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Research on Developing Client of Network Sport Fitness Game Based on 3D Game Engine *

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Abstract. Network sports fitness game is the product combining computer technology and network technology with the fitness exercise and game. It shows the trend of development of fitness movement. The engine of 3D game encloses complex substrate 3DAPI programme, which greatly reduces the complexity of exploitation. This paper explains the structure and the main templets of game engine and describes the structure of client's software of network fitness game based on 3D game engine. It also studies and analyzes some key technology such as handling of game movement, scrip of client, game data traffic, implementation of music sound and mutual system. At last through an example of running sports game proves its high efficiency to use 3D game engine to explore games.

Key words: 3D Game Engine, Fitness Game, Game Client, API Function

1. Introduction

Game industry has become a new area of growth in our economic development. The United States, Japan and South Korea take Web surfer animated cartoon industry as a key industry in economic development. The survey of GDP in developed countries shows that it is not the motor and manufacturing industry but the Web surfer animated cartoon industry which rank the first. At present, we keep developing and applying all kinds of new games. games and sports are closely connected. It can be said that games is not only the source of sports competitions but also the essence of sport fun. Network fitness game said in this paper is a kind of fitness game based on the network environment. This kind of game is real-time, collaborative, virtual and interactive. It refers to computer network technology, motion capture, virtual reality, digital fitness equipment, sharing environment and computer software and hardware technology such as manipulative virtual human and self-governing virtual human. by USB interface technique, digital fitness equipments are connected to computer so that network technique and fitness equipments are combined perfectly. The game makes fitness more funny, and realizes the combination of entertainment and fitness by carrying on fitness and games simultaneously.

3D game engine is tool kit in common use to develop game. The development of it represents the trend of the development of computer technology. After the game industry continues to develop, the game engine has been developed into a complex system is composed of several subsystems today. 3D game engine covers almost all the major aspects of the development process such as modeling, animated cartoon, lighting, particles magic, physical system, collision detection, document management, network characteristics, professional editing tools and building blocks[2]. Therefore, using the 3D game engine exploit network fitness game client will greatly enhance the efficiency of the development of realistic games

2. The summary of 3D game engine

3D game engine is nothing to do with the specific game, and it's reusable modular code. In the game development process, the core technology is the framework of the game engine, which determines the quality

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of the game. Game engine is a series of preprogrammed related API functions(usually in the form of Dynamic Link Library) such as game initialization, graphic processing，role control and collision detection. It is equivalent to the development of the game programmer tool kit (SDK), so game programmers need not write code from the bottom of the games, only need to call the API function related to the game engine. Similarly, the drama, the role of various background, various locations transform, advance on the game engine has been a common pattern and a general framework, Some organizations rely on a complex database and then completed[2]. Generally, 3D game engine mainly include: the engine core, the sound processing module, the graphics processing module, the game logic processing module and the interactive processing module[3]. The system chart of 3D game engine is displayed by fig.1.

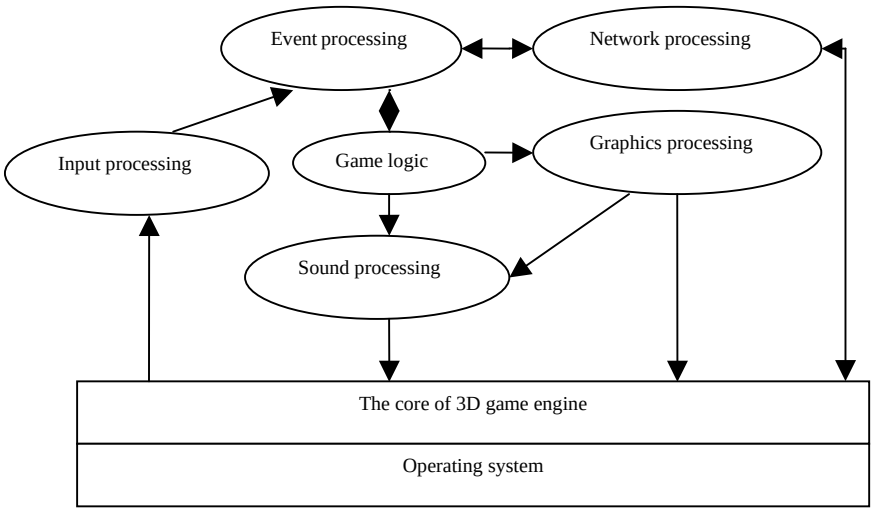

Fig. 1. The system chart of 3D game engine

The core of 3D game engine is the communication and interaction module between 3D game engine and operating system. The input processing module, event processing and network processing together deal with human-computer interactive message[4]. The graphics processing module takes charge of the operation of drawing point, line etc. in screen. Game logic module will be responsible for the objective law and the logic relations of the game implemented in the virtual world, such as collision detection, inverse kinematics, gravity, inertia and the speed of achieving, and artificial intelligence[3].

3. The client of network fitness game

Network fitness game platform includes client and server, of which the client includes hall client and game client. Client hall, as the main entrance of client games, in the definition of standard interfaces, can start up different game clients and it is responsible for displays of the hall interface and transfer of information from the server to the games. Game client, with different game interface and operation interface, can write different game rules according to different games. Server is to handle logic and game rules, deliver network information between clients and read and store data between databases at the server end. Meanwhile, the server also has the function to incept and transmit client's data to realize communication between different clients.

3D game engine packages a series of the game development API function. Call these functions to achieve specific functions of the game. The client of network fitness game is the backing of the 3D game engine, joining the game required resources (images, sound, animation, etc.) and edited according to the specific logic of the game. Game resources are indispensable elements for development of games. According to the object-oriented method, game resources can be compared to object, and game engine can be compared to methods. The layer chart of network fitness game client is displayed by fig.2.

Game client can generally be separated into three layers: the performance layer, the game layer, the engine layer engine[5]. The engine layer includes a number of subsystems, such as the scene module, the input processing module, the Netcom module and the sound processing module etc. It is the cornerstone of the entire game; The game layer contains the rules of the game and the algorithm of the game. It is the basis of the game's fair and funny, simultaneity, is the basis of the performance layer. The performance level directly to the needs of player is linked to human-computer interaction that calls the engine layer interface,

including game interface, interactive menus and windows.

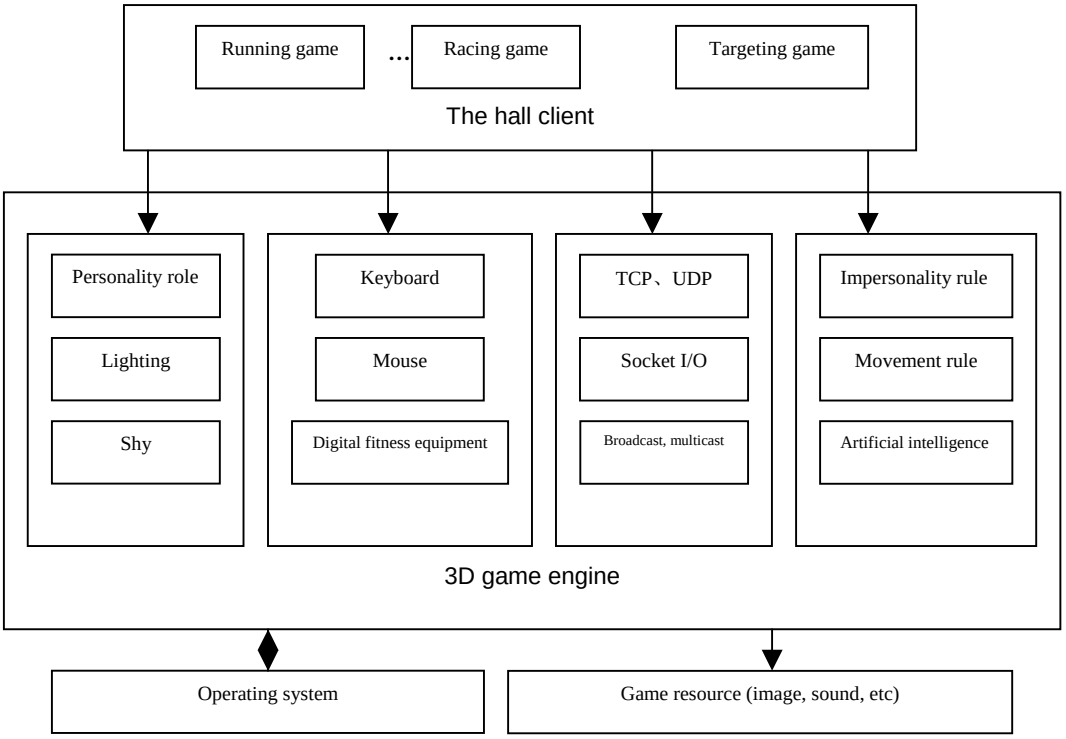

Fig. 2 The layer chart of network fitness game client

4. Some key technology of client's software

The client of network fitness game is the function carrier of game, as well as the communication platform between center server and the other client. Some key technology is analyzed in the following paragraph.

4.1. The handling of game action and scripting

Response and process of figure action, operating action etc. support the operation of network sport fitness game. Partial game action of network sport fitness game is shown as Table 1 [5]. After defining game actions, these actions are responded and processed, and general 3D game engine simulates the response and process of Windows Messages. When game action operates, Messages are started-up to respond and process the action based on the mark of game action.

Table 1. Some game action and mark

The type of action	The mark of action	The type of action	The mark of action
Figure moving	MSG_MOVE	Play music	MSG_PLAYMUSIC
Load scene	MSG_LOADMAP	Stop music	MSG_STOPMUSIC
Set play state	MAG_SETPLAYSTATE	Break	MSG_BREAK
Set role position	MSG_SETROLEPOS	Add the message of system	MAG_ADDMSG
Set role direction	MSG_SETROLEDIR	Show the message of system	MSG_SHOWMSG

Scripting language is an instruction set. Game scripting is a series of program that are compiled by scripting language according to game rule and game logic; it is the spirit of a game. Scripting processing module reads the scripting files, instruction set and variable firstly, and then executes scripting to control the operation of the game.

4.2. Game data traffic

Data communication not only includes the communication between client and center server, but also includes the communication among clients. Game Communication Class, Game Application Class, Game Framework Class, Game Processing Class and Graph Display and Processing Class etc[6]. are the mainly data communication content of client. Game Communication Class mainly takes charge of the details of data transfers, and the details of network communication can be ignored in programming. Congestion is

introduced in this paper to actualize Socket Communication of Game client program, and the Communication Class Packet mainly includes CBlockingSocket, CCardSocket, CBlockingSoctetException and CSockAddr etc. Function Send() and Receive() of Class CBlockingSocket execute sending data and receiving data:

```
int CBlockingSocket::Send(const void *lpBuf, int nBufLen, int nFlags) //send data
int CBlockingSocket::Receive(void *lpBuf, int nBufLen, int nFlags) //receive data
```

4.3. The implementation of music and tone

Fitness game needs background music, such as scene music, collision sound effect, footstep and yawp etc. Generally speaking, music file employs MIDI format, sound effect file employs WAV format. Three function of 3D Game Engine sound processing module contains loading files of music and sound effect, reading sound files of MIDI and WAV format, playing, pausing and stopping music and sound effect.

3D Game Engine sound processing module controls the play of music and sound effect. Sound processing module packages two components DirectMusic and DirectSound of DirectX. Class Cmusic and Class Csound create music class and sound effect class, which implement the function of reading and playing sound files of MIDI and WAV format, and offer interface functions such as Load()、Play()、Stop()、Pause()、Resume()、IsPlay() etc.

4.4. Human-computer interaction system

Taking charge of communication between client and computer, processing the signal from digital fitness equipment, keyboard, mouse and the other peripherals is an important function of 3D Game Engine. Some 3D Game Engine lacks the function of processing I/O signal from keyboard, mouse and the other peripherals, but borrows WIN32API and C++ class libraries to process the functions of keyboard, mouse and the other peripherals [7].Process of keyboard input: using C++ class libraries function int GetAsyncKeyState(int); formal parameter is Integer value, and it must be a defined virtual key assignments or letters keyboard, as well as ASCII value of numbers keyboard. While the press is on or off, different integer value will return to the function. Process of mouse operation: using intGetCursorPos(struct&point) generally, the mouse positions at present are obtained, then decide the mouse positions memorized in structural bodies. After that, call SetCursorPos(doublex,doubley), the mouse is relocated in screen. It calls the component DirectInput of DirectX to process the Special games USB interface peripheral equipment of digital fitness exercise treadmill and digital exercise Bike. Consult the DirectX Help File to obtain specific method employed.

5. Running fitness game

The exploitation tools of running fitness game are as follows: Visual C++, CrystalSpace3D, WIN32GDI. Connect the digital treadmills to the computer host through the USB interface, then transmit the running data gathered in real-time to the computer, and the gathered data can be used to control the role's action. The running fitness treadmill and the scene of virtual fitness game is displayed by fig. 3 .

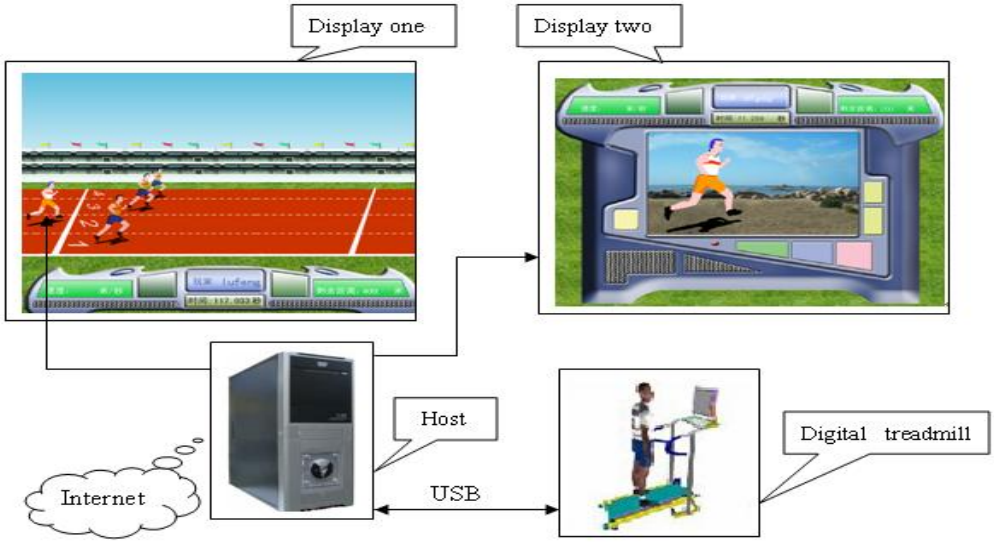

Fig.3. Fitness exercise treadmill and virtual fitness game

6. Conclusion

This paper explores the structure and the main templets of game engine, represents a structure of network fitness game client's software on 3D game engine, then analyzes some key technology of client's software, such as movement of game, manage of scrip, data traffic, music sound, mutual system. Finally, it utilizes the strong function of 3D game engine. Running fitness game is exploited by using Visual Studio integration exploitation tool. Examples indicate that simplifying the physical and mathematical model and complex 3D graphics, exploiting 3D game engine independently can achieve a good fitness game, but also it can save development time, greatly improve the development efficiency, and reduce development costs.

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