Final Project

The final project will be of your own design but it must be fully 3D and include the following:

- Update project name in all relevant files, includes a relevant favicon (see flight sim).
- Animation that is at least semi-independent of user interaction (can be started or manipulated due to user interaction but continues independently)
- Scenes that are complex enough to require the use of groups
- Textures as primary coloring of an object (but not directly part of an externally loaded model)
- Mouse and/or Keyboard controls that are not just orbit controls or any other single built-in controls
- Appropriate lighting/shading, geometry, transformations, and cameras
- Reuse of geometries/materials/other and an efficient animation loop

It must also include ***at least three*** of the following intermediate topics:

- Complex models loaded from external sources
- Translucent Materials
- Textures as non-primary-color source (bump, normal, displacement, AO, light, metalness, roughness, specular, emissive, or alpha map) that is not part of an externally loaded model.
- Texture generated in a Canvas, from an array, or from a video (maybe be done with the above).
- Complex geometries generated in code.
- Reflector objects
- Reflection/Environment Maps that is not part of an externally loaded model.

It must also include ***at least two*** of the following advanced topics:

- Using EffectComposer with multiple passes
- Creating a custom shader not provided in any add-on
- Sprites and/or Points (typically used for things like snow, rain, stars, HUDs, faux-3D style)
- Morph Targets and/or Skeleton Animation
- Using a physics engine synchronized with your scene (e.g. Rapier)
- Spatial sound

Based on the type of project you choose, it must also follow these requirements:

- Games: must have at least 3 levels or difficulties
- Models/Simulation: mouse/keyboard don't just change view but interact with the system
- Data Visualization: must be able to import or use live data

Covering a topic must not feel forced, must make a significant and useful difference, and may not be done trivially (e.g. just doing exactly what was done in class/book).

Possible extra credit for incorporating advanced features of JS/ThreeJS not discussed in class. Some ideas are:

- Playing and recording audio [just playing audio is not sufficient]
- Using the webcam (it can be used as a texture)
- Active client-server communication (e.g. WebSocket)
- Background processing threads (e.g. Web Workers)

You must submit an idea for your project by Monday Nov 10 via Canvas. I will reply by the following Friday if they are approved or need adjustments. Make sure the submission says how all requirements will be covered.

Your project will be turned in via Gitkeeper by Monday Dec 8 1pm. You will present your work during the final exam period from 1-3pm. Your presentation will be 12 minutes. You must demo the program, explain how to interact with it, describe any special features you have added, and talk about at least 2 challenging programming aspects that you had to go through while making the program. You may choose to use slides in addition to your demo program but that is not required.

GRADING

There are 100 pts and they are broken down as follows:

- 4 pts each of animation, complexity, interaction, texture, lighting/geometry/transformation/camera
- 7 pts for each of 3 intermediate topics
- 10 pts for each of 2 advanced topics
- 15 pts for good code quality including good object reuse, efficient animation loop
- 15 pts for polish including your informing the user how to use the program and title/favicon
- 9 pts for your presentation

Full use of non-discussed advanced features is eligible for up to 10 extra credit points.

PROJECT IDEAS

These ideas are just starting points and will need more details. You can also have a completely distinct idea.

Data Visualization

- 3D sound visualizer

Simulations

- Solar System
- Sky (based on date and time, day/night, sun/stars/moon, moon phases, moon positioning, selectable items tell you what they are)
- Fish Tank
- Interactive Moravian Campus that allows multiple people to join, move, and talk

Games

- Rubik's Cube
- Billiards
- Car Racing
- Maze/Puzzle (with POV of being in the maze, has challenges in parts of the maze to get through)
- Board Game Pack (Chinese checkers, chess, …)
- 3D Snake (snake travels in 3D, not just a 3D view of a 2D snake game; view from snake's perspective)
- 3D Asteroids (movement is in 3D, not just a 3D view of a 2D asteroids game)