Narrative for Artifact Inclusion in ePortfolio

Zaffar Shiekh

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Federico Bermudez

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**Artifact Description**

The artifact I have chosen to include in my ePortfolio is a **3D Scene Renderer** project. This project was initially created during the CS-330 Computational Graphics and Visualization course. The primary objective of this artifact was to demonstrate the ability to manage and render 3D objects within a viewport, utilizing algorithms and data structures for efficient computation and rendering processes.

**Justification for Inclusion**

This artifact has been included in my ePortfolio because it showcases a comprehensive application of algorithms and data structures in a real-world context. Specifically, the following components of the artifact highlight my skills and abilities in this area:

1. **Camera Manipulation Algorithms**: The project includes advanced algorithms for camera manipulation, allowing for smooth transitions and adjustments in 3D space. This involves handling user inputs and updating the camera's position and orientation accordingly.
2. **Lighting and Shading Algorithms**: Implementing dynamic lighting and shading techniques demonstrates an understanding of complex mathematical models and their practical application in computer graphics.
3. **Data Structures for Object Management**: Efficient data structures manage and render multiple 3D objects, ensuring optimal performance and scalability of the rendering engine.

The enhancements made to this artifact, such as improving camera movement speed, adding turning capabilities, and fixing color rendering issues, further emphasize my proficiency in this domain. These improvements not only enhance the renderer's functionality but also demonstrate my problem-solving skills and ability to refine existing solutions.

**Changes Made and Future Plans**

The following changes have been made to the artifact so far:

1. **Camera Rotation**: We added functionality to rotate the camera left and right in addition to the existing forward, backward, up, and down movements. This enhancement involved refining the camera manipulation algorithms to allow smooth, responsive rotations based on user inputs.
2. **Color Rendering Fixes**: Corrected color rendering and shading issues, ensuring that textures and colors are applied accurately in the 3D scene. This required debugging the shader code and making necessary adjustments to the lighting model.
3. **Switch to a New 3D Model**: Due to losing the original files, the model used in Module One was changed to a different 3D model. This involved updating the project to the new model, ensuring compatibility and proper rendering.

Next, I plan to implement the following enhancements:

1. **Cutting the Top of the Pyramid**: Modify the existing pyramid model to cut off the top section, creating a flat surface.
2. **Placing a Prism at the Top**: Position a prism at the top of the modified pyramid, creating a new geometric structure.

These future enhancements will further showcase my skills in 3D modeling and rendering, as well as my ability to work with complex data structures and algorithms.

**Meeting Course Objectives**

I planned to enhance the artifact in Module One by improving camera controls and fixing rendering issues. These enhancements have been successfully implemented and align with the course objectives. Specifically, the goals were to:

* Implement more intuitive and responsive camera controls.
* Ensure accurate color rendering and shading in the 3D scene.

These objectives have been met through adjustments to the camera movement algorithms and corrections to the shader code.

**Reflection on the Enhancement Process**

The process of enhancing and modifying this artifact provided significant learning opportunities. Key learnings and challenges faced include:

1. **Algorithmic Optimization**: Enhancing the camera controls required a deep dive into algorithmic optimization to ensure smooth and responsive interactions. This involved refining the existing algorithms to account for dynamically varying speeds and user inputs.
2. **Shader Programming**: Fixing the color rendering issues necessitated a thorough understanding of shader programming. This involved debugging the shader code and correctly applying the textures and colors.
3. **Debugging and Problem Solving**: The process highlighted the importance of debugging and iterative problem-solving. Encountering and resolving issues such as incorrect color application and slow camera turns reinforced the need for meticulous testing and refinement.
4. **Adaptability**: Switching to a new 3D model after losing the original files showcased my ability to adapt to changing circumstances and achieve the desired outcome.

These enhancements demonstrate substantial progress toward proficiency in the Computer Science program outcomes, particularly in designing and evaluating computing solutions using algorithmic principles and computer science practices.

**Submission Details**

For the Milestone Three submission, I have included:

* **Technical Artifact Files**: All the necessary code files for the 3D Scene Renderer project, including the main code, shader files, and supporting libraries.
* **Narrative**: This Microsoft Word document detailing the artifact description, justification for inclusion, alignment with course objectives, and reflection on the enhancement process.

This submission addresses these aspects and illustrates significant progress toward proficiency in several categories outlined in the Computer Science program outcomes, effectively demonstrating my algorithms and data structures capabilities.