



Human-Computer Interaction Design in Animation Industry

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Abstract. Motion capture is an important technology in the development of the animation industry combined with human-computer interaction technology. Many problems existing in the field of VR games and somatosensory games in human-computer interaction are derived from the limitations of technological development. At the heart of the somatosensory game is the user experience. Improving the existing technology enables the user have a better experience, while also taking into account the designer's structured modifications. Based on the overall environment of the animation industry, combined with the principle of human-computer interaction technology and user experience supremacy, this paper proposes a scheme to improve the existing motion capture technology, expounds the advantages and disadvantages of this design, the specific design method and its Meaning and specific benefits.

Keywords: Animation industry · Human-computer interaction · Real-time systems · User experience · Motion capture design

1 Introduction

The development of human-computer interaction technology in the animation industry has been going on for decades, but most of its practical applications still exist only in science fiction movies. People use 3D scanner and motion capture technologies to capture realistic portraits and track motions for motion capture. After completing these, the data is imported into the computer and edited later into movie animations and even games. This is a kind of human-computer interaction development. The new model is also a new trend that fits the theme. The purpose described below is designed to improve the user experience of the current program, make the device transmission smoother, improve the comfort of the targeted audience and to increase the frequency of use. At the same time, it greatly saves us the time to make animations and movies, and improves the accuracy of the action. If it can be used in more aspects involving human-computer interaction, it will greatly benefit human beings, such as the behavior control of simple intelligent robots. But again, it also has many drawbacks. The main purpose of the current human-computer interaction is people-oriented, so that the user's needs replace other factors as the most important part. Therefore, here we will propose a new and improved form of the original method, improve the use mode, reduce the cost of use, and expand the field of use.

2 Learning Theory

2.1 Application of Human-Computer Interaction Technology in Animation Industry

The model of global animation industry development shows that the United States and Japan and other animation powers guide the development of the domestic animation industry. The animation industry is now an emerging industry. Audiences and gamers are equivalent to users in this industry. Paying attention to their feedback and opinions is a prerequisite for correcting development problems and improving the user experience to promote the continuous development of the entire industry.

The animation industry has the characteristics of high investment, high profit and high risk. As a capital-intensive industry, the design of creative and animated characters, the smoothness of animation, and the pertinence of the audience are all important factors for the success of an animation. It is closely linked with technology. The level of animation in different eras will change. The emerging human-computer interaction technology plays an important role in the development. The animation industry has a long marketing cycle, many derivatives, high investment, and high output, so there is a great demand for market purchasing power. At the same time, with the continuous development of science and technology, the improvement of people's living standards, and the increasing demand for products such as animation and games, the animation industry has rapidly increased its position in the global economy, and the demand for talents has increased, which has become a pillar industry in many countries. In particular, China has a strong potential market as a developing country, and the wave of information technology development has created a good foundation for the prosperity of the animation industry (Fig. 1).



Fig. 1. Current VR usage form. (Source: Bing)

At present, VR (Virtual Reality), AR (Augmented Reality) and MR (Mixed Reality) technologies are widely used in the animation industry, and are widely used in

the animation industry, especially in games. Most of the virtual VR exists in VR games, bringing vision into the virtual environment, AR brings the virtual part into the real world, and MR is equivalent to the combination of AR and VR, which is a huge flying over in the development of science and technology. There is also CR (Cinematic Reality), which is equivalent to another derivative of MR. These different forms constitute the concept of XR (Extended Reality). Through the development of computer technology and science and technology, the use of wearable devices and the like to create a human-computer-interactive, real-world virtual environment.

In the case of VR games and somatosensory games, the user purchase trend tends to rise steadily and then plummet. The most important reason for the user to abandon the game after purchasing the game is because the user experience is different from the expected one, which results in a huge difference in the magnitude of the difference. Under this trend, adjustment and improvement of technology are indispensable.

2.2 Application of Human-Computer Interaction Technology in VR Scene Design

(1) Analysis of the application status of VR technology

Virtual reality technology was born in the 1960s. It is a process in which users use specific devices to interact with virtual environments in the environment, that is, human-computer interaction. VR has four important characteristics: multi-perception, that is, there should be a sense of visual auditory olfactory touch in human beings in virtual reality; The sense of existence which should be able to make people in the virtual world but unable to distinguish between virtual world and real world; Interactivity means that people and machines can communicate seamlessly, the operation on the machine should get feedback for the next step. Autonomy means that objects and movements in the virtual world should move according to the laws of motion in the real world [1].

At present, the development of VR technology is mostly used in games, medical, military and other aspects. In terms of life, there is a popular home automation system. In medicine, some nerve systems can be repaired and the brain stimulated appropriately. In terms of games, the equipment uses helmets, glasses or gloves to transmit data from the human auditory vision and other aspects, bringing people into a specific range of virtual environments, giving users an immersive real experience.

(2) Thoughts on the Existing Problems in Human-Computer Interaction in the Practice of VR Technology

In the early stage of technology development, there is a large demand for talents, but most of the VR professional designers gather in the periphery of developed countries and developed countries, which has caused the shortage of talents. At the same time, the defects of image recognition now limit the development of VR, and the accuracy of recognition is low, especially for complex images and dynamic pictures with more details. There is a high demand for game content such as VR games, but the current production content is still limited by capital and technology, and since this is a new technology, many investors do not tend to invest in technology and tend to choose a less risky direction.

The current VR game combines the human sensory system with virtual reality, but can't achieve real human-computer interaction. Most interactions are unilateral interactions. For example, when a person moves in a virtual scene, the machine can only perform a unilateral play operation and a small part of the motion capture to combine the picture with the user's movement path, to convey a predetermined picture sense to the user, and when the person is in motion When you want to stop or dramatically change the virtual scene, you cannot use voice or other forms to interact with the virtual scene.

In terms of somatosensory and game sense, many people are inaccurate like objects and cannot achieve complete real effects. At the same time, if the equipment such as helmets and glasses are worn for a long time, the feeling of dizziness may occur due to the difference in spatial sense. Tactile and gesture recognition is still in its infancy.

In the process of interaction, since the virtual game scene and the actual speed cannot be completely matched, the phenomenon of jamming often occurs during transmission, which affects the user experience. The role of motion capture is essential when interacting in this way. Past research has focused on the capture of facial and body nodes, while ignoring the importance of muscles and bones for motion capture. Among them, for this technology, the problem of somatosensory games is the delay of motion capture; the problem of VR games is the mismatch of transmission speed and the irrationality of some designs; from the designer's point of view, the flaw of this technology leads to Animation is time consuming and costly. When the defects of motion capture technology are improved, these existing problems are likely to be solved.

At present, based on the premise of technological development, many users have become interested in the development of VR virtual technology. Producers seized this opportunity to research and manufacture VR games and somatosensory games, but due to the limitations of technological development, various problems appeared in the later stage, which greatly affected the user experience. The essence of technological improvement is to focus on the user, and the value of the product depends largely on the satisfaction of the consumer. Solve the shortcomings of this technical detail, improve the fluency of the user experience and promote the development of technology.

2.3 The Role of Motion Capture Technology (Based on the User Experience Design)

(1) Relationship between VR and motion capture technology

"In the field of virtual reality, optical positioning technology and sensor-based inertial motion capture technology in motion capture technology are bound together, because if you want to achieve full interaction and true immersion of VR, these two technologies are indispensable" [2]. Motion capture technology is not the only requirement to enhance the VR experience, but its importance is evident. The significance of improving motion capture technology is to raise a fundamental problem in many large areas, focusing on the small details of big problems to more accurately solve the current difficulties.

(2) Explain the application of motion capture technology for games

With the development of technology, motion capture technology has now been widely used, such as somatosensory games. As the most popular gameplay using motion capture technology, it has won the favor of many users in the early stage of entering the market. In terms of animation, many companies use the motion capture of human-computer interaction technology to achieve many shots. The human-based mobile achieves smooth, simulation purposes, and enhances the viewer's experience when watching movies. Currently immersive games, wearable computers and stealth technologies, and emotional computing technologies are still under study (Fig. 2).



Fig. 2. Form description of the somatosensory game. (Source: Baidu)

The motion recognition capability of some control devices has reached the level of consumer application, such as the game console WiiU. The main feature of this remote control is equipped with a motion sensor, which can judge the action on the screen in real time. The action is truly reflected in the game, interacting with the virtual parts of the TV screen. WiiU Gamepad supports near field communication and wirelessly exchanges data with objects, which opens up new possibilities for gaming and interaction. At the same time, motion capture technology is beginning to enter the medical field, and doctors no longer need to manually touch the button to issue commands, but interact through the screen. Then, Microsoft's Kinect does not need to use any controller. It relies on the camera to capture the motion of the player in three-dimensional space. It can be said that Kinect is more dependent on the camera. As the main technology of Natal, Natal is much more advanced than the Wii. It can also perform face recognition at the same time in the process of recognizing human body movements. When the player enters the game, he can also issue commands and voice signals to the game. But on the one hand, Kinect needs a lot of space to achieve motion capture, but few ordinary families can use such a large space to set up space

entertainment devices. On the other hand, its game category is only for home entertainment and fitness games, the range of choices is too small, and as a stand-alone program it does not support the import and use of other game programs. So fewer and fewer people use the Kinect somatosensory game console. The Switch, which has emerged in the future, has revolutionized the new way of seamlessly switching between the console and the host mode, and the detachable Joy-con handle, as well as its multiplayer co-game model is a new breakthrough. Overall, some of the achievements in this technology have been achieved. But it also has its shortcomings. For example, the joystick of the handle is not sensitive enough, it is easy to damage, and the pixels of the picture are not high, which affects the user's game experience. In this aspect of the game, the most important thing is the sense of the game, that is, the communication and interaction between people and machines, and the most important part of which I think is the development of motion capture technology.

(3) Questionnaire based on user experience in human-computer interaction games

In response to the current popularity of somatosensory games and VR games among the masses, questionnaires and interviews were conducted. The surveyed population was mainly young people aged 20–30. A total of 200 people were surveyed, most of them are college students, a small number of staff and social service providers. The survey results show that 87% of the survey base (174 people) have played somatosensory or VR games. Among them, 65% (130 people) think that there is a problem in the game experience of this game, such as not smooth, which affects their game experience. For the comparison of ordinary mobile games and somatosensory and VR games, 93% (186 people) tend to choose ordinary mobile games. Through interviews, the reasons for such choices are basically dissatisfied with the built-in fluency of the game, there are delays or catching up in the process of capturing user actions, and there is a lack of portability in such games which is not as easy to play as mobile games. The price is relatively expensive and so on. Only 16% (32 people) in the fifth question tend to purchase somatosensory gaming devices at home. Most people are still on the sidelines of using this device at home. The interview has learned that many people have tried to buy but comments of defects on these devices on the Internet have caused them to abandon their purchases plan. Others have to give up because of the large space required for such devices and the lack of space in the home. The reason why people who have already purchased are not used frequently is because their native games are too less to play. Compared with mobile games, the production process of such games is cumbersome and difficult, so people are generally no longer used after they feel fresh. Finally, 65% of people (130 people) responded that if the above problems can be solved, they may be willing to try more of these devices (Fig. 3).

The conclusion shows that the popularity of somatosensory games and VR games is high, but most people do not choose to purchase because of the current technology, price, space and other considerations. However, the development prospects are huge, and we should focus on solving technical problems and design “user-centered products.”

■ QUESTIONNAIRE

— MOTION SENSING GAME&VR

- 1.ARE YOU MALE OR FEMALE?
- 2.HAVE YOU EVER PLAYED MOTION GAMES OR VR GAMES?
- 3.DOES YOUR MOVEMENT MOVE SMOOTHLY ACROSS THE SCREEN DURING THE GAME?
- 4.DO YOU PREFER TO PLAY MOTION GAMES OR REGULAR MOBILE GAMES?
- 5.DO YOU THINK YOU'LL HAVE A MOTION-SENSING DEVICE AT HOME?
- 6.WHAT DO YOU THINK IS THE BIGGEST DILEMMA FACING MOTION GAMES AND VR GAMES?
- 7.IF YOUR PROBLEM WERE SOLVED, WOULD YOU USE MOTION CAPTURE DEVICES LIKE THESE IN YOUR LIFE?

Fig. 3. Questionnaire questions list. (Source: Author)

(4) Limitations of current motion capture technology development based on user experience

Human-computer interaction technology is similar to film production in many aspects, cinematography and software engineering, editing and design, script writing and information architecture. The most important part is acting, which is the usability of technology. The key to improving the usability of technology is to improve the practical application of this technology, which is closely related to its popularity among the masses. The production of movies and animated games belongs to the same category of production process, and their audience is crowds. Firmly grasping people’s preferences and accurately targeting the audience are important parts of the technology development process. Among them, the importance of motion capture technology is self-evident. Nowadays, many movie games use this technology. For example, the most famous ones are “Avatar” and the animated “The Lord of the Rings” series of Gurum (Fig. 4).

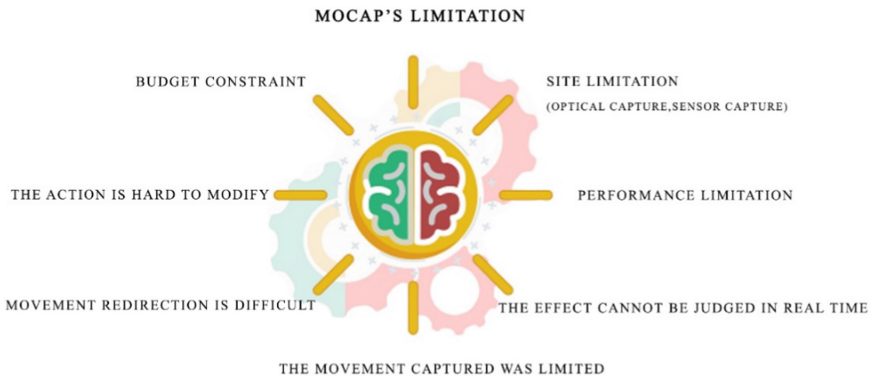


Fig. 4. Existing problems with motion capture technology. (Source: Author)

At first, the motion capture technology was based on humans, but due to the constraints of science and technology, it could not form a system. Therefore, people use stop motion animation. For example, many pictures in the movie “King Kong” require the animator to debug the scene object one frame at a time to shoot the stop motion animation, but this method is too cumbersome and extremely time consuming and laborious. The mechanical model that emerged later benefited from the development of radio technology, which can control the movement and rotation of the model through controllers such as the joystick. However, the mechanical model itself is difficult to manufacture, and the external type is high, so it takes a long time. At the same time, there will be a pause in the movement process, which greatly affects the smoothness and efficiency of the production process. After that, the frame-by-frame transfer technique solved the problem caused by the mechanical model. At that time, people used this technology to make many famous cartoons. But this way means that the movement of the picture has to be redrawn, the workload is large and it takes a long time, and this method does not constitute a 3D effect. The flatness of painting limits development. But now the motion capture technology has skillfully solved these problems. Measuring, tracking, and recording the trajectory of an object in three-dimensional space is the essence of motion capture, which means the device needs to be measured and recorded. So there are many ways to capture motion, and the pros and cons are obvious. Among them, mechanical and electromagnetic and inertial capture have been rarely used, and optical capture technology is now more used (Fig. 5).

MOTION CAPTURE SYSTEM	STANDARD							
	FTOP	COVER	EXTERNAL DISTURBANCE	ACCURACY	PRICE	RESPONSE DELAY	NUMBER OF PEOPLE	DISADVANTAGE
MECHANICAL	-	NO	NO	INACCURACY	LOW	NO	SINGLE	HEAVY HAVE INERTIA
ELECTROMAGNETIC	120HZ	NO	MAGNETIC METAL	INACCURACY	LOW	LARGE (33MS)	MULTIPLE	LIABLE TO IMPACT BIASED ERROR
INERTIAL	-	NO	NO	INACCURACY	LOW	-	MULTIPLE	RAPID ACCUMULATIVE ERROR
OPTICAL FIBER	-	NO	NO	ACCURACY	HIGH	SHORT	MULTIPLE	ANGULAR CONSTRAINT
OPTICAL PROFILE (INITIATIVE)	480HZ	YES	RAY	ACCURACY	HIGH	SHORT	MULTIPLE	THE CAMERA IS IN ABSOLUTE POSITION
OPTICAL PROFILE (PASSIVE)	2000HZ	YES	RAY	ACCURACY	HIGH	SHORT	MULTIPLE	THE CAMERA IS IN ABSOLUTE POSITION

Fig. 5. Comparison of different methods of motion capture technology. (Source: Author)

The motion capture technology used today has not been improved and improved for decades, mainly because many objective factors have limited its development, and many problems are difficult to overcome. The current use of motion capture technology is mostly used for animation to the animator as a reference, or as a storyline draft

(Previsualization) and Crowd simulation, and its real role is not fully functional come out. The manner in which the motion capture and feedback and interaction of the few somatosensory games described above has been greatly developed but still has many drawbacks. In response to these problems, an improved idea is proposed.

2.4 Design Ideas for Improvement of Motion Capture Technology in Human-Computer Interaction Technology

(1) Explain the design idea with user experience as the core

As part of the human-computer interaction, to form an effective interaction core, the most important thing is feedback. The feedback contains two aspects, the interaction between the person and the machine. When the button is pressed by the machine, the machine can respond in time. The second aspect is that after this operation, the state of the system itself has changed. A stable expectation is very important for interaction. When the operation is performed and the feedback of the system is contrary to the operation or there is a big discrepancy, the principle of interaction is violated.

The current motion capture technology has been slowly improved, but the fluency and real-time performance are relatively blocked compared to the body's own motion. But suppose that the modeling of human skeletal muscles and skin is combined with the recognition system of the motion capture that has now appeared but is limited, resulting in a direct and rapid scanning of the old form of skeletal muscle instead of bone nodes. In this way, we can solve the problem of low output fidelity of the hinged structure to a large extent and the limitations of identifying the action by marking the position angle. This method can also be input into the current robot as a program, which can improve the interaction ability of the existing robot. At the same time, it solves the shortcomings of losing the ability for the characters when they out of the animation environment (Fig. 6).

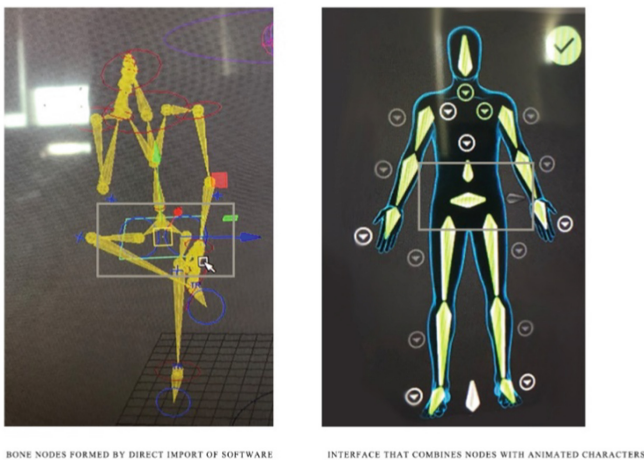


Fig. 6. The actual operation display of the scan generation node in the software. (Source: Author)

- This is a process of transforming the concrete motion into a whole. In appearance, the modification of the person's own clothing device can enhance the comfort of the person when wearing it. The node formed by the person during the motion capture is the state of the node that is diverging from the waist to the head and the foot. So placing the scan point on the waist can form a scan range that diverges from the middle to the periphery thereby scanning the movement path completely and accurately. The Bluetooth transmission system and the auto-scanning system are installed inside the line. Due to the complexity of the center of gravity and scanning, you can choose the belt and other objects as the shape basis. At present, the node generated after scanning is also started from the node of the waist, and scanning as the central node of the body can also better determine the position of the center of gravity of the whole body.
- The form of this scanned body can be transformed from external scan to its own trajectory scan. For example, some existing software (ha you), etc., have already implemented augmented reality technology, and the picture editing can be displayed in the lens of real-time camera through the video painting function. The self-trajectory depiction can be understood as carrying a self-scanning device on the body of the action sender. When moving, the signal is automatically drawn in the connected computer, and the path after the auto-scan is wirelessly transmitted to the switchboard for editing. During the scanning process, the scanning is the self-moving path, that is, the moving curve. The transmission process is a silhouette generated by the combined path after auto-scanning. The separate scanning system of skeletal muscle can only be used to generate a complete human body image when it is generated in the machine after scanning. This method can basically solve the problem of motion capture site limitation. The role in the movement process is simply to trace the path and then feed the trajectory back to the computer which can ensure the scanning body is compact in form and light in size. It can only transmit information as a pipeline between people and computers. This can save energy consumption when the device is moving, reduce the number of feedbacks, and achieve the purpose of drawing the path after one transfer. Reducing the participation of the camera during the capture process can free up space constraints in the technology, and self-transmission replaces the interaction between the sensor and the camera (Fig. 7).
- The transmission process reduces line transmission, and the new technology of 5G equipment is selected. It can support multiple devices for transmission, while the future 5G network can transmit at 10 Gbps and can be transported over long distances. After the scanner carrier self-scans, the information is transmitted through the wireless connection machine, and the data packets such as motion and sound are separately transmitted in the process, thereby reducing the transmission pressure and the jamming phenomenon. Many dynamic data cannot be used directly after the transfer is completed, but require a lot of changes and reorganization. However, the data volume is too large to change, so it is packaged and saved in 20 frames as a compressed file for additional transmission. When it needs to be modified, it only needs to call the compressed folder of the changed folder for later modification. At the same time, the current modulation method has improved the anti-interference ability of the technology to ensure the privacy of transmission. After the transfer,

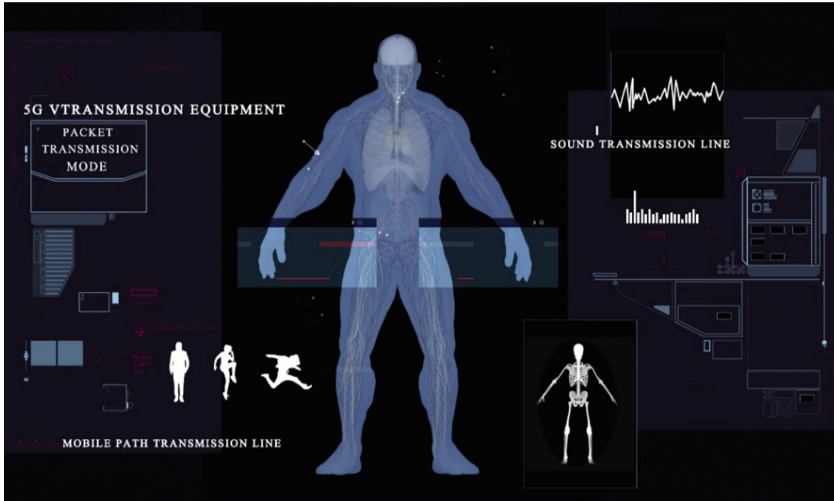


Fig. 7. Interface form when transporting separately in design assumptions. (Source: Author)

the moving path of the program file can be input into the robot's program, so that it can not only improve the accuracy in the animation game, but also improve the defects of the current robot movement.

- When many people are playing the same game, not only to achieve communication between people, but also to ensure interaction between people and machines. The interaction between people is achieved through the voice system, and the interaction between the person and the machine can also be. Data information can be transmitted via Bluetooth during information transmission. Using one of the controllers as a master controller to form a star topology similar to a computer, making the entire line a closed line, forming a private LAN-like game transmission process. But the general controller inside does not take on the real control, but as a central medium to assist in the generation of this topology. When one of them drops, that is, the failure of a single connection will not affect other machines. When there is a problem with the main controller, other connectors will not be affected, thus achieving efficient multi-person transmission.

(2) Design usability analysis

In the design process, the scanner can be divided into industrial use and home use. In terms of industrial use, the accuracy of the capture, the transmission speed, and the like are relatively high, so that the whole body scan can be performed in the program in advance to ensure that the error during the scanning process is smaller. At the same time, program memory can be set separately, and more storage space can be designed for industrial use. Family use is more focused on coherence and real-time. In terms of programming, home capture devices do not require too many complicated functions, while industrial devices require precise and detailed procedures. Based on industrial equipment, simplify the program, retain only the most useful programs and ensure that

the interface remains clear and clear. Follow the “ten-minute rule” to achieve the goal of easy learning in the user experience.

As a new way of combining input and output, it has proven to be a practical possibility. For example, the iPhone XS facial recognition system uses motion capture technology for facial recognition. Incorporating this technology into the existing popular household or industrial robot program, the robot’s motion control is improved to a greater extent, and its interactive ability is improved. Popularizing popular household robots such as sweeping robots and simple intelligent robots has now entered people’s lives. It is undeniable that they can help humans complete some lengthy repetitive work in their own fields, saving time and effort. But from another point of view, the sweeping robot can only judge whether there are obstacles around by a brief and rough perception, and their walking route is not completely independent. So there are often things that sweeping robots repeatedly hit the table corner under your feet. Simple intelligent robots can only do the actions and behaviors set by the system, and this behavior is kind of stiff. Therefore, it is essential to combine the real-time scanning system of bones and muscles with the current human-computer interaction. It can improve the naturalness and smoothness of robot movements as much as possible, so that they can be more beautiful and convenient under the premise of ensuring work efficiency. Now, when you enter this program, you can save the most space by subjecting you to subjectively setting the general direction of movement of a certain behavior to alleviate the burden of simultaneously scanning skeletal muscles. This is the concept of calling, subjectively setting the movement path, or using the movement path after motion capture.

Pre-setting for some fixed actions and fixed positions saves space and saves costs. At the same time, scanning and matching the silhouette of the skeletal muscle can reduce the workload of subsequent operations. For the animator, it is only necessary to adjust the part of the body that fits the body without modifying and making it from scratch. For simple home or medical robots, the accuracy and practicality are greatly improved. At the same time, this way can realize the communication between the ontology and the outside world, and improve the appearance and moving path of the current robot. Through the introduction of the human body’s own mobile data, the robot has virtual muscles, and the virtual muscles in the program move the limbs during the movement to complete a series of actions.

This technology can also be applied to the current VR field, using tools to combine virtual world and real world, and can directly perform self-scanning during its work, perfecting the drawbacks of scanning fingers in the current VR scanning process. In the VR field, human-computer interaction can be better realized, and 5G transmission technology and speech recognition technology can be used to make communication between human and virtual world possible. The transmission mode in the improved design is packet transmission, which facilitates the system to separately recognize the voice of the voice, so that the human’s willingness can feedback the system’s requirements in real time, so that the system can respond in time, thereby achieving a highly efficient multi-person transmission function.

(3) Benefit Analysis Based on Human-Computer Interaction Design

- Economic benefits from improved design

The intuitive benefits of the design come from the direct docking of the animation industry, which improves cost and saves time. At present, the motion capture technology used in the animation industry is expensive, so the design can greatly reduce the cost investment and obtain greater profits after product output. It is easy to form a complete callable action library. The action is not only used by a single person, but also can be modified for a specific number of frames based on the action. At the same time, system maintenance will become easier, reducing the possibility of system crashes and facilitating upgrades. The popularity of 5G technology will provide possibilities for new transmission methods in design. After the popularization of 5G technology, the people's recognition is high, the demand is large, and the purchasing power will inevitably cause the price to drop, so it can also save production costs from this aspect. When the existing problems are solved and then re-entered into the market, the masses will choose to try to purchase, thereby increasing revenue.

- Social benefits derived from user experience

The improved design interface is simple, the system is clear, and its easy learning improves the possibility of high popularity in the future. If the user can accept and enjoy this usage, the design will bring good social benefits. The development of a technology is undoubtedly the best way to drive another technology. This improved technology can simultaneously promote the development of 5G technology and speech recognition technology. Form a parallel state that enhances the comfort of the user experience. The combination of motion capture technology has made it a developmental situation of independent programs. This method can be directly embedded in existing software that needs motion capture technology, combining independence and integration to greatly facilitate people's lives. For designers, this approach is also a more convenient way. The function of separately transmitting is convenient for the modification and upgrade of the program, and the storage method of the compressed package greatly solves the problem that the storage space is insufficient. Therefore, this technology has a good promotion significance and can penetrate current technology equipment from many aspects. The design can greatly improve people's lives, bring convenience to users, and have great social significance.

- Possible defects

At present, it is still impossible to get rid of the shackles of artifacts, and it is impossible to further improve the design using technologies such as thermal sensing. Flexibility is still not enough. When the captured source object is not around, it is impossible to capture the motion for human-computer interaction. Because the solution proposed for the current problem in the design process can not meet the needs of all users to a certain extent, for example, it is difficult for young children to perform self-scanning through the belt during use. Solving the current problems and anticipating possible problems in the future is the most significant way to promote technological development.

3 Future Developments

The future development of human-computer interaction will move toward a more comfortable user experience, a more convenient interaction path and a more efficient interaction. Motion capture technology is always a problem for the current interactive technology. Proposing design ideas, combining modern technology to develop new technologies, improving multi-purpose capture devices, and improving capture capabilities are excellent technological development paths. Multi-purpose use can be combined with the latest technology to stabilize and enhance the development and improve the technical level. The development of the animation industry is not a one-step process, and the combination of the core content of the animation industry and human-computer interaction technology will bring new changes to technology. With the continuous development of human-computer interaction technology, the practical application ability of technology will be greatly improved, thereby bringing a better user experience.

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