DYNAMIC OUTDOOR 3D SCENE RECONSTRUCTION

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Abstract

Existing systems for 3-D reconstruction require manual interaction and capture using multiple sensors to reconstruct the background scene and segment the dynamic foreground for reconstruction. The scenes are relatively large capture volumes with complex backgrounds and non-uniform illumination. This research is motivated by the demand for 3-D reconstruction of natural outdoor scenes to support film and broadcast production and focuses on a general solution to the problem of dynamic outdoor scene reconstruction from multiple view video.

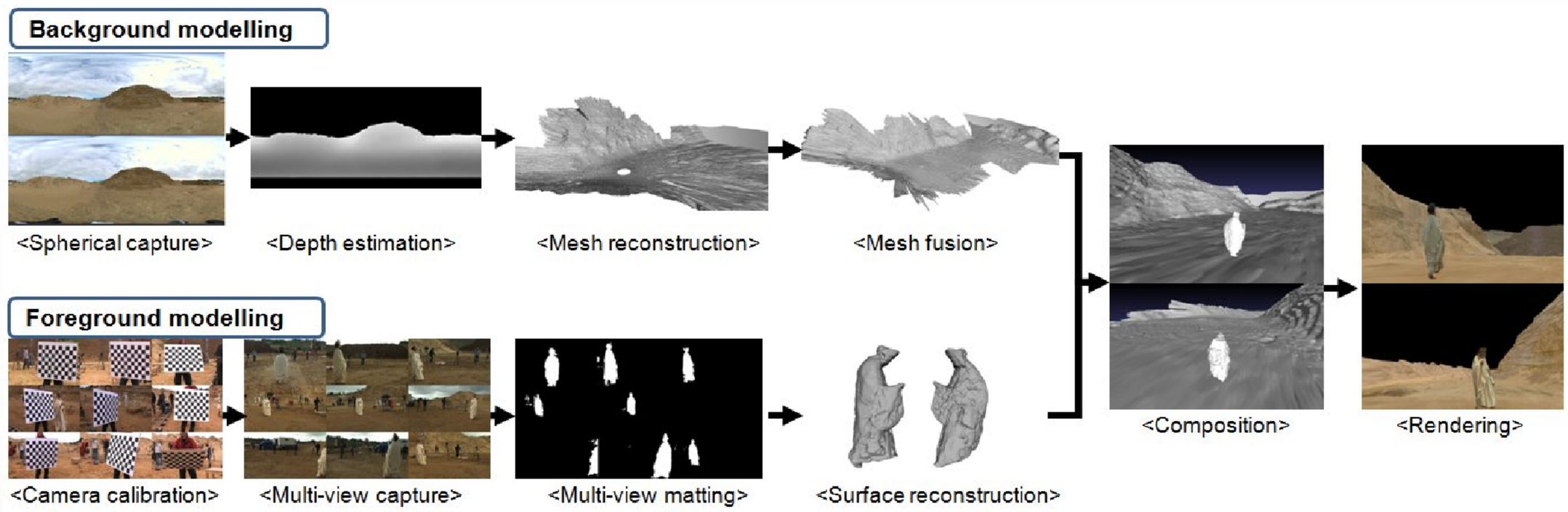
Requirements for 3D

Outdoor scene capture requires the following considerations:

- Large capture volume
- Natural scene backgrounds
- Uncontrolled illumination
- Portable capture equipment
- Robust to calibration errors
- Fast scene motion

Existing Method and Problem

In [1] Outdoor 3-D scene reconstruction is performed as follows: 1) Environment modelling; 2) Dynamic foreground scene reconstruction; and 3) Model Composition and Rendering. The pipeline is shown in Figure.

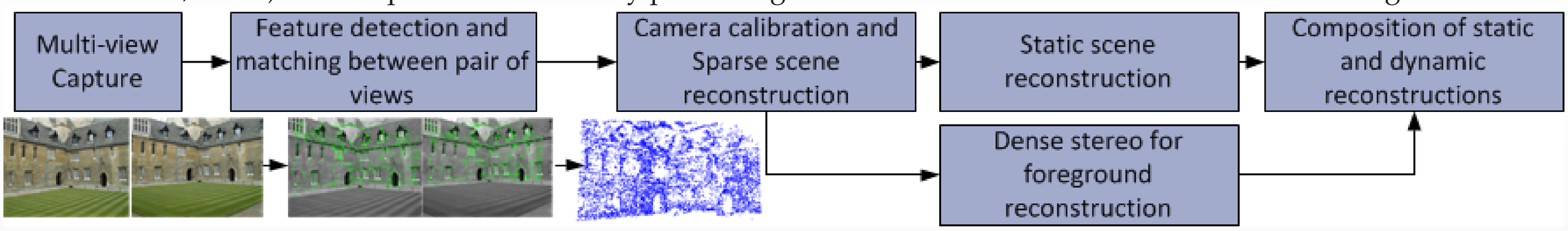


Existing 3D reconstruction techniques suffers from the following problems:

- Accurate segmentation of dynamic foreground objects - Poor automatic segmentation for complex scenes.
- Separate processing: Static background and dynamic foreground are processed separately leading to scale and alignment problem. [1] requires multi-camera views along with spherical capture to obtain scene reconstruction.
- Low speed performance

Research Plan

1) Sparse feature matching for camera calibration and reconstruction of the static scene structure, together with dense stereo for foreground reconstruction; 2) Integrating sparse 3D feature constraints with dense stereo matching to obtain a complete reconstruction; and 3) GPU implementation of key processing bottlenecks such as stereo and feature matching to be used.



References

[1] H., Kim, J., Guillemaut, T., Takai, M., Sarim, A., Hilton, Outdoor Dynamic 3-D Scene Reconstruction, in *IEEE Trans. Circuits Syst. Video Techn.*, 2012

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