3D Model From 2D Images

Project Report

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Summary

This document presents an overview of 3D modeling, discussing the history and origins of 3D modeling. I will be discussing my project and going through the results and giving a step-by-step procedure. I also will be incorporating literature research that relates to my project.

Introduction/Background

3D modeling is the process of making a three-dimensional image using computer software of an actual object. The first breakthrough in 3D modeling was in 1963 when a computer scientist from the USA named Ivan Sutherland wrote a program that was called sketchpad. Ivan Sutherland said his goal was “to surround the user with three-dimensional information”. This helped further the technology used for 3D modeling and advanced the computer graphics field to what it is now. When it comes to 3D modeling there are many types like wireframe models, in which all the surfaces are outlined in lines and visible for us to see, we are also able to see the internal components which we usually are not able to see. The wireframe is also known as the least complex method in 3D modeling. There is also surface modeling which is more complex compared to wireframe modeling. Surface modeling allows for more realistic and detailed visualization. It defines the surfaces and edges of a 3D model by using a polygonal mesh. Solid modeling helps make every surface geometrically correct, it also helps us create an animation of the 3D models. Geometric shapes like spheres, c cubes, and cones can be used to create 3-dimensional designs. 3D modeling is used for many things like the medical field. Doctors might use 3d models of a specific body part to visualize it and practice their surgery with a 3D-printed body part before doing the actual surgery. They also can use it for sizing and pre-fitting medical equipment.

Analysis

In my project, I answer the following questions: how can I create a 3D model from 2D images that I have captured from a real-world object? At the beginning of this project, I had to

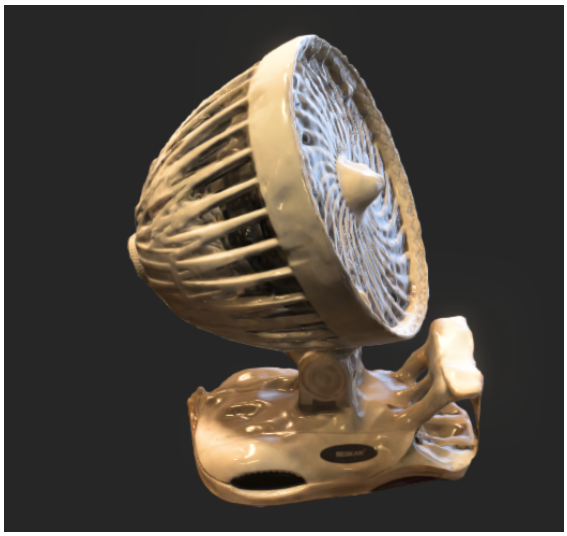
make the decision of what object I would use to create a 3D model. At first, I decided that I will use a smaller object with not a lot of detail because it will be easier to capture it and create a much cleaner 3D model compared to a very complex and detailed object. A book written by Héno, Raphaële, author.; Chandelier, Laure called

3*D modeling of buildings: outstanding sites talks*

about the steps and background information about how we can create 3D models of our urban environment. The author says that "Some building specifications focus more on visual appearance than on overall accuracy. In this case the demands on the data acquisition phase will be relaxed". This tells us that some objects will be much easier to create a 3D model out of because they have less detail. But some complex objects with lots of detail will require us to do a bit more work and take more photos. For my project, I decided to make a mini fan. I first started by taking pictures of the fan from many different angles. I took over 60 photos from all different angles. Then I attempted to use meshroom which is a software used to import images and then the software will go through the images you imported and create a 3D image out of the images. I had many problems with meshroom first was not processing the images I imported because the lighting was not the same in all the images. So I decided to use a different software called Polycom. An article called *Creating 3D models of transportation vehicles using photogrammetry,* this article was written by Matys, Marian ; Krajcovic, Martin ; Gabajova, Gabriela. This article explains how we can use photogrammetry as a way to create 3D models. This article helped me understand that software plays an important role in creating 3D models from 2D images. In this article, they talk about photogrammetry which was the process I used to create the 3D model of the fan. The author writes "Photogrammetry is a process that allows the users to reconstruct the object position, size, shape or orientation using conventional or digital

photos". They give us a step by step process of how we can use photography to create a 3D model and they also recommend using meshroom as a software tool. I decided to use a different software called Polycom which is an app you can download on your phone. I first took 60 photos using the Polycom app on my phone and it processed the photos, this took 6 minutes for me but depends on the wifi speed. Afterward, it created a 3D model of my fan and I was able to cut out unimportant detail using the edit button in the app. I prefer polycam compared to meshroom because lighting does not affect your 3D model when it comes to Polycom and it can process the images very fast compared to meshroom. I created a 3D model from 2D images by using a software called Polycom and taking up to 60 images of my object from different angles and I was able to get a very detailed 3D model of my object.

Results/Images



InConclusion

In this paper, I discuss how I created a 3D model from 2D images that I have captured from a real-world object. I give a background about the history of 3D modeling and the different types of modeling. I give a step-by-step procedure of how to create a 3D model, I also talk about my struggles when it came to this project.

References/Citation

https://poly.cam/

Héno, Raphaële, and Laure Chandelier. 3D Modeling of Buildings : Outstanding Sites. 1st edition, iSTE, 2014.

Matys, Marian, et al. “Creating 3D Models of Transportation Vehicles Using Photogrammetry.” Transportation Research Procedia, vol. 55, 2021, pp. 584–91, doi:10.1016/j.trpro.2021.07.025.