**Lessons Learned Reflection CSC405**

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CSC405: Graphics and Visualization

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The Computer Science CSC405: Graphics and Visualization course took me through a learning journey that was challenging and very satisfying. It introduced me to core principles of computer graphics, including graphics systems, imaging, simulations, and advanced concepts such as geometric transformations, interaction, and animation. In this reflection, I will summarize key lessons that I learned and reflect on how these lessons can be applied to real-world applications as I continue my professional and academic endeavors.

**Fundamentals of Computer Graphics Systems**

At the beginning of the course, I was introduced to the basic components of computer graphics in both hardware and software domains. This gave me a better understanding of how computer graphics systems. On the hardware side, I was introduced to components such as Graphic Processing Units (GPU), Central Processing Unit (CPU), and display devices. While on the software side, I was introduced to tools such as OpenGL Shading Language (GLSL), WebGL and OpenGL APIs, JavaScript programming language, and HTML and CSS scripting languages. This gave me a good understanding of how both domains related to each other to create images and graphical scenes in computer graphics.

**Interaction, Simulations, and Animations**

A significant part of the course involves understanding, learning, and implementing small interactive graphic programs that simulate or create shape animations. Through it, I learned concepts such as transformations and keyframe animation that can be used to create immersive and interactive environments for users. This gave me very valuable experience working with WebGL as well as JavaScript in a browser environment, which will be valuable for my future endeavors in computer science, particularly in creating interactive interface graphics.

**Programming and Understanding Viewing, Lighting, and Hidden Surface Removal**

This part is what enjoyed the most about the course, but it was also the most challenging part. Understanding how the processes of viewing, lightning, and Hidden Surface Removal (HSR) work together to create scenes is crucial for implementing realistic visuals and efficient graphical applications. I learned about classical viewing, camera positioning, and different projection methods such as ethnographic and perspective projections. I also learned about lighting which adds depth and realism to scenes. Additionally, I learned how to apply textures to object surfaces enhancing the visual realism of 3D objects and the importance of HSR for running efficient graphical applications. HSR can be defined as the process of determining which objects in a 3D scene are visible to the camera and which are not visible as they are behind other objects (Angel & Shreiner). Learning how these processes work together to create realistic visuals and efficient applications is extremely valuable for my future professional and academic endeavors.

**Beyond CSC405**

I found computer graphics fascinating, and I thoroughly enjoyed the course by going beyond the class requirement, for four of my critical assignments I created a video describing the functionality of my programs below are YouTube links to those videos:

- [3D Rotating Cube WebGL](#)

- [Orthographic Projection of a 3D Rotating Cube WebGL](#)

- [Interactive 3D Recursive Approximated Sphere in WebGL](#)

- [Projection Lighting and Painter's Algorithm of a 3D Rotating Cube - WebGL](#)

I am unsure how good my videos are; however, they helped me to better understand and learn the concepts and techniques involved in computer graphics, as well as contributing to my portfolio.

This class strengthened my skills as a coder and my foundations as a future software engineer by teaching me how to implement viewing transformations, utilize lighting techniques, and apply Hidden Surface Removal (HSR), this course has equipped me with the skills and knowledge to take on more advanced graphics programming challenges with confidence. In other words, CSC405 has given me the tools to create efficient, realistic, and interactive visualizations, which is essential for my future in Computer Science.

**References**

Angel, E., & Shreiner, D. (2020). Chapter 12.6: Hidden-surface removal. Interactive computer

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Ricciardi A. (2024, September 7). *3D rotating cube WebGL* [Video]. YouTube.

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Ricciardi A. (2024, September 22). *Interactive 3D recursive approximated sphere in WebGL*

[Video]. YouTube. https://www.youtube.com/watch?v=Rp3mV8I62QE

Ricciardi A. (2024, September 30). *Projection lighting and painter's algorithm of a 3D rotating*

*cube – WebGL* [Video]. YouTube. https://www.youtube.com/watch?v=tczs3bjaGtQ