3D Semantic Scene reconstruction and depth map / wireframe / Point-Cloud from single RGB panorama scene (or Two views)

Computer Vision (CS6350)

TPA - 15

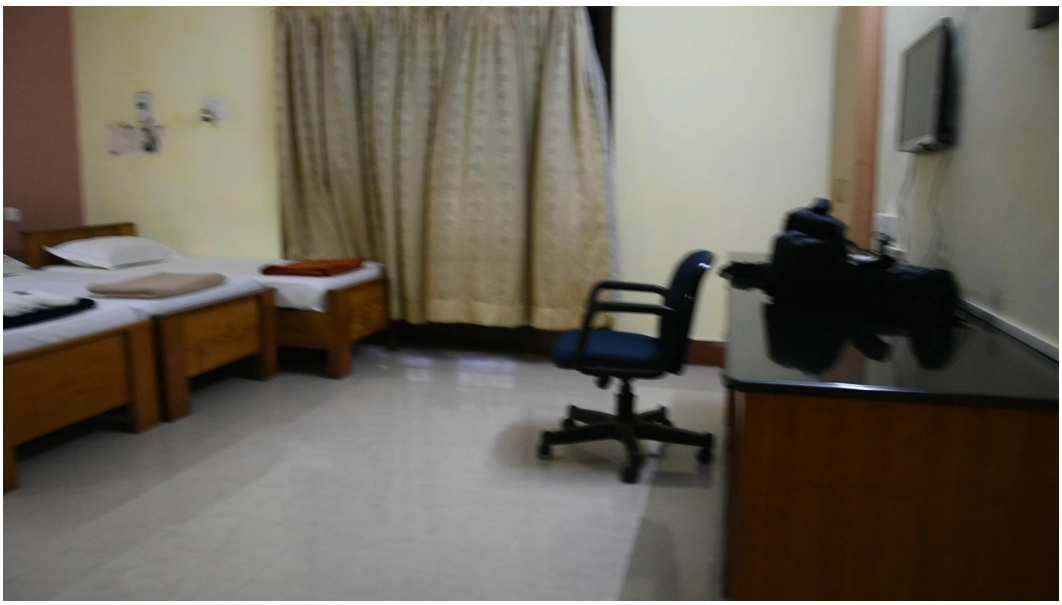
1. Problem Statement

The purpose of this project is to develop algorithms capable of three-dimensional semantic Scene Reconstruction from a single panorama scene (constructed from a pair of frames) and its corresponding semantic segmentation mask. The basic steps of a typical 3D reconstruction process are: predicting the depth map (disparity map), estimating depth of (visually) salient landmarks, tessellation to create a wireframe representation and finally rendering (preferably use OpenGL) with semantic colors of the various classes in the segmentation mask of the panorama. Depending on the model used, alternative methods can be adopted.

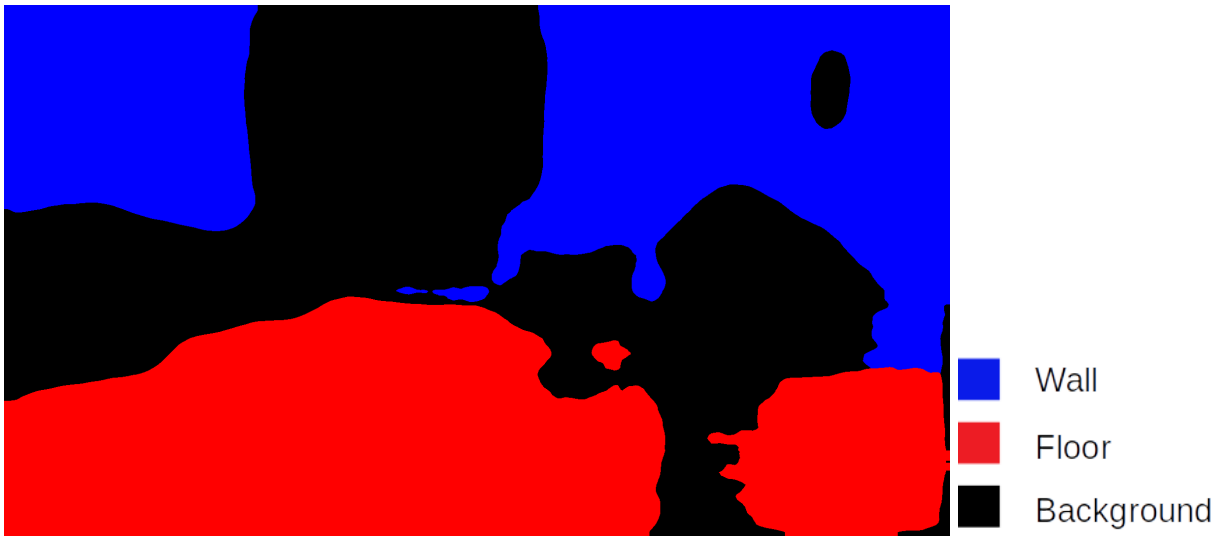
2. Input

- A panorama scene (or a pair of stereo frames)
- Segmentation mask of the panorama (or separately for both frames)

See examples in the following:



Input scene (not Panorama)



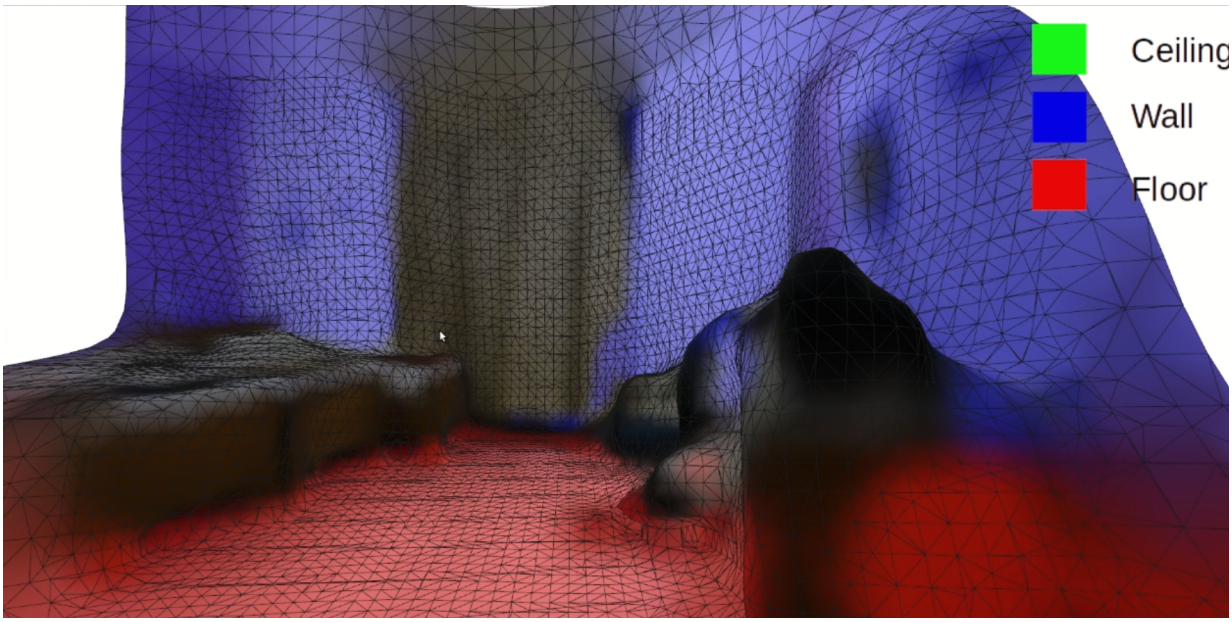
Segmentation mask

3. Output

• Depth Map ,Wireframe with semantic segmentation colors , Rendered 3D semantic scene with novel views

Depth map

3D Scene reconstruction



Semantic 3D wireframe

3D Semantic rendered Scene

4. Datasets

- KITTI Dataset

  link
-http://www.cvlibs.net/datasets/kitti/eval_object.php?obj_benchmark=3d

- NYU Depth v2 Dataset link -
  https://cs.nyu.edu/~silberman/datasets/nyu_depth_v2.html

- SapeNet Dataset link - https://www.shapenet.org/

Caution/Warning: Semantic scene Reconstruction from pan-video may be considered more challenging than from arbitrary (not perfect) stereo ; the former may get you more marks**.**

5. References

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[11] Ummenhofer, B., Zhou, H., Uhrig, J., Mayer, N., Ilg, E., Dosovitskiy, A., & Brox, T. (2017). Demon: Depth and motion network for learning monocular stereo. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition* (pp. 5038-5047). Code at:

https://github.com/lmb-freiburg/demon

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