

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

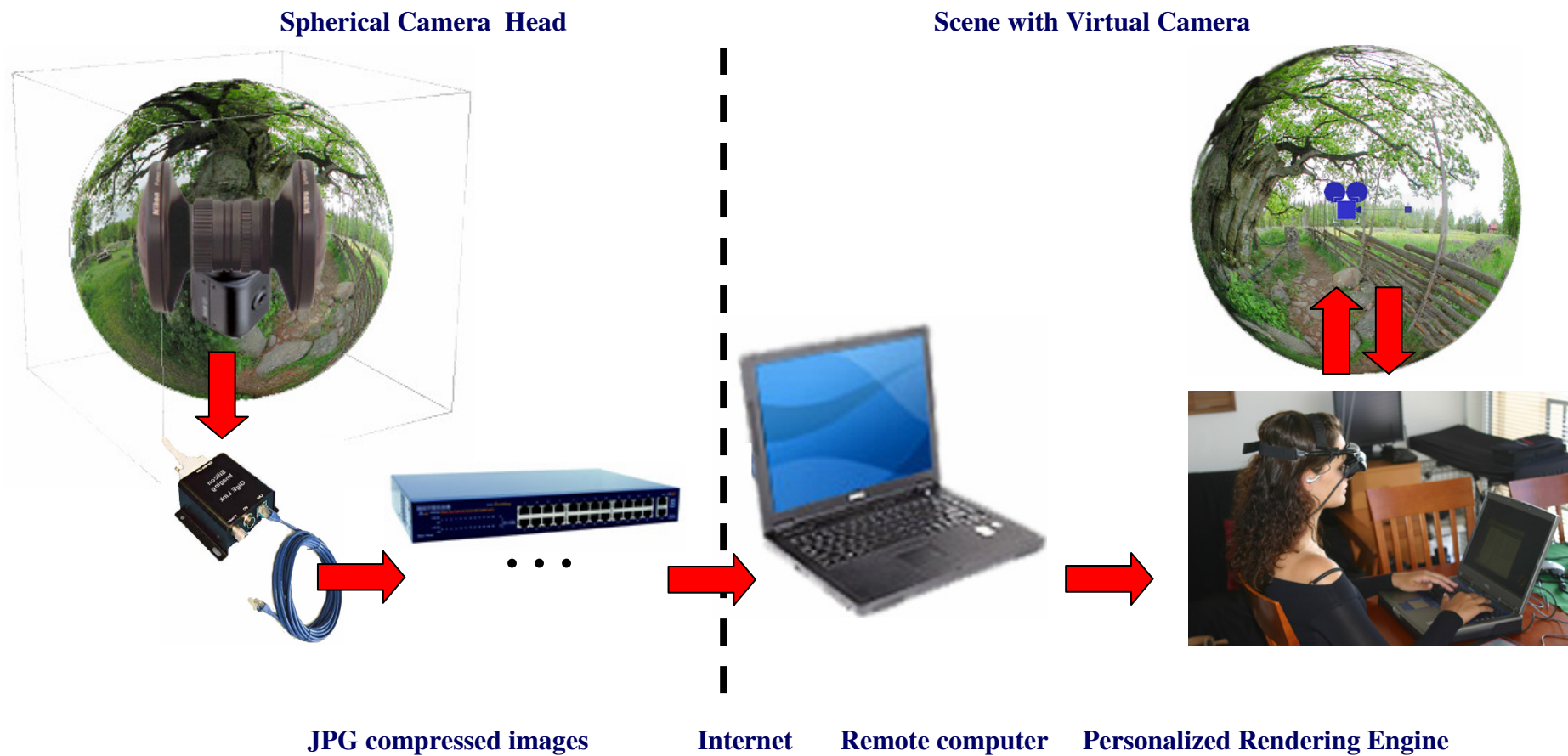
- **our focus**

- 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

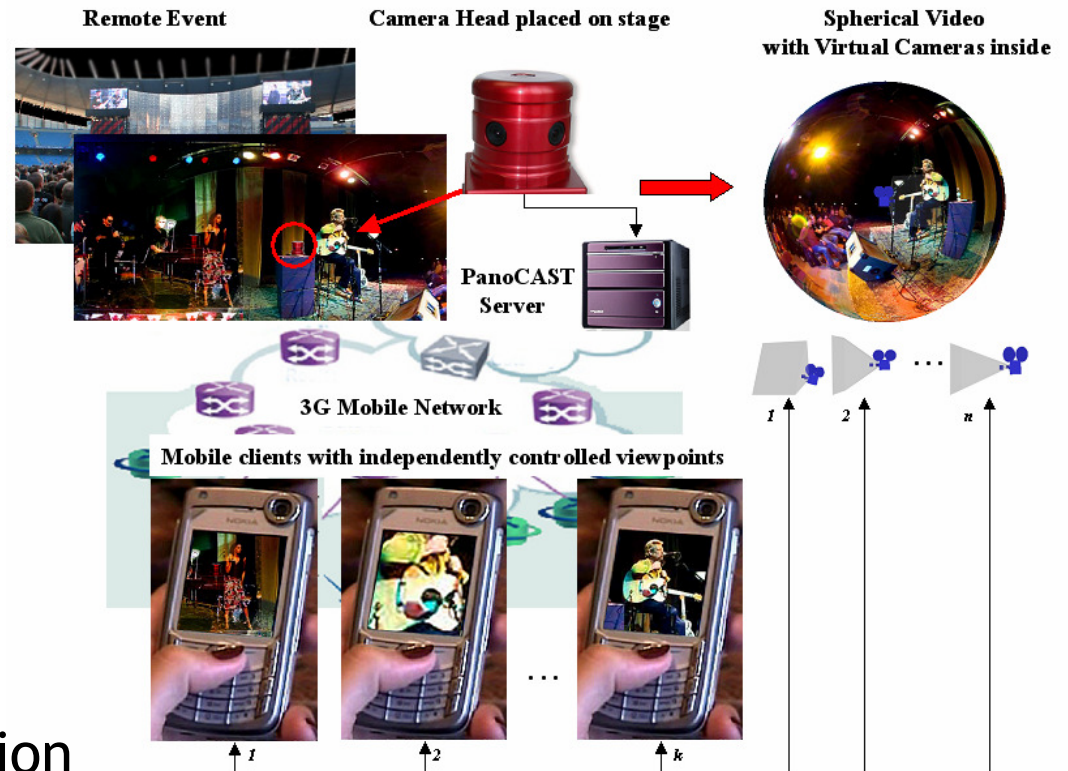


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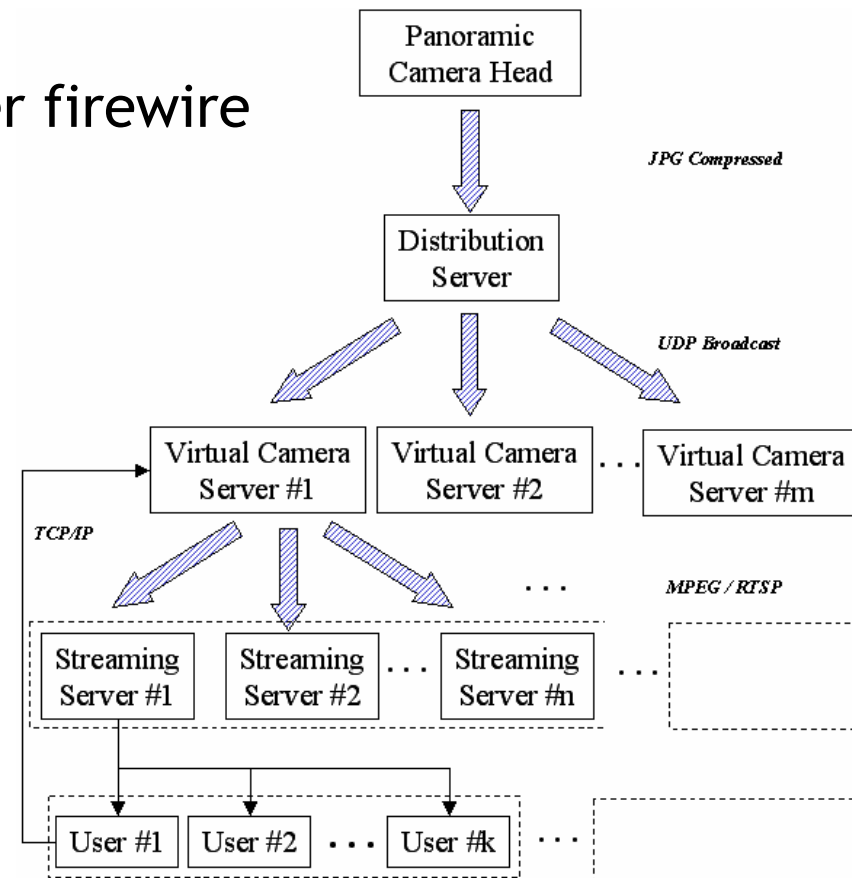
PanoCAST System Data Flow

- 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

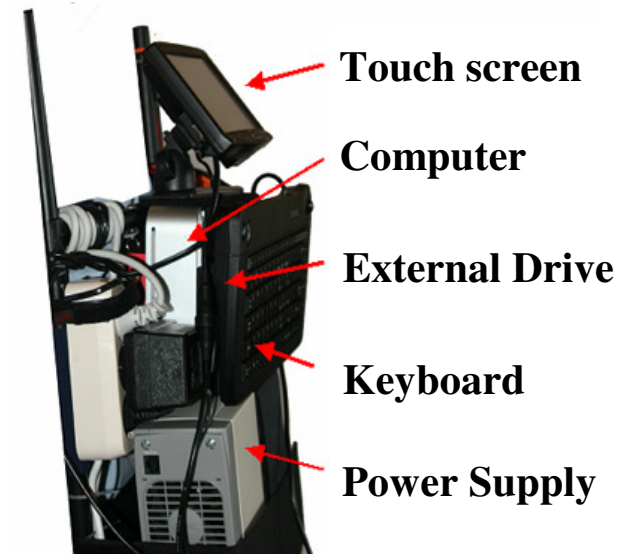


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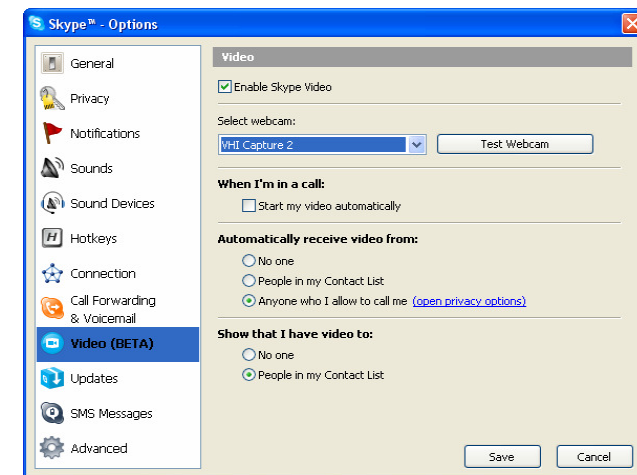
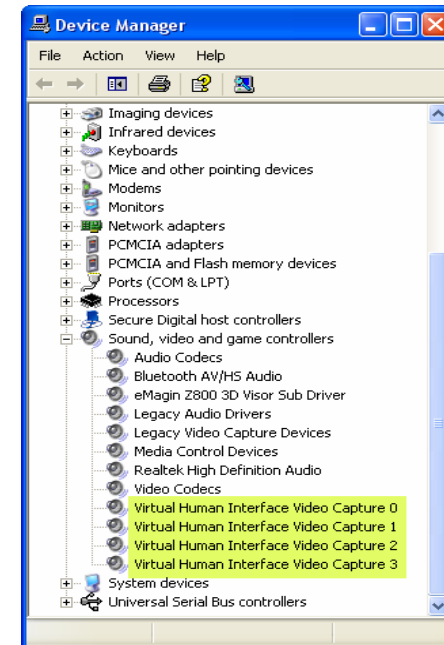
Spherical Panoramic Recording System

- 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



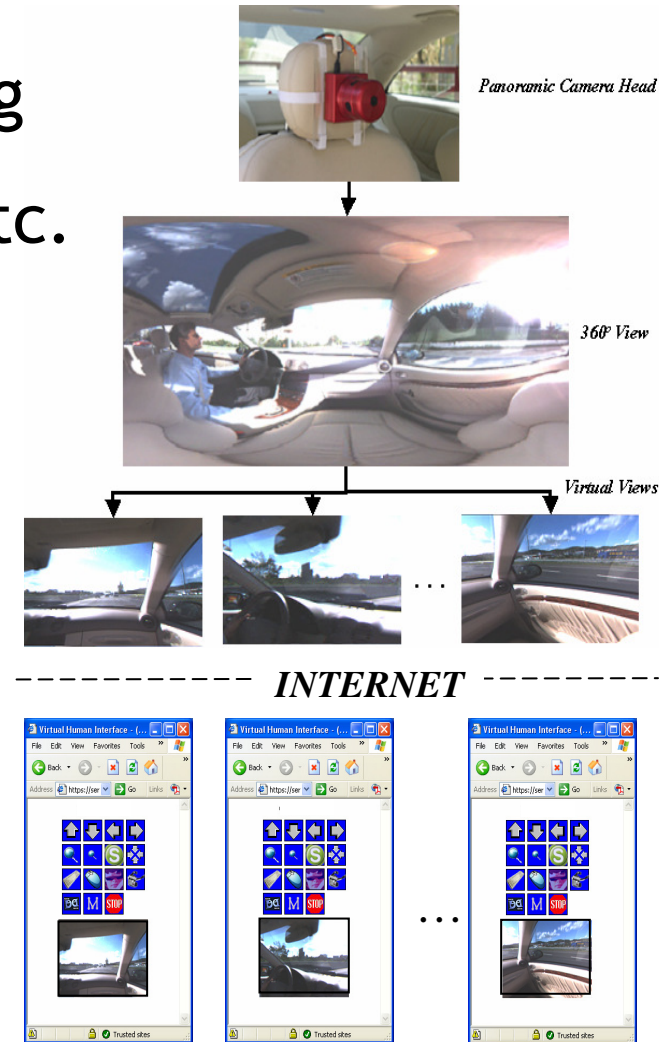
Virtual Camera Drivers

- 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!