Office of the Future

Office of the Future Concept


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.

Structured Light Sequence

Imperceptibility


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