Star Maps – Project Report

Developed by Theodore Linardic.

Description:

Star Maps is a city-building game set in outer space. The player is given the tools to build space stations, transportation hubs, and many other types of 'tiles' that make up their idea of a perfect system. Each tile has different purposes, pros, and cons. Entertainment tiles, for example the *Holo-Drive-In,* won't make much money on their own, but raises the system's happiness level greatly, which will increase residents' overall productivity. Commerce tiles help give the residents jobs, which increases productivity. There are some tiles that are controversial, such as the weapons store, which might make some more confident, but also makes many uncomfortable, therefore lowering the system happiness level. The player is supposed to try to build as efficiently as possible to make sure that they are keeping the residents of their system happy, keep progressing, not losing money, and keeping the lights on.

The player begins by creating a new save game, or loading their previous one if they are a returning player, to then be presented with their own personal system to manage. There are six planets, that all orbit around a sun in the system, with white lines drawn to represent their orbital path that they will follow. The player has multiple ways of interacting with the world, to make it fit their play style. They can place and delete as many tiles as is possible in their system. They simply need to be able to afford it, and not have any other tile in the place that they are trying to put it. Deleting tiles can be good for players trying to upgrade their system over time (for example, upgrading from a *Housing Station* to a *Mass Housing Station*, which hosts many more people in the same sized station), but they do not get the money back from deleting it. The player learns that they must be careful with how they manage their system. As the population grows and more residents move in, the player begins to see many NPC ships flying between areas on the map, giving visual feedback that the player is making progress in building a both functional and efficient system.

An example of a randomly spawned resident flying through the game world between planets

Features:

Star Maps contains many features intended to give the player options when they are trying to build their perfect system. Here is a list of many of the core features with descriptions of what they do.

Tile Placement:

The player is given 12 different options of tiles they can build to be placed in the game map. They are as follows: System Launcher, Galaxy Launcher, Housing Tile, Mass Housing Tile, Ship Factory, Weapons Store, Power Station, Bank Station, Food Store, Ship Store, Amusement Park, and the Holo-Movie Drive-In. Each station was fully modeled and textured by me using tools such as Blender and Asset Forge, as well as some additional building block add-ons for Asset Forge. (The GitHub page for the project has a full list of all of the software and tools used, as well as all code and pre-made asset libraries.) Each tile will follow its corresponding orbit around the sun, and objects placed around planets will correctly orbit the planet, as well as following the planets orbit around the sun. Tile placement was a big feature I was proud of in this game, as you can place a tile anywhere along the orbit you want, and the game visualizes it on the screen giving you instant feedback about what it will look like when you place the tile. The 'preview' also glows red if the tile is in an invalid spot, which is a great benefit to the game's playability. Tiles can also be deleted at any time as mentioned in the description. Each tile also contains a visual preview with some basic information when the user hovers over it.

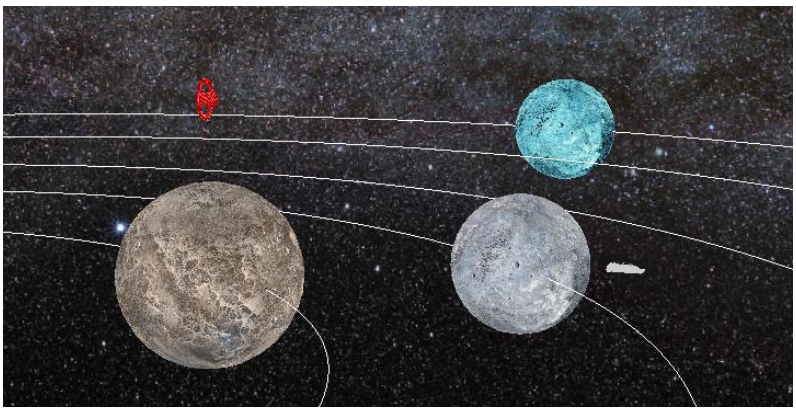
Time Manipulation:

The game world has a steady speed with a clock and day counter on the screen at all times so you can easily view how long your system has been around. There are also options that the player can take advantage of to manipulate time. The player can hit the pause button to stop the simulation if they need time to think about their next moves or the player can fast forward

time as much as they would like if they want to speed up the simulation to gain their daily income money faster.

System Visuals:

The game contains many things that help the player visualize the map. First and foremost are the planets rotations. They all rotate independently, and at different speeds, around the sun just as they do in a solar system like ours. The player can also clearly see the paths that the planets rotate around the sun, the planets also rotate on their axis's just like real planets. Individual objects can also rotate around the planets through sub rotations. Meaning, they will contain their own rotations around the planet while keeping the rotation around the sun as well. In addition to planetary visuals, the player can also see NPC ships flying throughout their system. These ships represent their residents traveling between the game maps' planets as there is more for them to do or go see.



An example of the visual feedback for an incorrect tile placement as well as a sub rotation of a ship around a planet

Examples of preview tiles that appear when the player hovers over a tile.

Game Logic:

Star Maps has a simple set of player goals to guide the player in progression through the game. They have three progress bars: System Happiness, Progress Rate, and Monetary Output. The idea is that the player must build a system good enough to meet all three of these goals with

the money and time that they have. The player is also able to save the game at any time as well as load a save file using JSON files.

Controls:

Star Maps has very few controls, but they are important. Left click is the main interact button. Any button on the screen can be clicked on using this. Right click lets the player delete game objects, once they've selected the delete tool of course. The WASD and arrow keys control the camera position in the world. I had intended to develop a simpler system to rotate around the system using the arrow keys, always keeping the sun in the center of the screen, but I simply did not have enough time to finish that feature. In the debug menu I created, opened by pressing the Tab key, I have some simple toggles for swapping between a side view and a top view of the system.

Team Members/Contributions:

I was the sole developer on *Star Maps* and I created the assets and wrote the code for the game in C++. As mentioned before, I used some third party software for models and textures in the game, as well as some C++ libraries such as *imgui* and *Assimp*. A full list of all of the assets and tools I used can be found on the projects GitHub Page (github.com/theolinardic/Star_Maps).

Conclusion:

I did not get to finish every feature in *Star Maps* unfortunately. I overscoped the project for a one man team, ran into many bugs and issues that slowed me down for a lot of time (such as figuring out the math for nested orbits to work correctly), and simply ran out of time to implement every feature to completion. For instance, the game progress features like System Happiness levels were half completed and not finished in this 'Final Version' unfortunately. However, I am very proud of what I was able to create using OpenGL. I think there are a lot of great features here that could be developed further into a really great game.