Hurricane

GAME ENGINE

Edwin Chen

CHEDWINX INC. |L6X 3W5 BRAMPTON, ON

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Overview

Get ready to be blown away!

Synopsis

Hurricane is a 3D game engine used to create simple 3D platformer games. All of the subsystems and components of Hurricane will be built from scratch. Essentially, Hurricane is designed to be fast and efficiently but not run at state of the art performance levels.

Language

Hurricane will be written in C++. C++ allows Hurricane to be performance and memory efficient as possible. Microsoft Visual Studio Ultimate 2013 is the main IDE used for development.

Team

This is an independent project. I want to show that I can program in pure C++ rather than try to program an Unreal Engine project using Epic Games' proprietary C++ conventions.

Platform Target

Hurricane will initially be designed for Windows OS. In the future, I hope to make Hurricane to be cross-platform expanding to Mac OSX and Linux platforms.

Project Management

Trello is a free-to-use project management system highly capable of efficiently monitoring and tracking development progress and activity.

Layout

At least four different types of UML diagrams will be made to demonstrate the engine. These types will at least include (but not limited to):

- Class diagrams
  - Layout of class relationships
- Sequence diagrams
  - Show lifetime of the engine and its components
- Component diagrams
  - Features how all the components are formed together in the engine
- Object
  - Focuses on particular sets of objects and their respective attributes and how they are used the game.

Several use cases will be created to model different types of scenarios the user may run into during development and logically outlines (an) appropriate solution(s). This is important for development because I want to ensure that the user can properly use the engine will minimal margins of error.

Components & Features

Every subcomponent of Hurricane is essential to creating the ultimate game. All of them working in their own sections is key for Hurricane to run as efficiently as possible. Each subcomponent has their own nickname based on the theme of hurricanes and tropical storms. The use of appropriate design patterns and data structures can ensure that Hurricane runs efficiently.

For every component, I will state where I find the resources to begin learning how I would implement the respective component.

The main resource to understand the complete layout for the functionality and design for a game engine is great book I found called, "Game Engine Architecture, 2nd Edition" by Jason Gregory. View in the link for details http://www.gameenginebook.com/.

Main Game Program

The main game loop is responsible for managing all the features of the Hurricane game engine. Note that algorithms used in the main loop should not control nor change any implementations of the other game engine's subcomponents. All the components should work independently from each other. Nicknamed, *Eye* (center of the storm).

Resource(s): A game that was made back in GAME203 outlines the basic framework of how a game loop would (at least should) be laid out.

Graphics

OpenGL will implement 3D graphics to perform at a mid-high level. Specifically, OpenGL ver. 3.3 allows older systems to use the game engine. Nicknamed, *Helix* (relative visual shape of a hurricane). A *Window* class should be in charge managing the onscreen graphics.

Resource(s): GAME303 or graphics class will teach the understandings and implementations of 3D computer graphics using OpenGL and hopefully touch upon DirectX APIs.

Physics Engine

Hurricane employs its own physics engine implemented for 3D game objects using mathematical models developed for linear and non-linear motion. Kinematics, and Newtonian mechanics. Nicknamed, *Vortex* (primary physics or dynamics of a typical hurricane).

Resource(s): Writing physics simulations and a physics engine in GAME256 is the primary resource. The secondary resource would be any sort of creditable online documentation regarding implementing physics simulations.

Collision Detection

Hurricane supports the **Bullet** Physics Library. Bullet is an open source collision detection system that uses rigid body dynamics. Nicknamed, ***Coriolics*** (play on words of the *Coriolis Effect*).

Resource(s): Use of Bullet in GAME256.

Audio

The audio engine runs with the OpenAL audio API. OpenAL uses models of 3D sound which simulate several audio sources in a 3D space that are heard by a single listener in that space. Nicknamed, ***Wind*** (you can't see wind but you can hear it).

Resource(s): This component will require external research. OpenAL API documentation and following online tutorials can provide excellent assistance.
    https://www.openal.org/documentation/

Artificial Intelligence

Hurricane will implement **A* Path Finding** as its main artificial intelligence system. A* is a computer algorithm widely known for its performance and efficiently, therefore it will fit in as a suitable AI system to meet Hurricane's performance standards. Nicknamed, ***Landfall*** (tropical storm "movement" to land).

Resource(s): A* is a topic covered in GAME302 however I will begin researching the topic many months beforehand to get a better understanding of the subject.

Summary

Hurricane will be a like a strong whirlwind storm. By the end of this current term (Semester 4), a complete prototype will be created to show the basic structure and functionality of the game engine. I plan to show off a completed Hurricane-made game prototype at the end of the project term.