CS 450: Assignment 04

Programming Assignments (95%)

- Copy src/app/Assign03.cpp and name it **src/app/Assign04.cpp**
    - Similar to before, make sure the shaders are loaded from the **shaders/Assign04** folder (instead of shaders/Assign03)
- Make a copy of the shaders/Assign03 folder and name it **shaders/Assign04**
- Modify **CMakeLists.txt** by adding the following lines to the end of the file:

```
add_executable(Assign04 ${GENERAL_SOURCES} "./src/app/Assign04.cpp")
target_link_libraries(Assign04 ${ALL_LIBRARIES})
install(TARGETS Assign04 RUNTIME DESTINATION bin/Assign04)
install(DIRECTORY shaders/Assign04 DESTINATION bin/Assign04/shaders)
```

- Make sure the sample configures, compiles, and runs as-is

Assign04.cpp

- **Add the following includes (if they are not already included):**
    - #include "glm/gtc/matrix_transform.hpp"
    - #define GLM_ENABLE_EXPERIMENTAL
    - #include "glm/gtx/transform.hpp"
    - #include "glm/gtx/string_cast.hpp"
    - #include "glm/gtc/type_ptr.hpp"
    - #include "Utility.hpp"
- **Add a global float *rotAngle* to hold current local rotation angle in degrees (default value 0.0f).**
- Add the following function for generating a transformation to rotate around the LOCAL Z axis: **glm::mat4 makeRotateZ(glm::vec3 offset)**
    - Generate transformation matrices (with glm) and form a composite transformation to perform the following IN ORDER:
        - Translate by NEGATIVE offset
        - Rotate *rotAngle* around the Z axis
            - **REMEMBER TO CONVERT rotAngle to RADIANS!!!!**
        - Translate by offset
    - Return the composite transformation

- Add the following function for rendering a scene ***recursively***:
  void renderScene(
  vector<MeshGL> &allMeshes,
  aiNode *node,
  glm::mat4 parentMat,
  GLint modelMatLoc,
  int level)
    - Get the transformation for the current node, which is an aiMatrix4x4: ***node->mTransformation***
    - Convert the transformation to a ***glm::mat4 nodeT*** using the aiMatToGLM4() function
      - This function is defined in include/Utility.hpp/cpp
    - Compute the current model matrix: ***glm::mat4 modelMat = parentMat*nodeT***
    - Get location of current node by:
      - Grabbing the last column of modelMat, which is a vec4
        - Remember that glm matrices are stored in column-major format, so modelMat[3] gives you the last column.
      - Convert this vec4 to a vec3 pos
    - Call makeRotateZ(pos) to get a proper local Z rotation: ***R***
    - Generate a temporary model matrix model matrix as:
      - ***glm::mat4 tmpModel = R * modelMat***
    - Use glUniformMatrix4fv() to pass in ***tmpModel*** as the model matrix
    - For each mesh in the NODE (***node->mNumMeshes*** meshes total)
      - Get the index of the mesh: ***int index = node->mMeshes[i]***
      - Call drawMesh() on each mesh ***allMeshes.at(index)***
    - Call renderScene() on each child of the NODE (***node->mNumChildren*** children total)
      - List of meshes and modelMatLoc: same as passed in
      - Node: ***node->mChildren[i]***
      - Parent matrix: ***modelMat***
        - NOT tmpModel!
      - Level: ***level + 1***
- **Add a GLFW key callback function:**
    - If the action is either GLFW_PRESS or GLFW_REPEAT, check for the following keys:
      - GLFW_KEY_ESCAPE
        - Call glfwSetWindowShouldClose()
      - GLFW_KEY_J
        - Add 1.0 to *rotAngle*
      - GLFW_KEY_K
        - Subtract 1.0 from *rotAngle*

- **In the main function:**
    - **Call glfwSetKeyCallback() to appropriately set the key callback function**
    - **AFTER the creation of the shader program but BEFORE the rendering loop:**
        - Get the model matrix location using glGetUniformLocation()
    - **INSIDE the drawing loop:**
        - INSTEAD of the loop with drawMesh calls, call renderScene()
            - Node: ***scene->mRootNode***
            - Parent matrix: ***glm::mat4(1.0)***
            - Level: ***0***

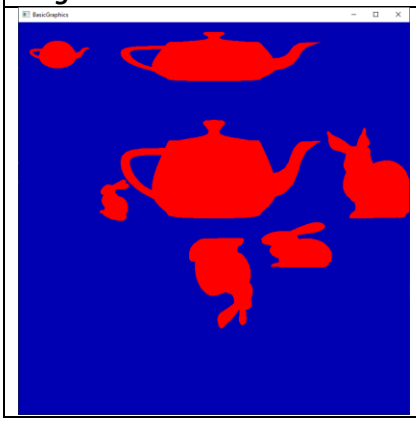
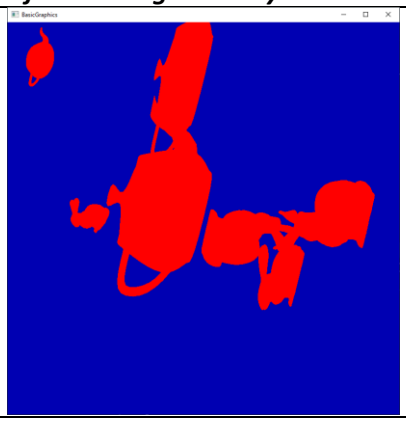
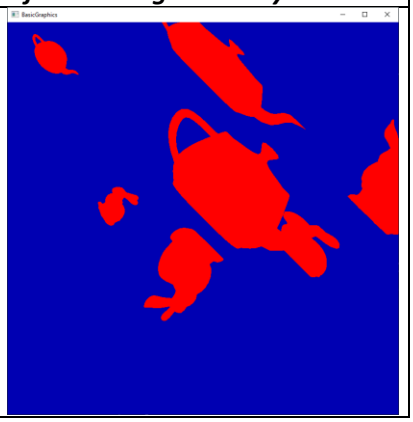
Basic.vs

- Add uniform variable *modelMat* of type mat4
- For gl_Position, multiply modelMat by objPos (IN THAT ORDER).

Screenshot (5%)

The previous models should load as before (and should rotate properly). For the screenshots, you will load **bunnyteatime.glb**, which has a more complex scene graph.

For this part of the assignment, **submit THREE screenshots** of the application window; your screenshots should look like the following (barring the specific color choices of the objects and background):

Original	***After holding the J key***	***After holding the K key***
		

Grading

Your OVERALL assignment grade is weighted as follows:

- 95% - Programming
- 5% - Screenshots