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Hybrid Animation: Implementation of Motion Capture

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Abstract. In the 21st century, much progress has been made following the industrial revolution 4.0. Therefore, the field of animation has also been injected into technological advances. The transmission of information is difficult to convey accurately and interactively to users. In providing users with more exposure and convenience in a more attractive and convenient way. Therefore, animation and motion capture are the best options for use today. As a result, the results of this project can have a huge impact on the animation industry in making video or animation more interesting.

1. Introduction

Animation of two dimensional (2D) and three dimensional (3D) known as hybrid animation is one of the most popular techniques used by many designers or animators to make cartoons, hybrid animation short story and many more. The creation and presentation of hybrid animation is not a new thing in multimedia industry. Hybrid animation is a 2D and 3D measurement of X, Y and Z scale on a flat plane. It is also the creation of moving pictures in a two-dimensional environment, such as through "traditional" cell animation or in computerized animation software[1]. Although nowadays, 3D animation is the new type of animation in industry, yet there are more advantages in using hybrid animation. One of the advantages is the process to create and manipulate the objects are easier. Besides that, hybrid animation cartoons are more simple and funny look.

The two most exhausting processes in 2D animation production are, the generation of key-frames and in between frames. The enormous amounts of still animation are produced by most cartoon studios manually, which is time-consuming and heavy. Compared to 2D animation, three dimensional animation take advantages such as, ease of camera motion, complex lighting and shading, realism and high reusability of assets from scene to scene[2]. The mixing of 2D and 3D assets is a kind of special approach for hybrid animation. The blending should be consistent throughout the film when combining the two types of elements.

Capturing movement (sometimes referred to as Mo-Cap or MoCap, for short) is the process of recording the movement of an object or person. It is used in military, entertainment, sports, medical applications, and for computer and robotics vision verification. In filmmaking and video game development, it refers to the recording of human actors, and uses that information to turn digital character models into 2D or 3D computer animations. When it involves face and fingers or captures subtle expressions, it is often referred to as performance capture. In many areas, motion capture is



sometimes referred to as motion tracking, but in film and game making, motion tracking usually refers more to matching motion[3].



Figure 1. Innovation of texture from 2D animation to 3D animation (Animasia Studio, 2014)

2. Related works

Motion capture has been widely used in the movie and game industry to achieve maximum realism and fidelity and is seen as the Holy Grail in modern character animation, even though it usually requires intensive man power for clean up and postprocessing. Recent research and development has targeted automating and reducing the humans factors from the loop[4].

To address the problem of developing a better method for collecting motion capture data, the focus on video motion capture. A new factoring method is presented that allows one to solve a subject frame model from a series of video images. No special marking or summons is required. The remainder of this thesis discusses new techniques for using flexible motion capture data after they are collected. For cases of cyclic motion such as walking[5].

The experience working on the animation pipeline with a small art team at ICT makes believe that motion capture is certainly not going away anytime soon. However, this is not to say that high quality animations must rely on motion capture and animation artists. In fact, over the past years many advances based on motion capture have been made, concerning slight but precise modifications of an original motion or the parameterization of large motion databases[6].

Keyframe animation has been used by traditional animators (animators who draw the frames of the animation by hand) long before the advent of computers. In traditional animation, one normally draws the extremes, or important landmarks in the motion, called “keyframes”, and then draws the intermediate frames using the keyframes as a guide. With the advent of computers and 3D graphics, people began using the computer as a tool to assist in creating an animation. A 3D model of a character is created in the computer, and the animator again specifies keyframes, this time not by drawing, but by posing the model in the computer[7].

Creating realistic character animations is still a great challenge in computer graphics. Currently, there are three methods by which this animation can be produced. The first is the main frame, where the animator provides a key key to the character in a particular frame. The second one uses physical simulation to drive the movement of the character as a result, because of the lack of control that is difficult to use and expensive and to the character it is not very successful. The last one is motion capture, which has been widely used to revive characters. It uses sensors placed on people and collects data that describes their movements as they perform the desired movements[8].

The main challenge facing animators is to produce character animations with realistic looks. Some seemingly simple behaviors like human walking are difficult to model because of their inherent instability. Motion capture is useful in many areas such as biomechanics, gait analysis, computer animation, signal recognition, sign language, music and fine arts performance. In sports science,

motion capture data is used to analyze and refine the mechanics of prime athlete sequence, as well as monitor the progress of physical therapy recovery. Computer animation of human locomotives has become trending in recent years due to the need to use humans as artificial actors in a three-dimensional simulation environment. It also helps in the pursuit of action to learn the true patterns of robots. In the field of animation and the gaming industry, it is common that motion information is captured in different formats and is limited to specific tasks[9].

TABLE I. COMPARISON OF THE PREVIOUS PROJECTS

Index	Title	Implementation techniques in MoCap	Implementation techniques in Animation
[5][7]	Motion Capture Assisted Animation: Texturing and Synthesis	- Optical System - Magnetic systems - Passive optical system - Physical Simulation	- 3D graphic - 3D modeling - Keyframe
[4][6]	Motion Capture Based Animation for Virtual Human Demonstrators: Modeling, Parameterization and Planning	- Active Marker - Optical System - Motion Parametrization - Kinematic-based Models	- Keyframing - 2D animation - 3D animation
[8][9]	A framework to create humanoid robot animations through motion capture	- Optical System - Physical Simulation	- 3D animation - Humanoid robot

3. The structural design of the hybrid animation

In the development of 2D and 3D modeling, it goes through some of the processes commonly used by some animation industries.

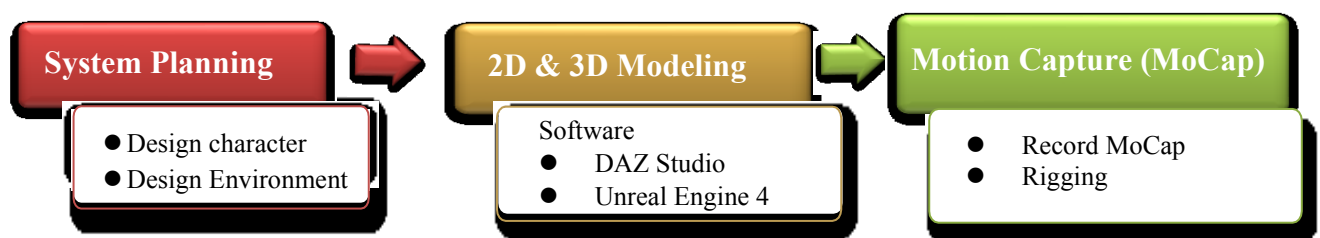


Figure 2. The structural design of the hybrid animation.

3.1. System planning

In animation design, the main factor is the design of the character and the environment. Character design plays an important role in the presentation of animations. It does not matter from the shape of the body to the facial expression of the character. Figure 3 shows the sketches and storyboards in the making of an animation. Storyboard is important as an introductory idea before doing character modeling.

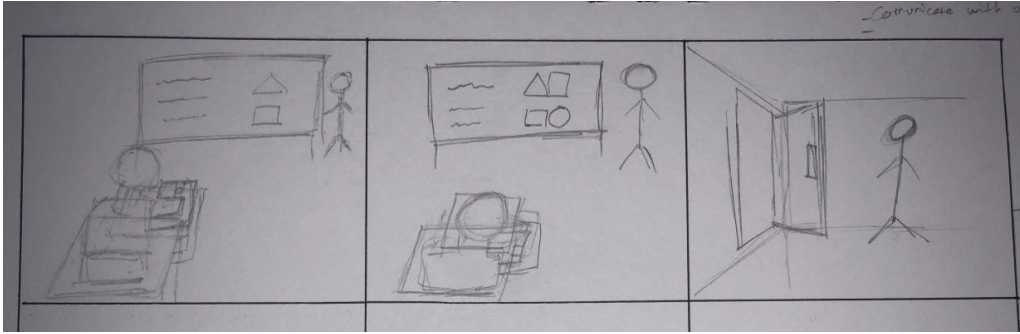


Figure 3. The storyboard in designing character and environment

3.2. 2D and 3D Modeling

The 3D Modeling is “the process of manually creating geometrical object models which meet desired design criteria” and DAZ Studio software are used. The features in the DAZ Studio software has a significant impact on the product development process, allowing improved quality, reduced cost, and aids products to get to market faster. Nowadays, there are many different 3D modeling software packages for different purposes are available such as Cinema 4D, Unity, and Unreal Engine 4. In this study Unreal Engine 4 software package from Epic Games has been chosen. It is one of the world’s most advanced and user friendly game engine. The software has been used for building and visualizing the prototype modeling, Figure 4 and Figure 5 shows the modeling character using DAZ Studio and modeling environment using Unreal engine 4 software.

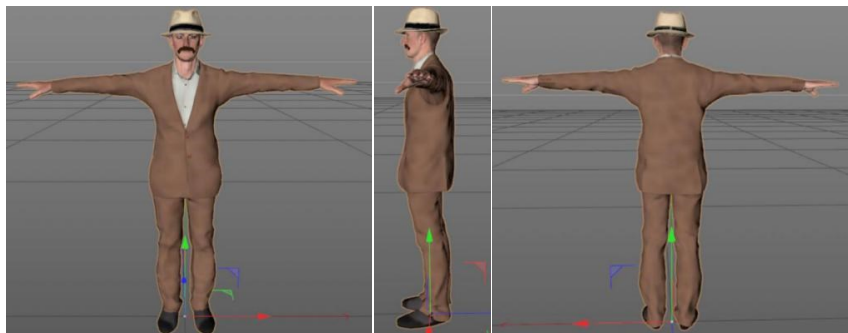


Figure 4.The character modeling.

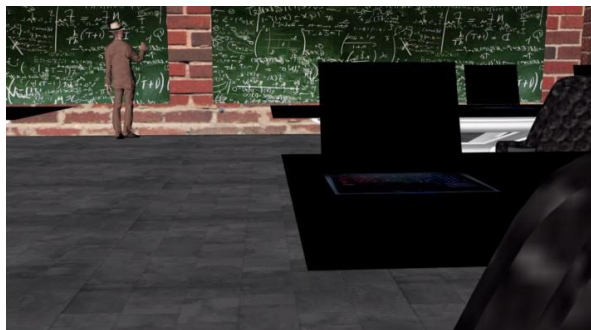


Figure 5. The environment modeling

3.3. Motion Capture (MoCap)

There are several issues associated with the proper development of virtual simulation environments including the motion capture data transfer, rigging the motion capture skeleton with the modeling character. The Perception Neuron hardware will be used include with Axis Neuron software to capture

the data about the physical movement. To create the intended Hybrid Animation using motion capture the steps shown in Figure 6 and Figure 7 will be followed:

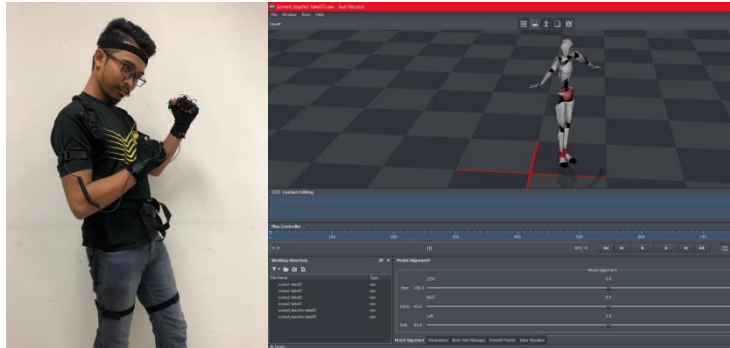


Figure 6. Perception Neuron hardware and Axis Neuron software.

- Put Perception Neurons into the body and ready to record the physical movement.
- Make move based on the storyboard.
- Save the data of the movement before transfer it to the Axis Neuron software.
- Open and play back the movement using the Axis Neuron software.
- Export the motion capture movement to .bvh format.



Figure 7 Rigging

- Import the .bvh format into Unreal Engine 4.
- Make sure the modeling character is .fbx format
- Rigging the motion capture skeleton with the modeling character.
- Export the overall project to the video format.

4. Result

Based on the final decision of the project, the techniques used in motion capture can be implemented in a hybrid of video and animation. Binding the actor with the bone and also how to animate the characters involved. This requires a lot time to complete this project. What is expected in the future is to improve the movement of characters and increase the number of characters in order for this animation to look more interesting.

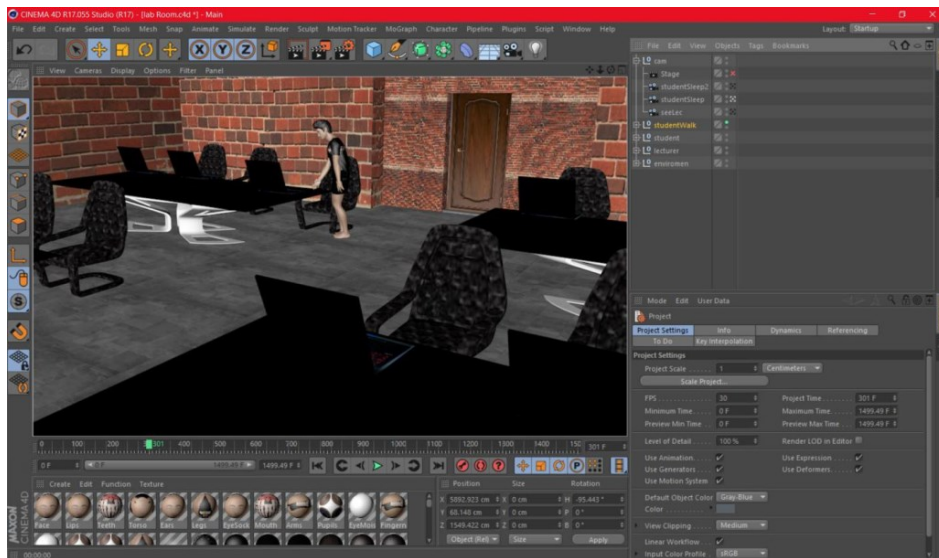


Figure 8. The hybrid animation environment

Integration is a process of combine close and smooth coordination between multiple departments, groups, organizations, systems, etc. Multimedia integration of animation, audio, graphics, text, and full motion video through computer hardware and software for education, entertainment, or training of a few group. Integration of animation, audio, graphics, text, and full motion video through computer hardware and software for education, entertainment, or training. Video a visual multimedia source that combines an array of images to form a moving image. Computer general purpose machines, usually consisting of digital circuits, which receive input, save, manipulate, and video files, or an electric signal, according to the instructions called the program. Hardware physical equipment that make up computer systems, such as circuit boards, keyboards and mice, monitors, printers, power supplies, storage devices. Unlike the software.

5. Conclusions

After being observed in this hybrid animation project. Among them, the animated shows are very short but full of the good content. This makes audiences feel satisfied when watching. In addition, the animation shown is in silent form, only motion and background sound. This animation is very interactive to the user due to the suitable color selection and lighting in this animation. Multimedia consists of orderly instructions and codes written by the programmer in any special computer language. Before using a software, the individual needs to evaluate more about a software in a subject to give a deep understanding.

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