical See-through Hand-Held Displays



D'après O. Bimber



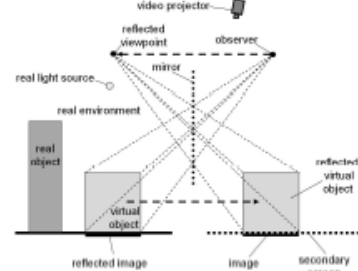
Augmented Reality



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Augmented Reality

Spatial Optical See-through Displays



D'après O. Bimber

Augmented Reality

Spatial Optical See-through Displays

The Extended Virtual Table
O. Bimber & al.



D'après O. Bimber

Augmented Reality

Spatial Optical See-through Displays

The Virtual Showcase
O. Bimber & al.

Video VS2_SIGGRAPH01_small
Video VS3_SIGGRAPH02_small
Video OcclusionShadows_small



Augmented Reality

Spatial Optical See-through Displays

The Virtual Showcase
O. Bimber & al.



Augmented Reality

Spatial Optical See-through Displays



CieMed



ReachIn



Augmented Reality

Spatial Optical See-through Displays

Pros:

- Easier eye accommodation and vergence
- Higher and scalable resolution
- Larger and scalable field-of-view
- Improved ergonomic factors
- Easier and more stable calibration
- Better controllable environment



Augmented Reality

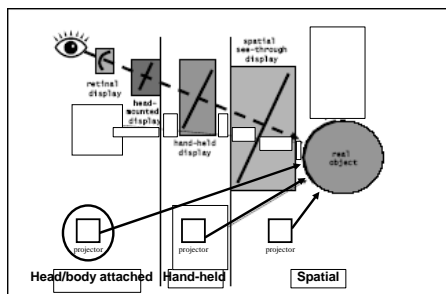
Spatial Optical See-through Displays

Cons:

- Do not support mobile applications
- In most cases, the applied optics prevents a direct manipulative interaction
- Number of users is restricted
- Mutual occlusion between real and virtual environment is normally not supported



Augmented Reality

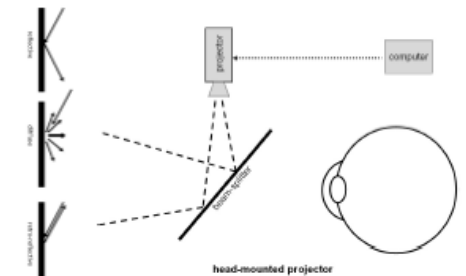


D'après O. Bimber



Augmented Reality

Head-Mounted projectors



D'après O. Bimber



Augmented Reality

Head-Mounted projectors (Tachi Lab, Inami)



Rice, et al. Using a head-mounted/projective display in interactive augmented environments. In: Proceedings of IEEE and ACM International Symposium on Augmented Reality 2003, pp. 217-223, 2003.



Inami, et al. and Tachi, S., Head-Mounted Display Using Head-Mounted Projector. Proceedings of IEEE Virtual Reality 2000, pp.213-240, 2000.



Augmented Reality

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Augmented Reality

Head/Body attached projectors Pattie Maes and Pranav Mistry (MIT)



total: \$350



Augmented Reality

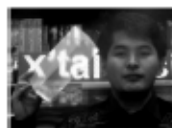
Head-Mounted projectors

Pros:

- Support mobile applications
- Support multi-user applications
- Have the potential of combining the advantages of projection displays (resolution, fov) with the advantages of traditional HMDs



Rice, et al. Using a head-mounted/projective display in interactive augmented environments. In: Proceedings of IEEE and ACM International Symposium on Augmented Reality 2003, pp. 217-223, 2003.



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Augmented Reality

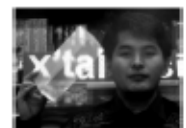
Head-Mounted projectors

Cons:

- Head-mounted projective displays might require special display surfaces (retro-reflective surface) to provide bright images)
- For projective head-mounted displays, the brightness of the images depends on the environmental light conditions



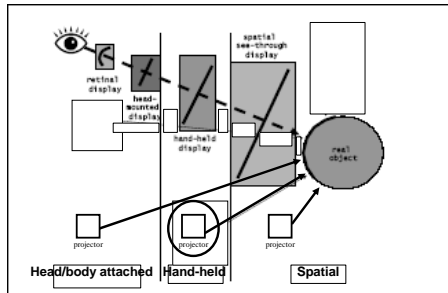
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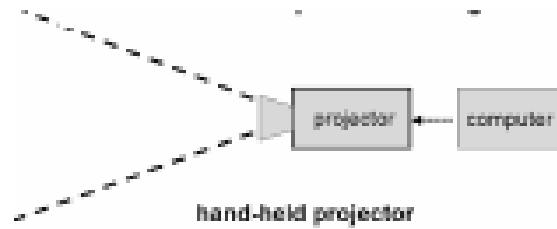
Augmented Reality



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Augmented Reality

Hand-Held Projector



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Augmented Reality

Hand-held projector (Raskar & al. MIT)

2002-03 iLamps

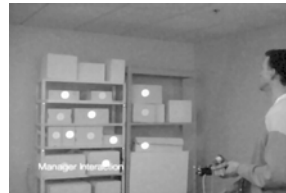


Video
video/handheldprojectors/iLampRaskar

Augmented Reality

Hand-held projector (Raskar & al. MIT)

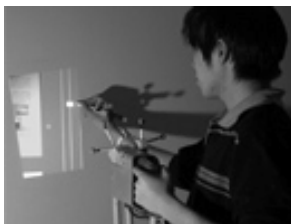
RFID



Video
video/handheldprojectors/RFIDRaskar

Augmented Reality

Hand-held projector (University Toronto)

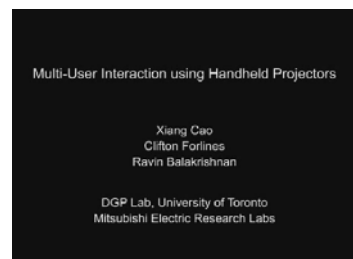


Video
video/handheldprojectors/Toronto

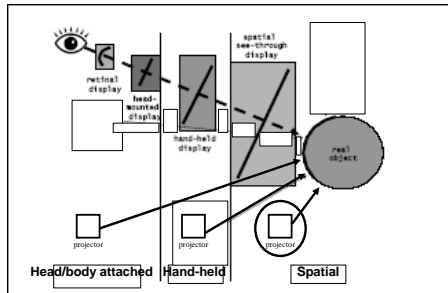
Augmented Reality

Hand-held projector (University Toronto)

Multi-user



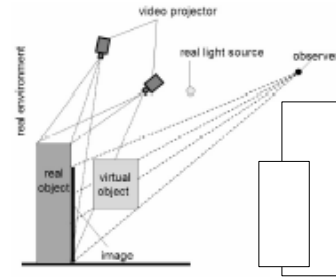
Augmented Reality



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Augmented Reality

Spatial projectors



D'après O. Bimber

Augmented Reality

Spatial projectors



Low & al.

Augmented Reality

Spatial projectors



O. Bimber & al.

Augmented Reality

Spatial projectors

Pros:

- Easier eye accommodation and vergence
- Higher and scalable resolution
- Larger and scalable field-of-view
- Improved ergonomic factors



Low & al.

Augmented Reality

Spatial projectors

Con:

- Do not support mobile applications
- Shadow-casting because of front-projection
- Restriction of the display area (size, shape, and color)
- Conventional projectors can only focus on a single focal plane



Low & al.