

Novel View Generation from Multiple Omni-directional Videos

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Background

Telepresence allows users to experience a virtualized real world.

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Novel view generation gives users novel views synthesized from multiple images.


Virtual camera (arbitrary viewpoint)

Telepresence with arbitrary viewpoint
Possible to realize richer telepresence

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Previous Work

Omni-directional camera in remote site



User

User's view image

Telepresence system using omni-directional camera

- Little delay in changing view direction
- Unchangeable user's viewpoint

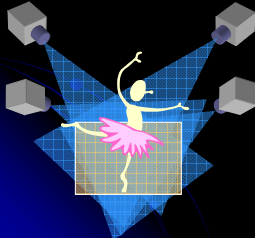
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Camera Configuration in Conventional Novel View Generation

Novel view generation from multiple cameras around a scene

- Limited object positions
- Visual Hull based rendering with voxel space

- Lacking background image
- Computational cost for a wide view



3D Room [Saito et al. 2003]

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Research Purpose

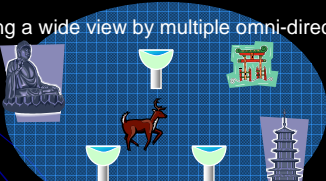
Telepresence with arbitrary viewpoint and direction

Requirements

- Wide view and dynamic environment
- Live video processing

Approach

- Capturing a wide view by multiple omni-directional cameras



- Segmenting a scene into static and dynamic regions
- Estimating efficient Visual Hull without voxel space by combining with calculation of dynamic regions

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Flow Diagram

Acquisition of multiple images from omni-directional cameras

Segmentation into static and dynamic regions

Static region: Novel view generation of static region

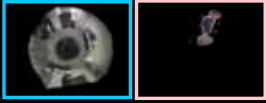
Dynamic region: Novel view generation of dynamic region

Synthesis of two novel view images

Complete novel view image

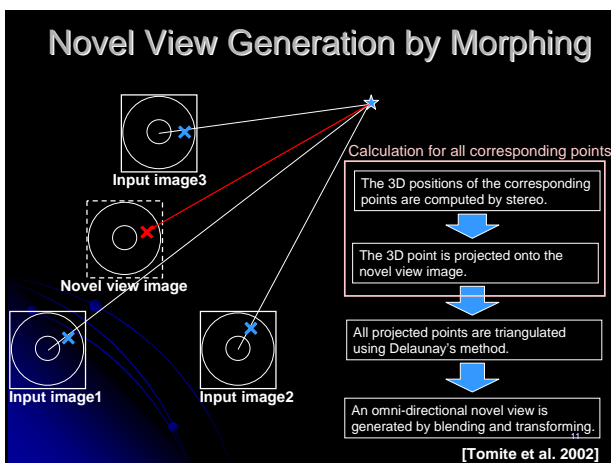
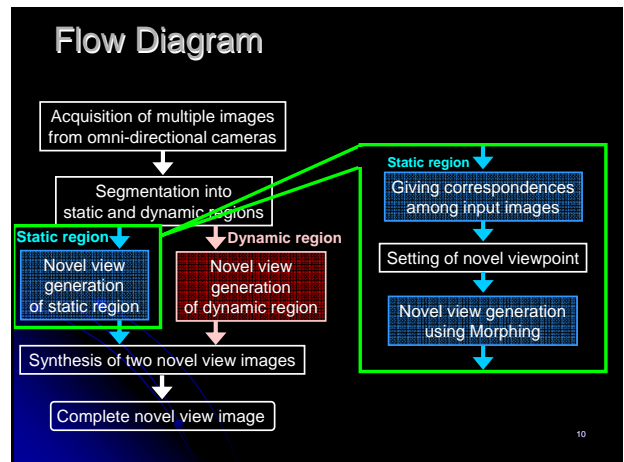
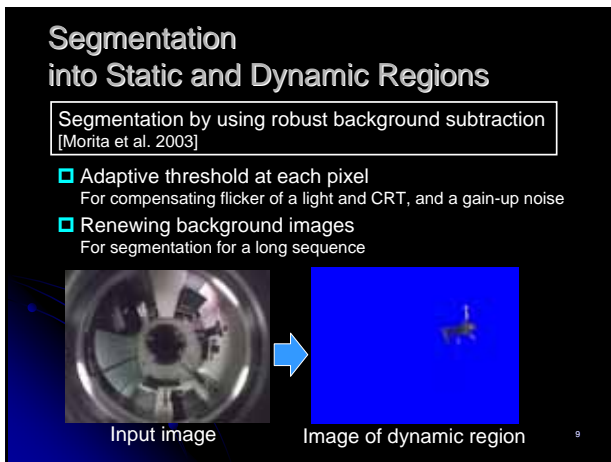
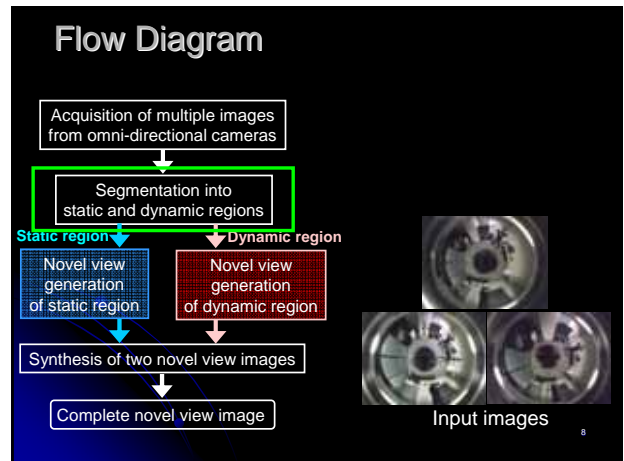
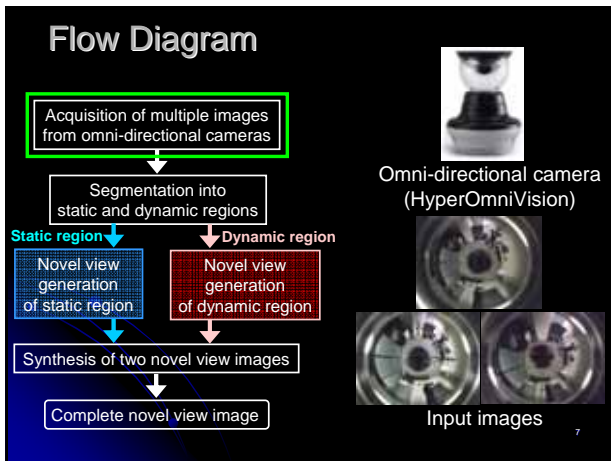
Precondition

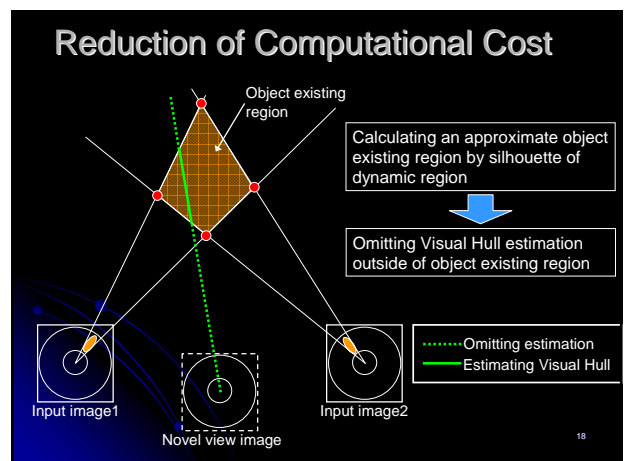
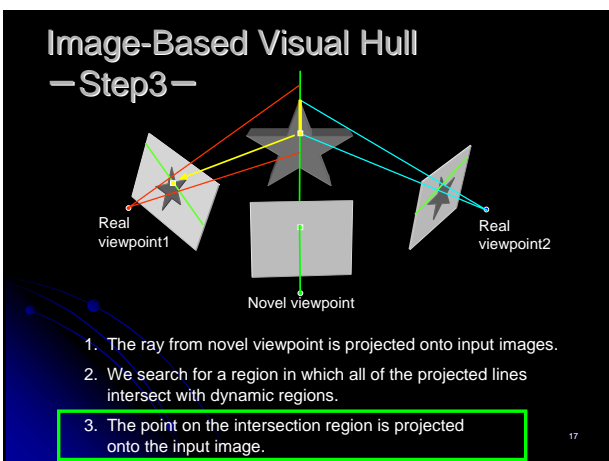
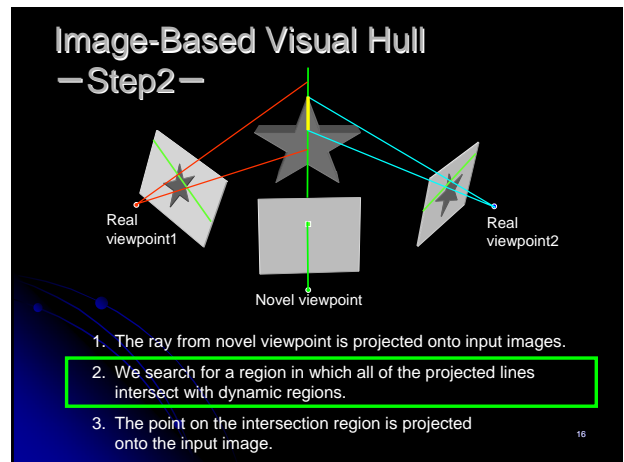
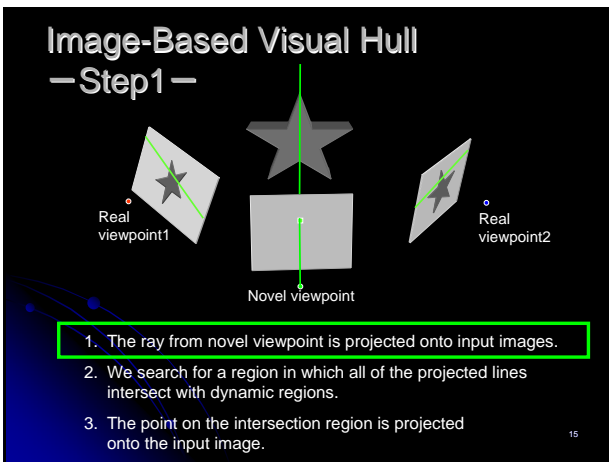
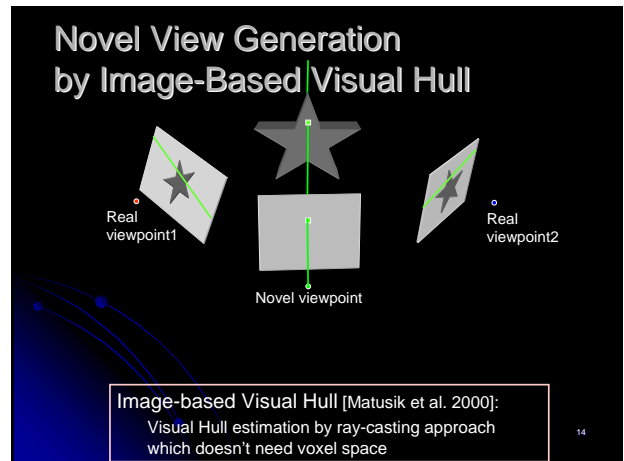
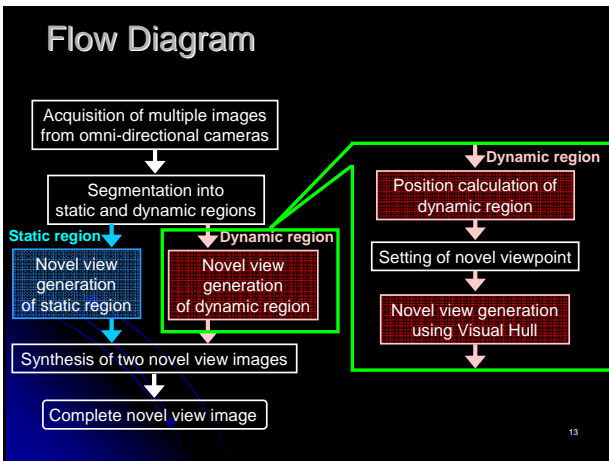
- Camera position and orientation are known.
- Cameras are fixed and synchronized.



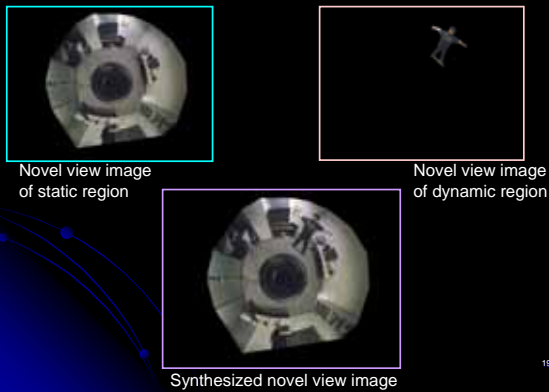
Novel view images of static and dynamic region

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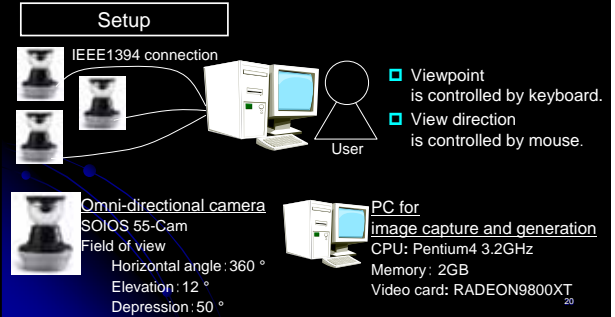
Synthesis of Two Novel View Images



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Experiment

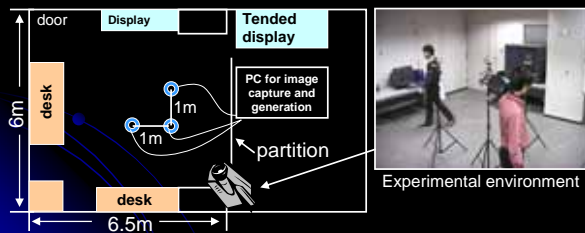
Novel view generation from live videos



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Environment of Experiment

- Corresponding points among input images have been given manually in advance.
- Regions for estimating visual hull are limited to user's view.



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Experimental Result

Experimental environment



Each frame of video is generated in 250ms.

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Summary

- Proposed method can generate a novel view image of a dynamic scene integrating morphing and visual hull.
- The prototype system has successfully generated novel view images from live videos.

Future works

- Improvement of generated image quality
- Constructing a networked system for many users

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