DESIGN RESEARCH SEMINAR

Game Engines – A Comparative Study

Guide: Prof. Phani Tetali

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Declaration

I hereby declare that research work done in relation to the Design Research Seminar and submitted as a written report to the Industrial Design Centre, IIT Bombay is a record of the work done by me under the guidance of Prof. Phani Tetali.

The views represented in this document as part of the written submission of the report is entirely research work and do not necessarily represent the views of Industrial Design Centre, IIT Bombay.

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February, 2015.

Approval

Certified that this is the approved version of the report on:

Design Research Seminar

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Acknowledgement

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I. Introduction

Game design and development is a fascinating field that entwines the artistic, storytelling and technical aspects of visual storytelling. It is a one true storytelling platform where the audience directly involves in the storytelling process. Its scope encompasses a broad spectrum of artistic and technical abilities and hence becomes a little intimidating. Any animator or a visual artist who wants to get into game design and development gets lost in the vastness of the domain. But with the advent of new and improved utilities to aid artists and programmers alike, developing a game has been easier than ever before. Equipped with the necessary skills, it is possible for an individual or a small team to develop an incredibly sophisticated and enjoyable game in a reasonable amount of time.

The report provides information on game design and development, the types of games and also about game engines. As the game engine lie at the heart of the game development process, I have tried to understand them to a certain extent to equip myself with the necessary information in identifying the best engines to use for the kind of games that I would want to develop.

Different game engines have been looked upon and condensed into a concentrated form, from open source game engines to completely commercial engines with an emphasis on its usability, functionality and price point.

II. Game Design and Development

Video game is developed through a process of initial conceptualization stages and design, through the technical development and to the final playable game. It integrates computer technology with interactive entertainment using a combination of science, engineering, technology, design and animation skills to create entertaining video games as well as educational and other miscellaneous content.

Even though game design and game development sounds similar, both are entirely different processes with a very fine line separating them.

Game Design vs. Game development

Game design focuses mainly on the creativity, art, design, storytelling and the flow of the game. Game designers focus on the structure and rules of the game as well as develop the concept, layout, and gameplay. It focusses on making the game interesting for gamers, which requires the game designers to understand what the gamers like and want in the game. Game designing is essentially seeing the big picture or having a vision of how the game would be.

Game development is the software development process involved in the creation of a game. It requires writing and analyzing of program code that integrates design into the playable game. The game developers are responsible for the simulation, computer graphics, artificial intelligence, physics, audio programming, and input that happens in the game. It is what finally makes the game playable.

It may take several years for the game to be completed after conceptualization and development. The mainstream games are usually funded by publishers and should comply a certain requirement set by the publishers or game company. Indie games, on the other hand, are independently developed games and are handled by individuals or smaller teams. They are developed much faster than the bigger games and are much smaller than the mainstream titles.

III. Types of Games

The video game genres are used to classify the games based on their gameplay. The genres are independent of the visual or narrative differences that the gameplay will have. It is set by a set of gameplay challenges and a particular game will fall into a certain category irrespective of the game content. Before jumping into the abyss of the actual game development process, it is wise to know the different types of games out there. To identify the type of games that exists so that we can understand the type of engines required to run them.

1. Arcade – Eg: Pac-Man, Scape Invaders, Galaxian
2. Car, Logic and Board Games – Poker, Solitaire, Mastermind, Chess, Checkers
3. Text Adventure – Commodore, Atari
4. Graphical Adventures – (Text adventure on steroids)
5. Simulation (aka Sims)
6. Strategy (aka Strats)
7. First Person Shooter (aka FPS)
8. Side Scrollers
9. Third Person Shooters
10. Role Playing Game (aka RPG)

IV. Game Engines

Before the game can be developed and executed, the game engine should be in place. It is the pivot around which the development of the game takes place.

The game is powered by an engine. Any game depends on its engine, without which it could neither be developed nor executed. The game engine is a software framework which is used by the game developers in developing a game. It acts as a pivot around which the development will occur. It helps them increase their productivity by the reuse of code instead of starting it from scratch.

Many properties and features common to all games like rendering, physics, artificial intelligence, input, networking functions etc. can be extracted from their particular contexts and given abstract forms which can be manipulated and moulded according to each game. These abstract forms are devoid of their previous references and apply not only to one game but all. The parts that do not belong to the engine component on account of their specific non-recognizable nature are the game content and the game development tools. They need to be created on a game by game basis with the game engine as the generalized framework that supports this content. Thus, the game engine becomes a single system

formed from all generalizable components of a game integrated together so that they could be reused in many different games.

In many cases the game engines provide a suite of visual development tools in addition to the software components.

A typical game engine is one that has enough generalized components and features that allow the creation of a wide range of games including first person shooters, platforms, sports simulators and RPG's.

Choosing an Engine

For a software to be considered as a game engine, it must be able to produce a game on its own merits. The ability and scope of an engine to make games is determined in large part by the collection of modules of simulation code from which the engine is made of. The essential modules or managers for a system to exist as a functional game engine includes a render manager, a resource manager, a scene manager, an input manager and an error manager. Each manager of an engine is an exchangeable unit serving a unique purpose. They can be exchanged with third party managers to achieve better performance.

Types and Purposes

Game engines usually fall under four categories - 2D, 3D, Mobile, Game Mods. They come in many different forms with varying levels of programming expertise. Based on the level of programming expertise, game engines can be categorized into

1. Low-Level game engines - Where the game developers roll out their own engines. These kind of engines gives the programmers the greatest amount of flexibility by giving them the ability to pick and choose the components that they want to integrate into the game engine however way they want it to.

2. Mid-Level game engines - These game engines are mostly ready game engines, which are ready to develop a game right out of the box. It will have it's own GUI and the essential modules. These engines, to varying degrees will still requires a certain level of programming to get them running into a complete game. They are a bit limited compared to low-level game engines as they don't provide the flexibility the low-level game engines provide. Most of them are optimized for a general case.

3. High-Level game engines - High-Level engines are point and click engines where they include a full chain of tools that allows you to point and click. They are made to require as little coding as possible. These kind of engines can be extremely limiting. Many of them could do only two or three genres of game well or one or two types of graphic modes.

For the purpose of this project we will deal with mid-level and high-level game engines for PC, MAC and LINUX which will be able to handle both 2d and 3d games.

V. Analysis and Comparison

There are a lot of powerful game engines available for game development, some more famous than others. The table below provides a condensed list of game engines based on their usability, functionality and price point.

See attached excel sheet.

VI. Conclusion

The short research project was primarily focused on understanding game engines, the type of game engines that exists and the game design and development process. Through the research process I was exposed to a lot of different game engines and their functionalities. It has inspired me to further advance my research and narrow down a particular engine which will help me develop a game.

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