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CS 550 - Introduction to Computer Graphics

Final Project

Educational 3D Solar System Model

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Original Proposal:

The initial proposal set forth the vision of creating an educational 3D model of the solar system. presenting celestial bodies in a detailed and accessible manner. Key objectives included developing a comprehensive 3D model with realistic textures and features for enhanced learning. The proposal emphasized utilizing OpenGL for 3D graphics, sourcing high-resolution astronomical images for textures, accurately representing planetary orbits, and integrating educational content. The project aimed to be completed within one week, using resources like .obj files and ChatGPT for generating basic 3D structures.

Project Implementation:

The project successfully achieved the creation of an interactive 3D solar system model. Key accomplishments include:

- **Dynamic 3D Renderings:** Each planet was meticulously rendered in 3D, with attention to astronomical accuracy and visual appeal.
- **High-Fidelity Textures:** Leveraged astronomical imagery to create realistic, high-fidelity textures for each celestial body.
- **Real-Time Orbit Mechanics:** Implemented a real-time simulation of planetary orbits, offering an immersive experience of celestial mechanics.

- **Lighting and Shading Effects:** Implemented dynamic lighting to simulate sunlight, along with shading effects to enhance the three-dimensional appearance of the celestial bodies.
- **Agile Development:** The project followed an agile approach, ensuring iterative development and regular testing.
- **Use of ChatGPT for Code Assistance:** Leveraged ChatGPT to assist in generating basic 3D scene structures and OpenGL code, particularly for simpler components like background stars and asteroids.

Deviations from Proposal:

- **Asteroid Belt Creation:** Introduced a randomized asteroid belt across solar system for added realism.
- **Dynamic Lighting:** Implemented advanced lighting techniques to simulate sunlight and enhance the 3D effect, exceeding the initial plan for basic lighting.
- **Improved Performance Optimization:** Achieved greater performance optimization, ensuring smoother animations and interactions than initially anticipated.

Notable Cleverness:

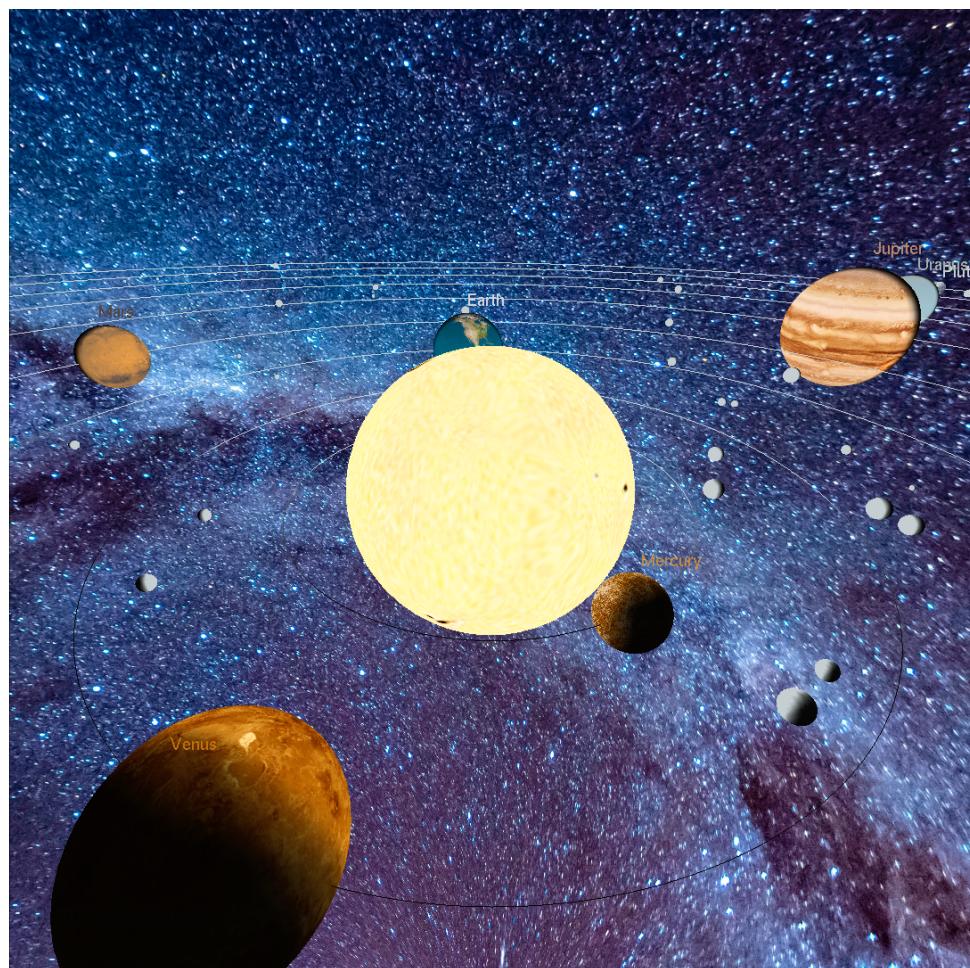
- **Sphere Inside a Sphere:** Used the same OsuSphere to create the Galaxy View.
- **AI- Generated Asteroids :** Random shape and placements of the asteroids across the solar system was generated by AI
- **Custom Physics Engine:** Developed a mini physics engine for accurate simulation of orbital dynamics.

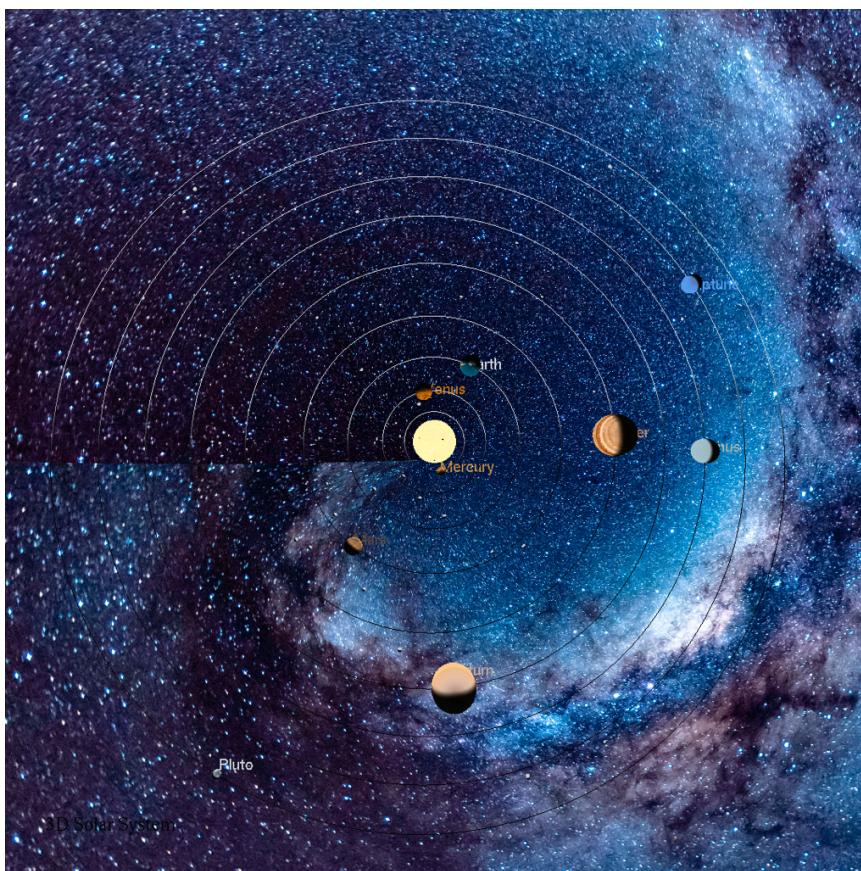
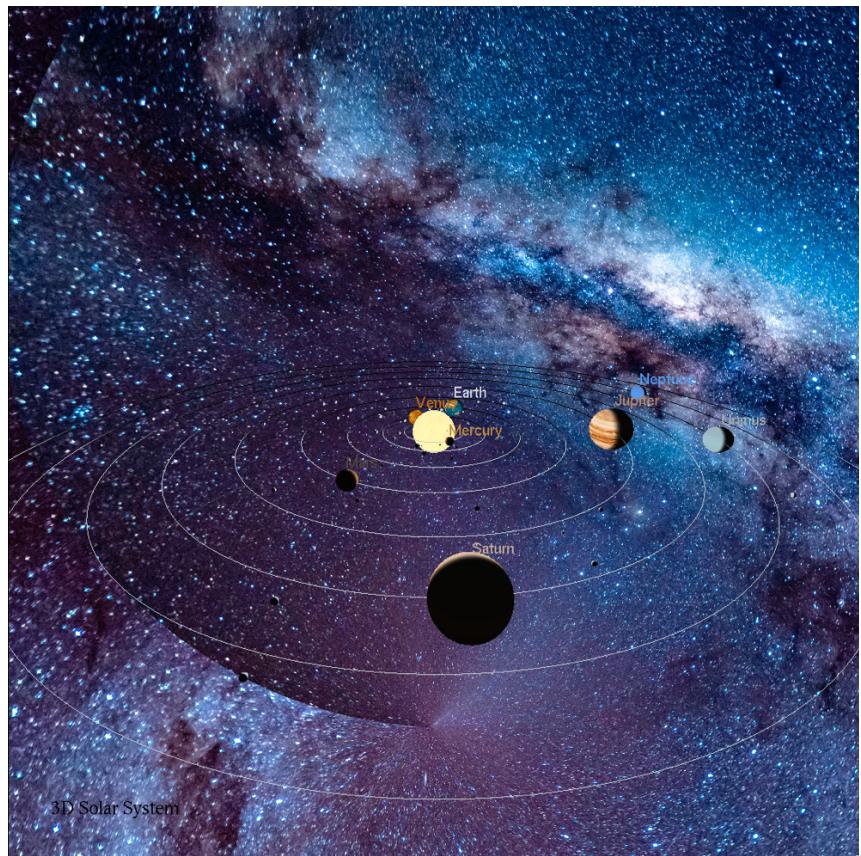
Learning Outcomes:

- **Advanced OpenGL Modelling:** Gained in-depth knowledge and practical experience in using OpenGL for rendering complex 3D scenes, textures, and animations.
- **Interactive 3D Graphics:** Developed a deeper understanding of user interaction in 3D space, including camera controls and object selection.

- **Realistic Texturing Techniques:** Developed skills in applying high-resolution textures to 3D models, understanding the nuances of making celestial bodies appear lifelike.
- **Dynamic Lighting and Shading:** Acquired the ability to implement dynamic lighting and shading, understanding their impact on the perception of 3D objects.
- **Astronomical Data Interpretation:** Gained insights into interpreting and visualizing astronomical data, applying it to accurately represent planetary characteristics and orbits.
- **Performance Optimization in 3D Rendering:** Enhanced understanding of performance optimization techniques to ensure smoother rendering of complex graphics.
- **Use of AI Tools in Development:** Explored the use of AI tools like ChatGPT in coding, especially in generating code snippets and scene elements.

Screenshots:





Project Demonstration Video Link : https://media.oregonstate.edu/media/t/1_y1g209c1