

Project Midterm Report

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Assignment: Similar to the project proposal, please follow the same format to report 1-page project midterm report, which mainly includes what you have done and what to do next.

Abstract:

Convert 2D Image to 3D Model

The goal of this project was to find technologies to allow the conversion of a 2D Image or series of 2D Images into a 3D model for use in 3D art projects, game development, etc...

There seem to be quite a few methods of 2D Image to 3D Model Conversion. However, many are still in the research phase and are unpolished. I've also found that many technologies have outdated packages that make running the code problematic. Despite that, a few technologies have been uncovered that work.

The Operating Systems I am building this project on are:

- 1) Windows 11 64-Bit
- 2) Linux Ubuntu 22.04 64_Bit

Using these Graphics Cards:

- 1) 1x Nvidia 3090 Desktop GPU
- 2) 1x Nvidia 4090 Laptop GPU

Technologies successfully able to run:

- 1) **Kaolin package and GUI Application:** A package developed by Nvidia and built on top of Pytorch. Able to generate synthetic training data from a preexisting 3D model and use that to train a model which can then be used to take in similar images and produce models off them. Works well in Windows and Linux OS. But seems to work better on Windows.
- 2) **Colmap:** Used a lot for constructing 3D environments and 3D models using many 2d Pictures. Relies on various machine learning and computer vision algorithms. Written mostly in C++ so it was most likely developed on Windows and seems to work the best on the Windows OS.
- 3) **Pytorch3D:** a package developed by Meta and built on top of Pytorch to work with 3D Data. Has many uses but for the purposes of this project, is able to take in a 2D image and convert to 3D model. This package is only able to run reliably on the Linux Kernel.
- 4) **PifuHD:** A package developed by a research group funded by Meta. This is also built on top of Pytorch. With the model I have trained for this network, it is used to convert a single image of a person's body and convert it into a rough 3D model. Easiest to run on the Linux Kernel.

What to do next:

Now that the environments have been successfully set up and the projects are tested and proven to work. The next goal is to input my own data for training and to produce my own 3D models. I'll then refine the models and add them to an existing 3D art project made the manual way by myself.

Also, will seek to refine the code and packages for a later date so that I might integrate into a unified application.

Sources:

1. **Colmap:** <https://colmap.github.io/license.html>
2. **PifuHD:** <https://github.com/facebookresearch/pifuhd>
3. **Kaolin:** <https://github.com/NVIDIAGameWorks/kaolin>
4. **Pytorch3d:** <https://github.com/facebookresearch/pytorch3d>