Image-based Walkthroughs of Real-World Environments

In this demonstration, we will show an image-based rendering system that uses high-resolution omnidirectional video to enable users to explore remote real-world locations. A lightweight high-resolution multi-sensor camera is used to quickly film a tour through a large environment such as a garden or the interior of a house. During the off-line authoring phase, the raw video is processed to produce a stabilized high-quality, high dynamic range video using a combination of novel techniques. These include:

- A stitching algorithm to remove parallax in areas of image overlap,
- Registration and blending algorithms to produce high dynamic range video from alternately exposed video frames,
- Camera stabilization using point features and vanishing lines, and
- A video compression scheme that supports selective run-time decompression and random access.

The final user experience is enhanced with multimedia elements such as overview maps, video textures, pop-up high-resolution stills, and sound. The user controls the viewpoint and location through a standard game controller, and the resulting user experience feels very much like a computer game. The combination of high-resolution continuous imagery with real-time interactivity provides viewers with an unprecedented sense of presence in interesting real-world environments. We will provide a laptop PC on which people can experience the walkthrough themselves.

The next page of this proposal is the poster we plan to show at the demo site.
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System overview

Camera Calibration
- Camera geometry
- Lens geometric properties
- Lens photometric properties

Data Capture
- Capture/store visual data
- Capture/store audio

Authoring
- Constructing photo-bubbles
- Motion stabilization
- Audio source placement
- Object tracking
- Data compression

Offline

Online

Rendering and Navigation
- Selective decompression
- Game pad control
- Selecting navigation path
- Augmented reality

Snapshots of Interactive Demos

Home Tour
- Interactive tour
- Video-textures

Bellevue Botanical Garden
- Bifurcations
- Map control

High-end Home
- Bifurcations
- Map control

Interactive tour
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