A STUDY OF GAME ENGINE AND ARCHITECTURE

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ABSTRACT As the growing popularity of Virtual Reality with the advent of Oculus Rift which can completely immerse you inside virtual worlds. Many related applications with virtual reality seem to be made by using either Unreal Engine 4 or Unity Engine. So the interest in game engines is growing in virtual reality as well as game industry. A game engine is a software framework designed for the creation and development of games for consoles, mobile devices and personal computers. With the increased size of game industry, the process of game development should be economized by reusing the same game engine to create different games, or to make it easier to port games to multiple platforms. This paper introduces the specifications of game engines widely used in the market and compare up to some extent these engines.

Keywords: Game engine, Rendering engine, Physics engine, Heirachical game engine.

1. INTRODUCTION

As the growing popularity of virtual reality applications, more emphasis on game engine has been emphasized. Fig. 1 shows popular game engine examples of Unreal and Unity. The basic concept of a game engine is the separation between core software components of games such as the three-dimensional graphics rendering system, the collision detection system, or the audio system and the art assets, game worlds, and rules of play that comprised the player’s gaming experience. The purpose of this separation is re-tooling core software components of games into new products to create new games without much changes to them [1-4].

In recent years, the trend of game industry has become multi-platform as smartphones, tablet PCs, web games, and various platforms beyond PC game or console game platform. At the same time, after the free version of Unreal Engine 3 is released, the tendency to free the game engine is also an important trend that leads to the popularization of the game engine. This paper overviews game engines in the market and analyzes them based on functional requirements.

\begin{center}
\includegraphics[width=\textwidth]{fig1.png}
\end{center}

\textbf{Figure 1.} Game Engine Examples

2. ARCHITECTURE
A game engine is a core software component that provides the technical infrastructure for games, which implements an interactive application with real-time graphical display capabilities such as computer and video games. It is a rendering engine for outputting 2D or 3D graphics, a physics engine, Provides key features such as response, sound output, scripting, animation, artificial intelligence, networking, streaming, memory management, threading, and scene graphing. Fig. 2 shows a little details of game engine architecture according to functional modules [1].

The main features of game engines are platform abstraction; so that a game can be executed without major modification on various platforms such as game console or PC like other middleware programs. For this, a hardware independent connection is possible through a graphics API or a low-level library. Next, a game engine simulates real-world physics on a computer, providing a more realistic game environment, and provides functions such as vehicles, rigid bodies, liquids, leg stones, fabric and overdue effects. Due to the increasing demand for realism, it has become an important part of the game engine. Common threads involve rendering, streaming, sound, and physics.

Figure 2. Game Engine Architecture

3. GAME ENGINES

There are several game engine types include Unreal engine, Unity engine, Quake engine, Lystech engine, Infiniti engine, and Havok engine shown in Fig. 3. Unity engine is an integrated authoring tool for creating 3D interactive video content such as 3D video games, architectural visualizations, and real-time 3D animations [5].

Unreal engine is a technology created by a game developer called Epic Games, famous for its versatility and consistent and easy-to-use tools. There is a tool called Blueprint that helps you design your game without any knowledge of coding. Crai Engine is a game engine developed by German game company Craitech, which features a wide view and natural depiction with its own editor. The engine's platform is Windows and uses the Lua language as an artificial intelligence script. Source engine is a 3D game
engine developed by Valve Corporation in the United States and features live-like graphics with low hardware specifications. GameBryo engine is a graphics rendering engine created by Emergent, and Auger engine OGRE is a cross-platform open source 3D graphics game engine. In addition, there are PanDa 3D engine, Id Tech, Fame Tech engine, etc. Eventhough game engines have common functional features, each of them may have difference characteristics with difference tems. Futher works may include details of each game engine and comparions between them.

4. CONCLUSION

This paper introduced the definition of game engines and examined the general functions and structures of game engines with the references of Unreal engine, Crai engine, and Unity 3D engine. Through further research, it is expected that understanding and utilization of next generation game engine platform will be enhanced by grasping detailed function and structure of each game engine.

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REFERENCES