Project Report

Project 1) Multi-view Plane Sweep

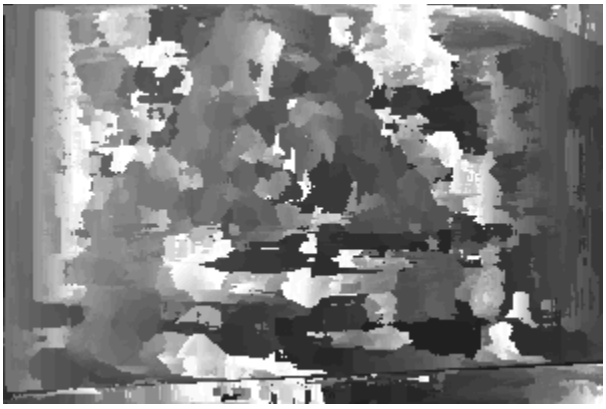
Dataset Source: https://icwww.epfl.ch/~marquez/multiview/denseMVS.html

- The images were resized from ***3072 x 2048*** to ***300 x 200*** to make it feasible to perform all computations in reasonable time.
- The K matrix was modified by pre-multiplying it with [0.097 0 0; 0 0.097 0; 0 0 1] to keep the field of view same for the resized image.
- Number of planes used in sweeping the scene: 40, the planes are orthogonal to reference camera unless specified. Note: range of depth values are integers from 1-40.
- Photo consistency measure: SAD
  window size for SAD: 13

Fountain

Observation: For a point in the reference image(point on the left below), the epipolar line misses the feature in the other images (as shows by the two points below). This leads to choosing a window size that is large enough to contain the atual feature.

Depth maps:

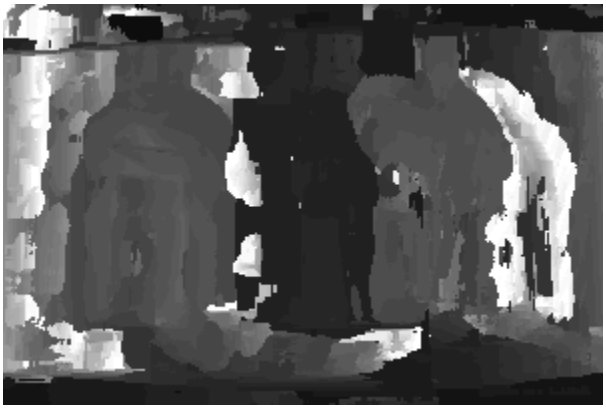


reference camera here is camera 4

reference camera here is camera 5

Herz-Jesu

Depth maps:



reference camera here is camera 4

reference camera here is camera 5

Castle Entry

Depth maps:

reference camera is camera 4

reference camera is camera 5

Planes used to generate the below depth map is represented by [1, 0, -1]

reference camera here is camera 5

- On changing the plane sweeping direction for the same camera, we can observe in the above two depth maps that the depth representation of the wall in the left and right parts of the depth maps changes according to the depth measured by the new sweeping directions.

- Changing the reference camera while computing depth maps allows us to sweep the space at an angle (between object and plane) different than the original and simultaneously compute depth maps for different point of views.

The error for depth values can be easily calculated given the ground truth depth values, like the teddy stereo pair assignment. The division of ground-truth values into foreground and background for the fountain dataset makes it difficult to create an error map in this project.

Cost aggregation: In using SAD as a photo consistency measure, the cost associated with each depth hypothesis is the sum of SAD scores generated from computing consistency between reference image patch and the left/right images.

Observation: Using plane sweeping to generate depth maps can be computationally heavy, but may also allow us to generate depth maps from multiple point of views