Modular Architecture for Computer Game Design

by Teddy McNeill
TJHSST Computer Systems Lab
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Abstract

In this project I attempted to design and implement a video game with a highly modular, data-centered architecture based on Jeff Plummer's "System of Systems" approach. The implementation had to demonstrate the successful interaction of independent systems, but was not required to have any significant complexity within each system (e.g. graphics, AI, etc.).

Applications

The development of a flexible and modular architecture promises to improve the amount of time and money required to make a large computer or video game. Also, the extra focus allows middleware to become increasingly complex, specified, and advanced for all programs.

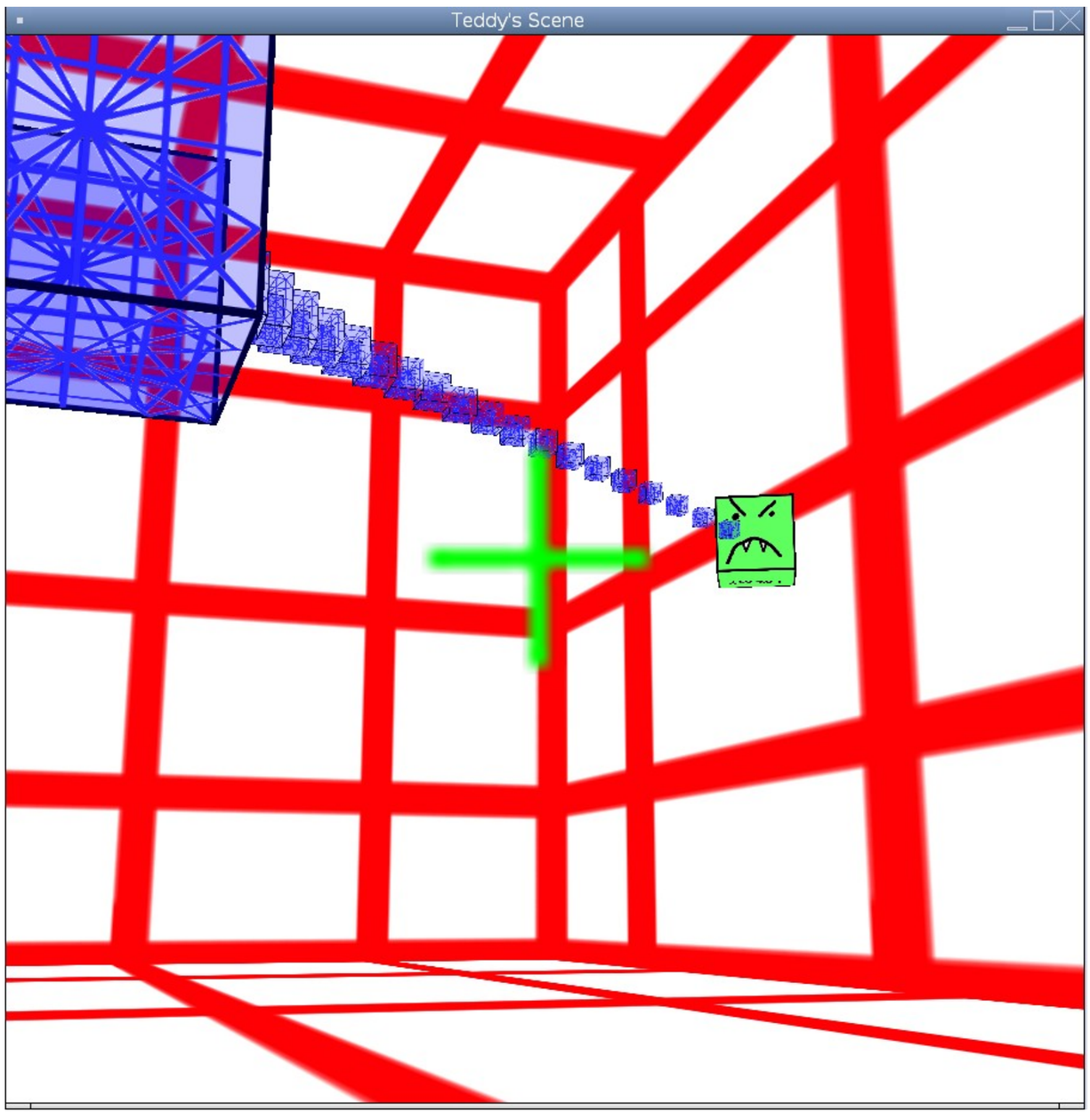

Figure 2: A screenshot from the game. The Enemy's artificial intelligence causes it to jump through the air, bouncing off of the walls, while turning to fire on the player. Straight lines in the background are used to provide perspective.

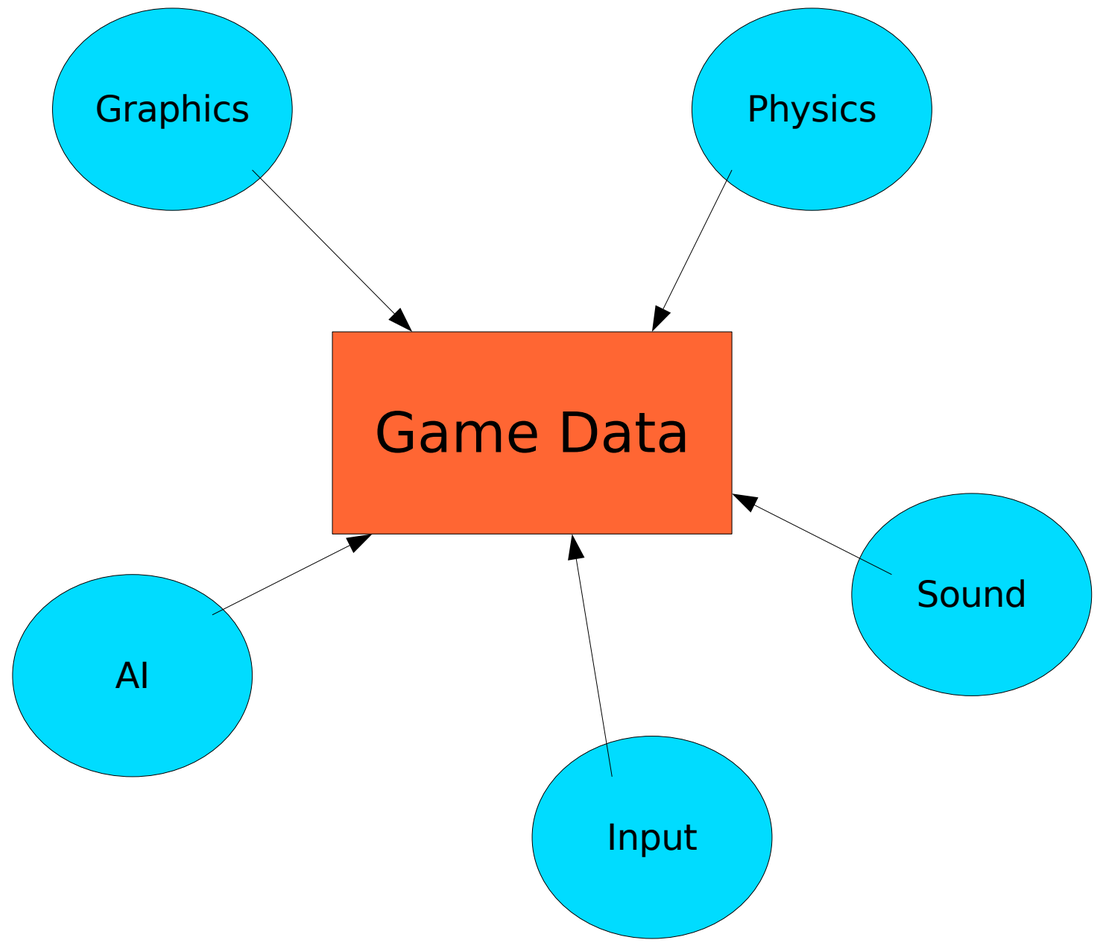

Figure 1: The System-of-Systems design model. Each system is independent from the others, and each operates on a central set of game data.

Development

I used C++ and the OpenGL library to implement the game. I first prototyped the game's functions and then reorganized this code into four independent systems: Input/Output, Data, Physics, and Game Logic. When this was complete, I added an Artificial Intelligence system from scratch in order to test the effect of the architecture on development.

Results

The data-centered nature of the program made the additions of an enemy and AI system much easier; data did not have to be meticulously managed and passed between systems. However, these additions were not seamless. They required that the Game Logic class be updated (which is to be expected upon changing the game rules) and that the I/O class include enemy-related output. In order to fully realize the advantages of the System-of-Systems approach, developers would have to standardize and abstract each system to a much greater degree than was achieved in this project.