Building a Panoramic Recording and Presentation System for TelePresence

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Presentation Outline

• Overview
  • TelePresence
  • PANOramic BroadCASTing
  • Functional Overview
• Architecture
  • Data Flow
  • Server Architecture
• Implementation Details
  • Recording System
  • Camera Drivers
  • Streaming Video
• Conclusion
TelePresence

• telepresence = “the experience or impression of being present at a location remote from one’s own immediate environment”
  • capture: visual, auditory, tactile, etc. stimuli
  • delivery: real-time, fully transparent (or should be)

• existing solutions
  • target collaboration, medical applications, etc.
  • employ symmetrical, two-way communication
  • involve expensive & complicated hardware
PANOramic BroadCASTing

• our focus
  • inexpensive panoramic *broadcasting*
  • visual and auditory channels only
  • 360° full spherical video
  • multiple *active* viewers simultaneously

• system components
  • panoramic camera setup
  • central server + render & streaming servers
  • thin clients, e.g. web browsers & mobile phones
Functional Overview

Spherical Camera Head

Scene with Virtual Camera

JPG compressed images

Internet

Remote computer

Personalized Rendering Engine
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PanoCAST System Data Flow

• server to client
  • a small part of the whole spherical image
  • live streaming data
  • sync. video and audio

• client to server
  • camera control (direction and field of view)
  • discrete commands or continuous tracker data
PanoCAST Server Architecture

- camera to D-server
  - JPEG-compressed images over firewire
- D-server to VC-servers
  - full imagery over UDP
- VC-servers to S-servers
  - MPEG-encoded over RTSP
- S-servers to clients
  - personalized view over TCP/IP or 3G
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Spherical Panoramic Recording System

- key element of the system
- records nearly 360° video
- production is difficult: no frames, no “blind spots”
- video is captured on computer mounted on a mobile rack
- UPS, touch screen, external hard drive
Virtual Camera Drivers

- a possible means of video transfer
- video is mapped to virtual cameras ("fake webcams") in the OS
- all video grabbing applications can receive the image as usual
- standard video-IM clients (Skype, MSN) transmit the imagery
Internet-based Distribution

- second option: video streaming
- using MS MWV, Adobe Flash, etc.
- camera control:
  - keyboard strokes
  - mouse clicks or movement
  - head tracker
  - game controller
  - face tracking (image processing)
  - etc.
Conclusion

• multi-cast application
• real-time streaming & control of spherical video
• shared experience, individual perspective
• flexible content delivery (wired network, WiFi, 3G)
• possible fields of application
  • education
  • entertainment
  • ... ?

Thank you!