Model Dicer

Model Decomposition for Enhanced Manufacturability

# Goal

My research is centered on breaking a complicated model into smaller pieces, each of which can be manufactured independently. They may be manufactured using the same process, or different processes.

# Demo

https://youtu.be/\_mcrYmvRmjU

# Operation of Project

Numpad 1, 2, and 3 will show possible cutting planes for the part. Once you’ve selected a cutting plane and want to go forward with the cut, press the space key.

The “w” key will scale one of the pieces up.

The “c” and “d” keys can be used to manipulate parts if the mouse is hovering over them.

# Implementation Details

## Modeling

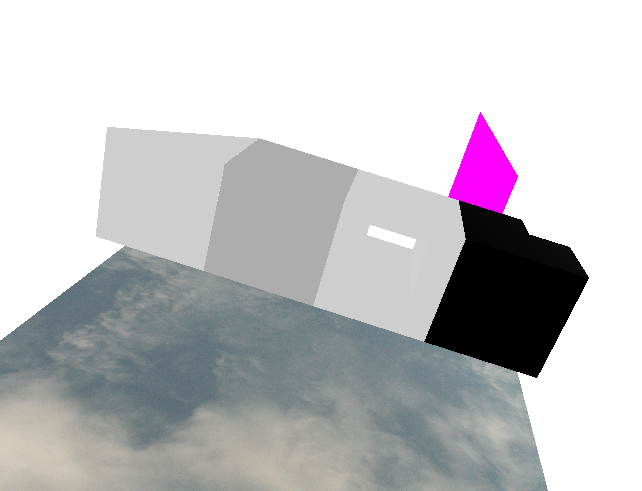
I generated a model in Blender and broke it into 4 objects, each of which were exported as .obj files. 3d planes are used to show cutting planes as well as to make a “table” surface, which is useful for keeping a common reference.

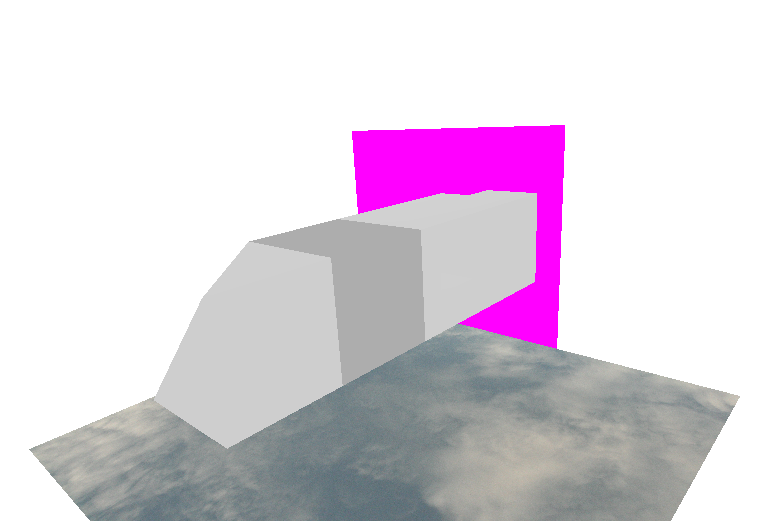
## Light

The lighting is very simple – the minimum required. The geometries were not particularly exciting, so adding spotlights would have done little to enhance the program.

## Appearance (Material)

I was trying to avoid an artifact when OpenGL cannot determine which item is in front of the other. I attempted to disable the GL\_DEPTH\_TEST when rendering the plane, but found the results to be strange. A combination of a steel work surface and clouds texture the horizontal plane.





## Navigation/Interaction

The keyboard callbacks were relatively simple to implement. I created a couple Boolean variables, and based on their value decided whether or not to render the planes. Hovering over an object and pressing “c” or “d” will move the object. Numpad 1, 2, and 3 will display possible cutting planes, and pressing “space” will cut the model there. There’s currently a problem with the 2nd cutting plane, in which it displays the objects as 3 chunks.

## Keyframe Animation

I attempted some animation, but ran into some challenges with the implementation. It would simply loop through forever. This was disabled for the final version.

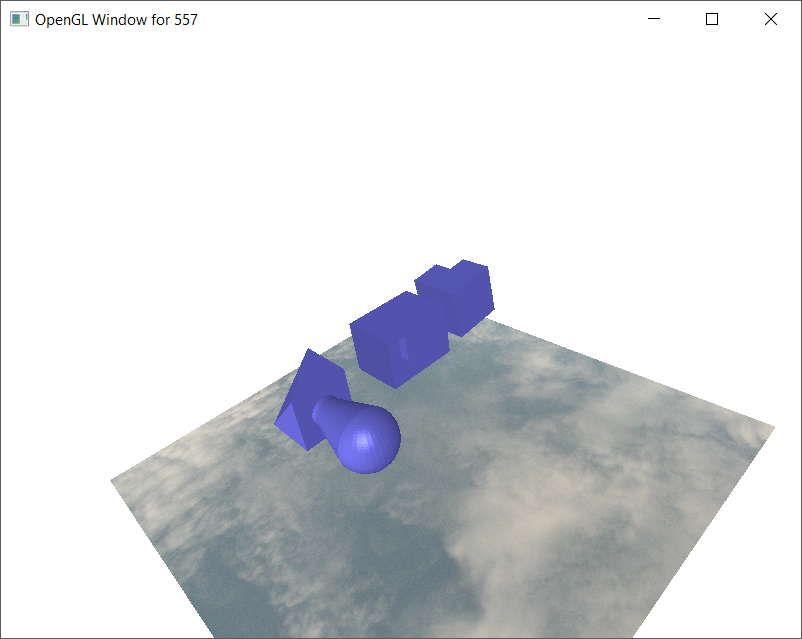
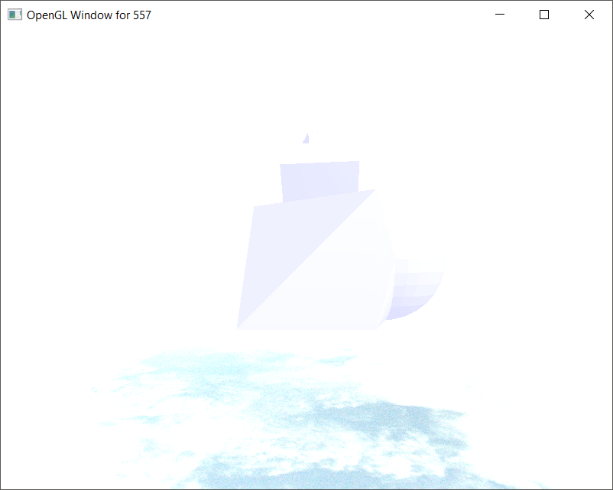
# Known Problems

Sometimes the application will run into an error right after compiling and launching. I have not been able to find a pattern to this. Simply stopping the program and running it again (without compiling) often fixes the issue.

When clicking to rotate the model, it will reset the view of the camera to the original orientation.

Sometimes, without a noticeable pattern, everything gets a washed out appearance. Recompiling seems to help, but not always.

Cutting on plane “2” will result in 3 chunks. There’s an error in the translations of the parts.



# Data Sources

Cloud texture - <http://www.texturemate.com/image/view/1095/_original>

Table texture - <http://www.texturemate.com/image/view/5584/_original>

# Rubric

