**4-2 Milestone: Enhancement Two: Algorithms and Data Structure**

Lauren-Ann Javier

Southern New Hampshire University

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Mr. Martinez

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1. **Briefly describe the artifact. What is it? When was it created?**

This artifact is a C++ OpenGL-based graphics application consisting primarily of MainCode.cpp and the ViewManager class (ViewManager.h and ViewManager.cpp), created in December 2024. It initializes and manages a 3D rendering context, handling window creation, user input, camera controls, and projection toggling between perspective and orthographic views to display 3D scenes interactively.

1. **Justify the inclusion of the artifact in your ePortfolio. Why did you select this item? What specific components of the artifact showcase your skills and abilities in algorithms and data structure? How was the artifact improved?**

I included this artifact because I think it demonstrates core competencies in graphics programming, including system initialization, event-driven programming, and matrix transformations critical to 3D visualization. The ViewManager showcases algorithmic application of camera movement using the mouse input and keyboard controls, alongside dynamic projection toggling, showcasing my ability to include user input handling with linear algebra operations. The artifact was improved by adding comprehensive comments for clarity, implementing toggling between orthographic and perspective projections, and fixing input processing logic to enhance usability and code maintainability.

1. **Did you meet the course outcomes you planned to meet with this enhancement in Module One? Do you have any updates to your outcome-coverage plans?**

Yes, this enhancement met my planned course outcomes related to understanding graphics pipeline management, user interaction for 3D navigation, and application structure in OpenGL. The improvements strengthened my mastery of event handling and camera mathematics. I plan to continue building on this foundation by incorporating more complex shader interactions and scene management techniques in upcoming projects.

1. **Reflect on the process of enhancing and modifying the artifact. What did you learn as you were creating it and improving it? What challenges did you face?**

While enhancing this artifact, I got a deeper understanding of integrating GLFW input callbacks with real-time camera control and learned how to switch projection modes dynamically, which required careful management of global and class-level state variables. The primary challenge was to ensure smooth toggling without disrupting the existing view matrix computations or anything the user inputs. Additionally, improving code comments pushed me to better articulate the purpose and flow of complex OpenGL setup routines, which strengthened my comprehension of the graphics pipeline.