3D Reconstruction from 2D Image Using Neural Network

First Update Report

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Summary of Work

Date	Summary
10/9	Achieved SUN RGBD dataset.
10/10	Achieved subset of SUN RGBD dataset. Achieved subset of NYU Depth Dataset V2.
10/13	Set up the computation environment for neural network.
10/25	Achieved LSUN dataset.
10/27	Achieved SUN RGBD dataset.

The main process that I have completed to this point is achieving a dataset for neural network training. While searching for available dataset for 3D reconstruction from 2D image, I found SUN RGBD dataset which contains features that I need for objective neural network. However, unexpected complications have come up. The dataset is provided in zip file. The zip file contains a lot of folders so a cpu of my device could not unzip the file. Therefore, I tried to find an alternative dataset. I found a subset of SUN RGBD dataset but it only contains image data. I found another alternative dataset, NYU Depth Dataset V2. But the dataset only contains image data too. So, I tried to find a dataset for room layout estimation and obtained LSUN dataset. Recently, I successfully unzip the SUN RGBD dataset in another device.

Analysis of Work

So far, I could get a dataset to utilize in modeling a neural network for 3D reconstruction from 2D image. I still need to work on modeling a neural network for extracting useful features from 2D image to predict 3D model of the image. These goals from the project proposal have not been met due to delay on obtaining the dataset. Before start building a neural network, I want to make sure that I have a suitable dataset which I can utilize for feature extraction. The SUN RGBD dataset provides the right data that I need, so I really want to work with the dataset. It took a lot of time to unzip the provided zip file.

Plan for Completion

With the dataset, I need to first create data loading function. I need to create a class for dataset which can provide utilities of the dataset. Then, I need to work on design a neural network for depth estimation with RGB image. Next, I will extend the model to use the extracted depth image with RGB image to perform layout estimation. Another stack of convolution neural network layers will be added at the end of previous model so that it can use extracted features from RGB image and depth image to predict edge points of a room. Then it will construct edges to estimate the layout of a room. The first objective of the project is reconstructing a 3D model of room layout with a 2D image. Next, I will further extend the model to detect objects in the image. I am planning to build a neural network model which can detect objects and construct 3D bounding boxes around the object. With 3D bounding boxes data, the model can locate the objects in the 3D room model from the first objective. I am expecting layout feature can be used to locate the boxes at the right position with depth information. The final objective of the project is reconstructing 3D model of each detected objects in the image.