A Kinect-Based Somatosensory Game by Integrated Unity and Motion Builder

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ABSTRACT

In this study, a somatosensory game system is proposed by using Kinect, Unity and Motion Builder. Kinect is a somatosensory device that is our primary interactive device and manipulation functions can plugin on Unity software. Unity is a good and friendly open source and is useful for a game development platform. We use this platform to construct the virtual characters, weapons and scenarios. The motion builder is applied to record the basic tricks and monster attacks. The purpose of this study was to create a sport and have fun with the monster fighting game system. We use Kinect to detect the depth of the human skeleton and apply the information of skeleton to the virtual character of Unity in order to control martial arts that are performed by these virtual characters. The detection methods of Kinect sensing the position of the player’s hands and virtual weapons to fight with the monster are proposed. Kinect also provides a wide variety of weapons with specific effects, which enhancing the likelihood for the player to defeat monsters. Thus players take corresponding actions in order to survive. The results of the integration of Unity and the motion builder software with Kinect-based somatosensory game support the feasibility and efficiency of the proposed method.

KEYWORDS:

Somatosensory Game, Motion Capture, Kinect, Unity, Motion Builder

1. INTRODUCTION*

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We hope to integrate Kinect, Unity, and Motion Builder to develop a video game in which players fight with monsters to survive and virtual characters’ moment is driven by the action of players, which making players feel like being in the scene and achieving the goal of exercise and entertainment.

Microsoft combined two English vocabularies, Kinetic and Connection, to create a new word, Kinect [2], and used it on various developing equipment. The purpose of Kinect is to capture users’ motions and transfer those data into computer programs and Xbox. The inductor of Kniet has three camera lens and array microphones: among three camera lens, the middle one is used for getting RGB statistics, the one on the left is infrared projector, and the one on the right is COMS video camera; both the right and the left ones are used to acquire 3D depth images. Multiple sets of microphones are used to compare voice signals to reduce noises. Please refer to [7] for more specifications of the hardware.

Unity 3D is a simple 3D game development platform, a game developing tool that has portable platform characteristic, which can be used on various platforms such as Windows, Mac OS, Android, and so on and so forth. Unity 3D also integrates many 3D modeling tools including Maya [8], 3ds Max [9]…etc. Those 3D modeling tools can be directly imported into Unity for making virtual characters. In addition, Unity 3D supports programming languages like JavaScript or C#, which provides developers more choices for writing codes. What’s more, Unity 3D also has the online Unity Asset Store [10] allowing developers to download sets of kits, making game development much easier and more convenient.

Making use of Kinect somatosensory linked Unity Through interactive game must Kinect with MS-SDK [11] suite (downloaded from Unity Asset Store for free) via parameter settings, let users apply the program as Kinect and Unity Connection the bridge, which will feature virtual characters through Kinect and Unity on the user's actions make connections, make virtual characters and the user can make the same action. Another kit also defines some basic postures to simplify the Unity game development, but also can use these basic posture functions to develop new user-defined position.

Motion Builder [6] is a 3D action software that can capture motions or adjust movements. Its animation toolkit has unique instant computer architecture, animation layering, nonlinear editing timeframe environment, and so on and so forth; all of the tools make it possible to record motions in a high-efficient way. In addition, Motion Builder could run under Windows and Mac OS systems; its file type, .FBX, not only has cross-platform functions but also could be imported into Unity for making animations of characters.

2. PROPOSED METHOD

Our research could be divided into 3 stages: game planning, environment setting, and software download and modification (Figs. 1-2). First of all, positioning the game as a fighting game between characters and the monsters to increase the somatosensory interactive game is interesting.

![Figure 1 Unity Environment Setup](image)

**2.1 Planning the content of game**

When planning the content of the game, it requires:
1. Players’ initial starting main screen
2. Due to somatosensory interaction, main menu and function detection need to have a well-designed, beautiful, and smooth screen for players to pick their characters, weapons, and special effects on the main selection list.
3. The design of characters, monsters, weapons, and scenes character, are not the specialty of computer engineers. Unity has many galleries; therefore, Maya software would not be the choice.

4. Rules Stipulation
   Rules stipulation is one of the essential factors that determine whether the game is fun or not. In order to make the game more interesting, rules about characters’ moves, monsters’ actions, weapons matching and special effects during the fight, rules about getting survival numbers and deducting survival numbers because of the attacks, each rules are stipulated after a carful discussion.

![Figure 2 The related software download and setup](image)

Our proposed process is like Figure 3. When it starts, it enters the main selection list. Players can select play, read, setting, and exit. When selecting play, capability will initialize before the game playing, including weapons, weapon magic special effect, and build scenes. Scenes build contains characters, game scenes, monsters and other load. Then you can start the game, reach certain locations, some information will then be stored in memory rather than stored as files or into the hard drive. So when you jump back to the main menu, the return information will be reload and players would easy returning to the same original position, the so-called access points. There are only two ways to go back and forth from the access point, one to manipulate the death of the main character, and second to select the access point from the game menu.

![Figure 3 The flowchart of the proposed game flow.](image)

In the menu control section is to modify the gesture Kinect with MS-SDK kit [11] contains sample scripts to detect modifications. Detection method is to read the label travel position and determine whether it is within the target range, if the stagnation is in the range for a few seconds, it has corresponding actions. Total start (Start), read (Load), set (Option), stop (Exit) and other options, as is the somatosensory detection, so the use of the range of about two rotary circle carousel four options for subtitles middle of the screen, select the function key once required subtitles appear on mobile virtual palm select this function, as shown in Figure 4.

2.2 Manipulation method of somatosensory game’s character

Since this topic is the use of somatosensory to play games, so through Kinect to control virtual characters will be very important part. There are two types, namely direct and indirect control of
manipulation, the following will explain the types for both manipulation and comparison.

A. Directed manipulation
Direct manipulation means players can be directly used by the body posture to interact with the game scenes, which means avatar sync with the player's actions demonstrated in Figure 5, extra attention to the fact that the result would be contrary to the video about the players direction, so mirror shall virtual role reversal developing. In addition to the direct control of the action, it only applies to the action standing, such as: boxing fists action games, music, dancing action games or sports games such as swing.

B. Indirect manipulation
Indirect control is based on the trigger to control virtual characters. When the player character not really want to walk straight, because Kinect is on the point, as long as it will take a few steps beyond the detection range of the Kinect, so moving in many games are needed to control it through this virtual character. Commonly used methods to detect the skeleton is to use Kinect to detect player movement, and then determine the skeleton should be implemented to detect those actions, and the use of Kinect Studio shown five examples can be detected in the skeleton [11].

This study will be coordinated with the collision detection Unity proposes a new way to detect manipulation. Kinect mainly uses direct manipulation the virtual characters, and then placed around the box that role in Unity, when a collision is detected that role to the box corresponding to the protagonist of the game is to make the action, as Figure 6 shows. Top of the window for the scene to develop Windows on Figure 6, you can see a virtual role and this role outside the map, and surrounded by a lots of boxes used for collision detection, while the role of the action is synchronized with the players; the game window below the window, that is, the actual running of the game screen, windows has another game character, the protagonist of the game is the avatar. When the players’ legs stretching forward above the avatar will follow stretched forward, touch two boxes when a message is transferred to the protagonist of the game script, to move forward. Therefore, this study presents action figures somatosensory detection process shown in Figure 7. The advantage of this control method is not because of direct manipulation caused by movements of the character and sense of violation, and compared to detect the development of relatively simple skeleton in, but the drawback is surrounded by virtual characters have many boxes, it may cause other problems such as miscarriage of justice.
2.3 Recording of character's motion

To create an import into Unity in game action is usually to use 3DS Max or Motion Builder program, by adjusting the animation timeline pane exist in different times of the module frame, and finally to complete the action carried out in series action figures Unity of the people and import for users, but this approach may make it easier to have a design background and need to spend a lot of time to adjust, otherwise there will be a bit out of action incongruity. To speed up the movement of production, the way we chose to use the recording. Because Motion Builder 2015 version has a built-in function can be directly connected Kinect, so you can make use of Kinect video action, and the action will be adjusted after the video directly in Motion Builder. At the beginning of the video before the actors need to put on a T-stance (hands need to play straight) until the computer a voice generated, said the skeleton is completely synchronized with the actors' movements, it game content required to begin recording the action.

3. EXPERIMENTAL RESULTS

3.1 Main Menu

Generally a game will surely have a main menu, this is the first picture of an alternative open this game to arrive, as Figure 8. Our main menu contains beginning (Start), read (Load), set (Option), left (Exit). In the control is still a sense of the main body, but is only crawl right node, when the magic touch to the right, the option will be to the right; on the contrary to the left, to touch at the top of the text will enter this option.

3.2 Selection of Combat ability

Selecting start will enter the weapons and magic selected interface. Weapons section you can choose a large sword, samurai swords and double knife three weapons; magic part, you can choose the fire properties, ice properties and mine property. After choosing the ability of fighting, you can start the game.

3.3 Game Playing

Actual game screen shown in Figure 9, the upper left part of the red blood represents life index, the yellow part of the monster magic value will be deducted when the monster hit a little blood, cast spells will be deducted from the monster's magic value, proceeds to do specify the action will have to implement the corresponding action, such as foot forward, then that is to move forward, backward and vice versa, the right foot is to the right, left and vice versa.

Each weapon has a different action brandished a knife, make a specific action will slashing, when the player jumped off the detection range or play equal.
4. CONCLUSIONS

This study proposes the integration of Kinect, Unity and Motion Builder open source to complete a somatosensory interactive game. Because Kinect is Microsoft's motion control device, it is easier to develop under Windows systems. Unity game engine is a kit that is free and has environmental application as a controller.

During the study will inevitably encounter many problems, such as controlled by Kinect role will be filming displacement factors and the role of action will have a great sense of discomfort, while the role of the action part failed to efficient production. Through multiple control experiences, the role of direct controlled by Kinect, we can solve control problems reduced the incongruity action section. The action part is learned from the Internet forum, this shift to Motion Builder software to solve. Because Motion Builder 2015 version [6] can be recorded directly connected Kinect action figures, and the action after recording can be imported directly into the Unity in use, thus allowing us to efficiently record the action through this software. The result proved that the real Kinect, combined with Unity development tools and Motion Builder, and is feasible and effective development model.

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REFERENCES


