



Large-Scale, Real-Time 3D Image Reconstruction Using Multi-View Stereo Algorithms

National Center for High-performance Computing, Taiwan

Ashley He

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Project Overview

The goal of my project is to implement a system that takes a large-scale set of two-dimensional images and output a three-dimensional stereoscopic image accurately in real-time.

The focus has been on creating and optimizing a system that integrates structure-from-motion (SfM), Clustering Views for Multi-view Stereo (CMVS), Patch-based Multi-view Stereo Software (PMVS), and Poisson Surface Reconstruction (PSR).

Progress

- Wrote code that successfully matches keypoints using SiftGPU. Also redesigned the code for keypoint detection to integrate directly with the code for keypoint match, thus eliminating the need for the keypoint matching code to spend significant amounts of time reading in the key files before performing the matching.
- Implemented a workaround solution to SiftGPU running out of memory when the images in the directory were too large.
 - ◆ When the program detects the image dimensions exceed the maximum (based on the amount of GPU memory), it prompts the user to approve or deny permission for the program to resize the images. If approved, the program then resizes the images to the maximum size without crashing SiftGPU.

Progress

- Added significant amounts of exception handling to better handle user/command-line input.
- Wrote two Python scripts that improves management of the directory. One of the scripts cleans the directory of the files and folders created when running the point-cloud reconstruction program. The other script moves those files and folders into one folder rather than deleting the files.

Future Work

- Parallelization of code utilizing SiftGPU, which is a challenging task due to how the code is structured.
- Rewrite Bundler so that the keys can be passed in directly instead of needing to be read from the *.key.gz files.
- A possibility to improve speed would be replacing SiftGPU's keypoint matching algorithm with KNN CUDA.
- Parallelization of PMVS2.

Culture

National Palace Museum, Shilin, Taipei



Red House Theater, Ximending, Taipei



(left) Hsinchu Municipal Glass Art Museum, (right) Hsinchu Zoo



Culture

Revisiting Tamsui



This time, I was able to see the beautiful sunset at Tamsui.

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