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Lab 6 Report: Hierarchical Modeling

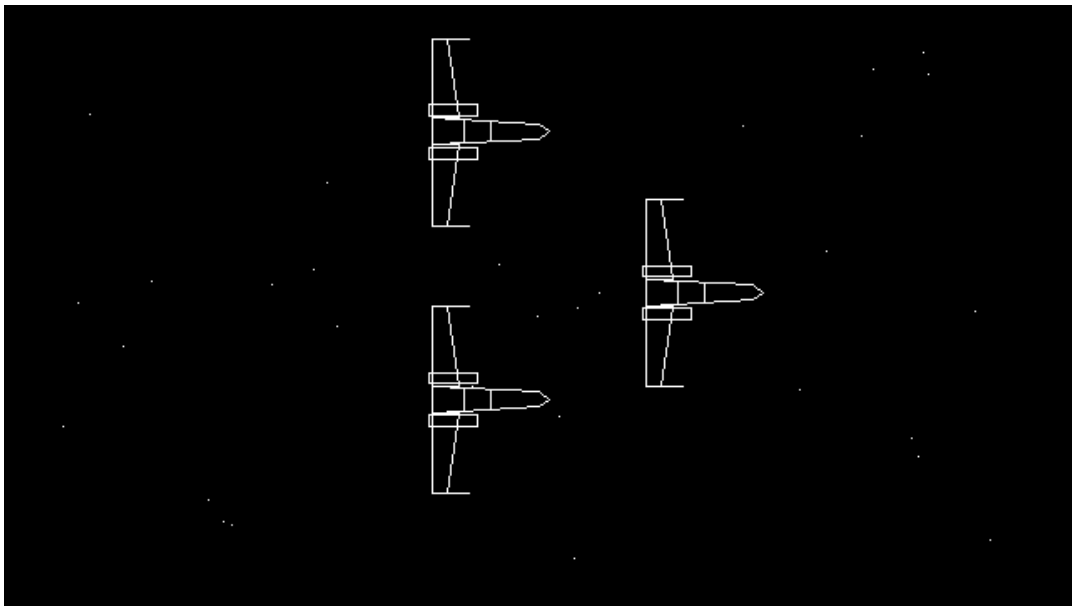
Summary

The purpose of this project was to implement a hierarchical modeling system using scene graphs and matrix transforms, enabling the creation of complex 2D and 3D scenes. I developed functions for inserting graphics primitives and transforms into modules, ensuring accurate representation and manipulation within the system.

Required Images

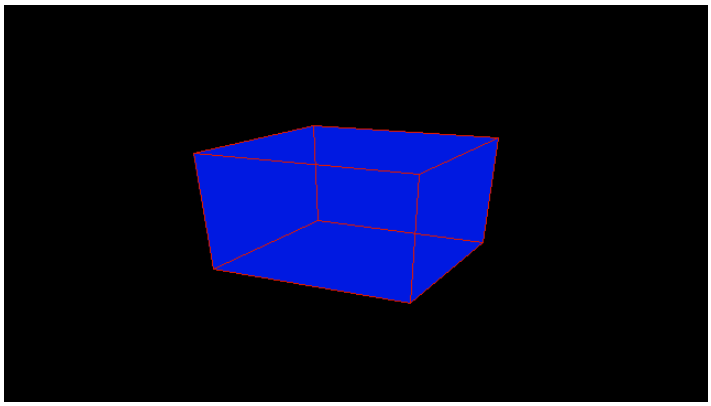
1. ***Test Image A***

   Description: This image was produced with ***test6a.c*** which tested basic module functions. The program demonstrated correct implementation by drawing specified points and lines. This foundational step ensured that the module system correctly handled and displayed elements.



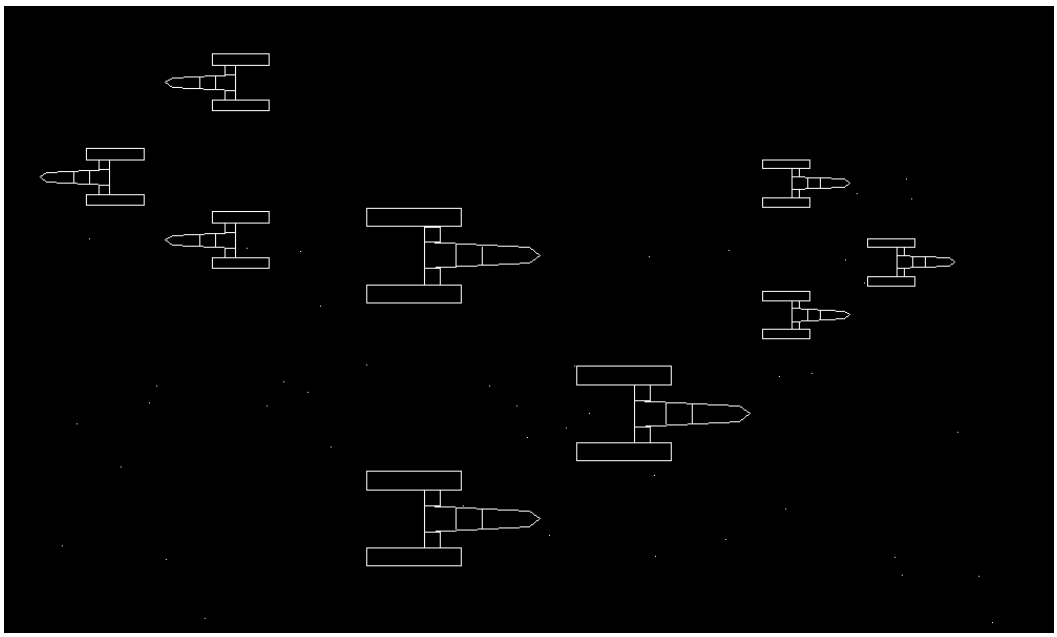
2. *3-D Blue Cube*

Description: Generated using the ***module_cube*** function, I created a 3D rendering of a blue cube. The cube's edges and sides were accurately rendered, showcasing the system's capability to handle 3D objects and maintain proper transformations across modules. A red outline was layered over the blue cube to demonstrate that the cube can be rendered using both lines and polygons.



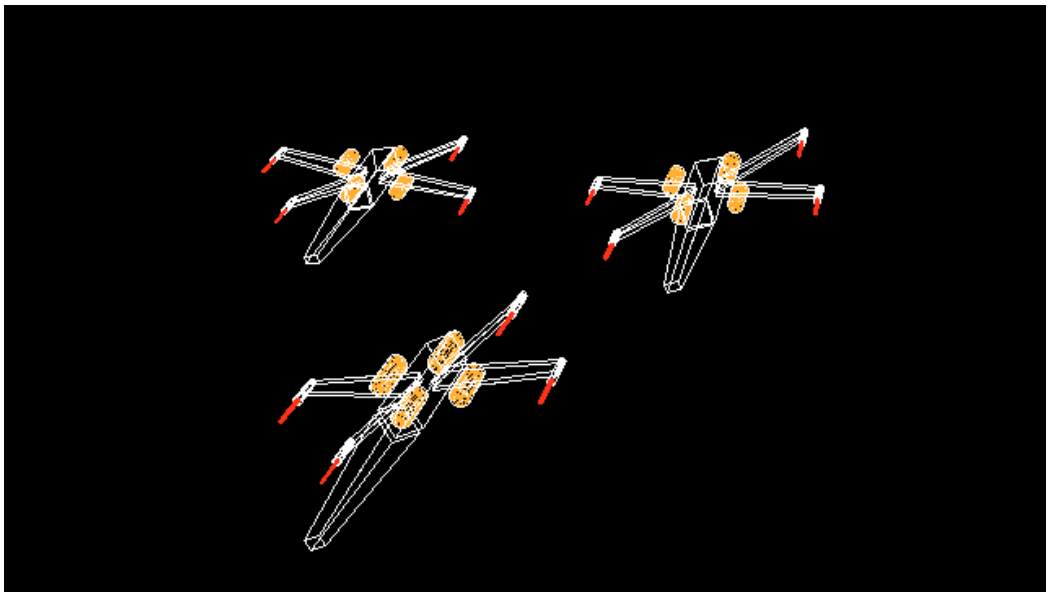
3. *Scene with at least 3 Layers of Modules*

Description: For this image, I constructed a hierarchical model featuring three layers of modules. The base module represented a Y-wing, which was grouped into formations. At the scene level, multiple formations performed distinct actions, highlighting the system's flexibility in scene composition and animation potential.



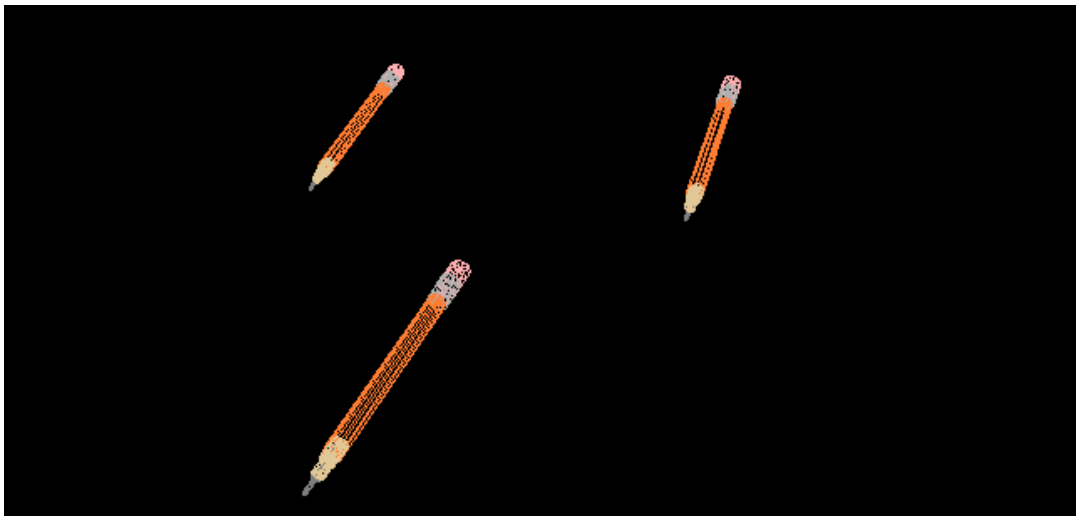
4. *Test Image B*

Description: The 3D scene generated from ***test6b.c*** included multiple X-wing models. This test confirmed the correct implementation of 3D transformations and module traversal, as the models were displayed with proper orientation and positioning.



5. *Creative 3D Image*

Description: I generated my creative 3D scene with multiple pencil models incorporating various primitives and transformations. This creative exercise demonstrated the system's versatility and my ability to compose intricate scenes that utilized hierarchical modeling effectively.



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Reflection

This project deepened my understanding of hierarchical modeling and scene graph traversal. Implementing matrix operations and maintaining accurate module relationships were key learning experiences, enhancing my ability to create structured and dynamic graphics environments.

Acknowledgements

I would like to recognize the following for helping me complete this assignment:

- **Instructor and Course Material:** Professor Maxwell's lecture notes and videos provided me with guidance and reference materials for implementing the algorithms. My email correspondence with him was also able to help me with some issues generating test image A. I also got help from my TA Jinming.
- **Classmates:** N/A
- **Online Resources:** Various online tutorials and articles from sites like W3schools on scanline and barycentric algorithms contributed to my understanding of the concepts.