Office of the Future

Office of the Future Layout

Raskar, Welch, Cutts, Lake, Stesin, and Fuchs, "The Office of the Future: A Unified Approach to Image-Based Modeling and Spatially Immersive Displays," *Proceedings of SIGGRAPH 98*. Page 179.

Office of the Future Concept

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Features

Combines image-based modelling with spatially-immersive display

Unlike HMD, bring the display into the world rather than the user into the display

Also, bring the display to the user's environment rather than the user to a display environment (unlike CAVE)

Basic Idea

Acquire depth information for environment surfaces in real time

Use acquired model to:

- **Project images *on* the surfaces**
  - **—big immersive display**
- **Render images *of* the surfaces**
  - **—remote display / telecollaboration**
- **Interpret changes *in* the surfaces**
  - **—update dynamic environment**

Applications

Tele-collaboration

Local collaboration

Every-day work

Equipment

Ceiling-mounted projectors

Ceiling-mounted cameras

(Head-tracking device)

Office surfaces

Algorithm Components

Environment acquisition

- **imperceptible structured light**
- **depth field extraction / simplification**

Display

- **projective textures onto room geometry**
- **blending of multiple projectors**

Acquiring Depth Maps

Multiple cameras see the same scene

Use camera position information to determine depth of each pixel

Correspondence problem

- **Determining corresponding pixels in both camera views is difficult and often ill-posed problem**

Imperceptible Structured Light

Use feedback between projectors and cameras

Time multiplex known patterns in projected light

- **Binary coded structured light patterns solve correspondence problem**
- **Fast sequence of patterns**
  - **—visible to cameras**
  - **—integrates to white (gray) light in eye**

Binary Coded Structured Light

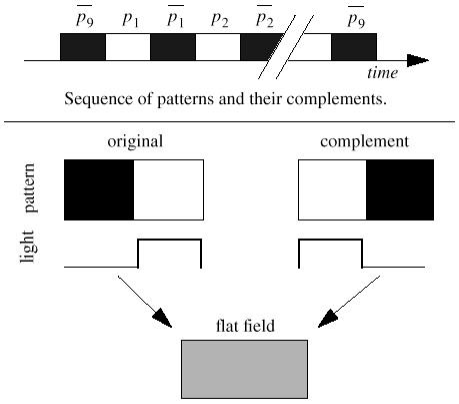

Figure 4: Pattern and complement are visually integrated over time, the result is the appearance of a flat field, or "white" light.

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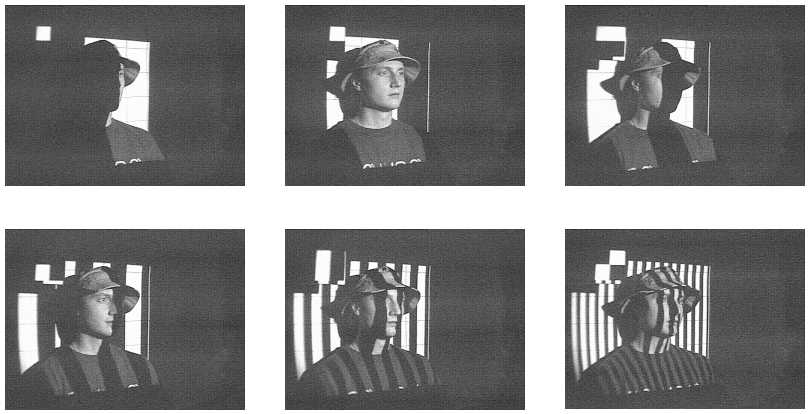
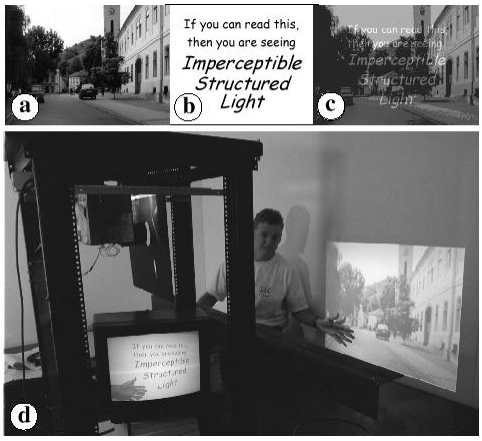
Structured Light Sequence



Imperceptibility



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Rendering onto Non-Planar Surfaces

Model surfaces

Render image to be seen by viewer

Use rendered image to texture display surface model

- **Projection as seen by projector**

  —(draw figure on board)

Many components still lacking

Need faster acquisition and simplification of depth images

Better acquisition and rendering for arbitrary reflectance surfaces

Faster rendering for 2-pass algorithm

Lower latency

Better tracking