Computer Vision Assignment 2 Report

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Camera Intrinsics

To calculate the intrinsics of the cameras, we used the calibration part of the assignment 1 code. Some videos had parts of it where the checkerboard pattern was unavailable by lighting or it being outside of the screen. Because of this, we chose the parts where the pattern had to most subsequent frames in which it was visible.

By running the intrinsics.avi for each camera in the calibration code, data was generated that contained the intrinsics parameters of each camera. We copied this data into the intrinsics.xml files for each corresponding camera.

Camera Extrinsics

To be able to do the extrinsics, we first had to add background images for each camera. We made a blend of multiple frames of each of the background.avi videos for a better background.png.

After adding these images, we ran the program to hand pick the extrinsics of the cameras. For the beginning corner, we picked the far right one in checkerboard.avi for camera 1. The points were picked by going down the longest side of the checkerboard first. In the following videos we picked the starting corner used in the extrinsics of camera 1 as starting corners.

After all extrinsics were done, we checked all the results to see if the axis alignment came out ok. After adjusting some wonky axes, the extrinsics and intrinsics of the assignment were done.

Background Subtraction

For the background subtraction, we experimented with applying erosion/dilation to the foreground image to remove outliers and improve the quality of the voxel reconstruction. These effects are applied after thresholding using the HSV values in the code. We tried different shapes and sizes for the kernels.

Initially, we tried a dilation followed by an erosion, but discovered that this (naturally) did not remove any outliers as they increased in size before applying the erosion. Therefore, we decided to apply the erosion first, followed by a dilation.

We tried a square kernel for both the erosion and dilation, but with a size of 3x3 for the erosion and 5x5 for the dilation. We thought this would create a more “solid” shape while removing outliers, and while it did indeed remove outliers successfully, the shape had become too “thick” in certain areas (such as the arms, legs and chair legs).

After several more adjustments, we discovered that a simple 3x3 erosion with a square element followed by a 3x3 erosion with the same square element, along with a thresholding of the HSV values at **10**, **49**, and **47**, respectively, resulted in the most pleasing result: a voxel reconstruction that has a similar shape to the input videos.

The result can be seen in the following video, along with the footage of each individual camera used: https://www.youtube.com/watch?v=x8v7o7-kcic