



A Research and Practice on Real Time Interactive Campus Virtual Idol Live Broadcasting

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Abstract. In response to the problems of "real-time interactivity" and "insufficient education" in campus virtual idol live streaming, the paper conducts a research and practice on real-time interactive campus virtual idol live streaming, exploring the use of combining optical motion capture and inertial motion capture to achieve "virtual reality interoperability, real-time interaction, and deep immersion" in virtual human live streaming. The paper aims to carry out educational campus virtual idol live streaming promotion and operation for young college students, endowing campus virtual idols with educational significance.

Keywords: Real time interaction; Campus virtual idols; Live Broadcasting.

1 Introduction

Virtual digital human refers to a comprehensive product that exists in a non physical world and is created and used by computer means such as computer graphics, graphic rendering, action capture, deep learning, speech synthesis, etc., and has multiple human features [1]. Its representative segmented applications include virtual assistants, virtual customer service, virtual idols/anchors, etc[2].

Virtual idol is a type of digital virtual human, which does not have a corresponding real person in the real world[3]. Its appearance characteristics, basic human settings, various preferences, background information, etc. are all artificially set. The benefits of virtual idols are long-term stable ownership of specific IPs, stable staffing, and high compatibility with the high-frequency, fragmented, and real-time operational needs of the live streaming industry[4].

With the popularity of online live streaming and the concept of "live streaming+" diversification, the concept of online live "streaming virtual" image is becoming increasingly well-known, which has attracted many teenagers and become an important carrier of youth culture[5]. As indigenous people of the Internet, teenagers have an exceptionally strong ability to accept the Internet. Compared to real-life communication, the Internet enables teenagers to actively, conveniently, and in real-time communicate and form virtual communities; And virtual image live streaming is thriving in such a fertile land, even forming a unique cultural and interactive mechanism[6].

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Therefore, the paper combines "digital virtual human" technology with the education industry, and forms a real-time interactive campus virtual idol with the help of "action capture" technology; At the same time, design corresponding educational application scenarios to endow virtual idols with educational significance.

2 Analysis of Existing Technical Solutions

2.1 Existing Virtual Idol Live Streaming Technology Solutions Mostly Focus on Facial Expression Live Streaming, Lacking Full Body Interaction

The existing virtual idol live streaming technology solutions mostly focus on key changes in facial expressions, eyes, gestures, and other aspects, thereby driving changes in virtual humans[7]. Taking the famous virtual anchor CodeMiko as an example, her virtual idol live broadcast uses the method of capturing her facial expressions to drive the actions and expressions of the virtual anchor.

2.2 Virtual Idol Live Streaming Technology Focuses on Entertainment Industry Applications

At present, virtual idol live streaming mainly appears in the form of virtual customer service and anchors, live streaming sales, news broadcasts, virtual digital human assistants, etc., and is rarely applied in the field of education[8; 9]. For example, when selling live streaming on virtual anchors in e-commerce, consumers who enter the live streaming room are welcomed with a fixed number of scripts and answered questions about prices, express delivery, product details, and so on.

3 A Real-time Interactive Campus Virtual Idol Live Streaming Solution

In response to the shortcomings of virtual idol live streaming, this article combines virtual idols with the education industry and proposes the concept of campus virtual idols to solve the problem of "insufficient education". At the same time, the paper draws on the combination of optical motion capture and inertial motion capture technology to design a campus virtual idol that can interact in real time, in order to solve the problem of "insufficient real-time interactivity".

The specific technical solution is shown in the figure 1.

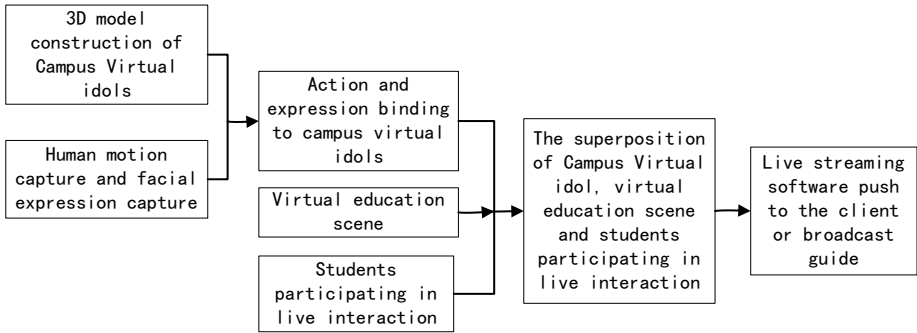


Fig. 1. Real time interactive Campus Virtual idol live broadcast scheme

3.1 Campus Virtual Idol Design and 3D Model Construction

The paper constructs a virtual idol combination of "students and teachers". The personality characteristics data of its virtual idol includes background characteristics such as career information and personality information. Establishing a campus virtual idol requires preliminary image design, original painting, or modelling. Due to the need to apply action binding to achieve real-time interaction, the paper uses 3D max to create a 3D model of the face and body of a campus virtual idol.

3.2 Human Motion Capture and Facial Expression Capture

Human motion capture is mainly achieved by optical motion capture technology and inertial motion capture technology[10]. Optical motion capture is used for motion capture of indoor scenes, because of its high capture accuracy, low delay and strong real-time performance. Optical motion capture technology uses the principle of computer vision to cover the human body with reflective markers, and then spread infrared cameras around. These high-speed cameras record the time of infrared reflection to determine the distance between the light point and the camera, and track the target feature points from different angles to complete the capture of the whole body motion.

The paper uses inertial motion capture system in outdoor scenes. Because the inertial motion capture technology can overcome the deficiency of the influence of light and shade, the equipment has low cost and high accuracy, which is conducive to real-time measurement and simultaneous capture of multiple objects.

The paper uses facial expression capture technology when the interaction needs the facial expression changes of Campus Virtual idols. Facial expression capture technology mainly captures the muscle data of the face in real time through a special helmet or camera, and then matches the model bound in the computer to drive the virtual digital human to make the same expression.

3.3 Real Action and Expression Bound to Campus Virtual Idols

The movement of Campus Virtual idols is also driven by the movement of bones, and each bone will drive a part of the model. Because the action data of real people are obtained through the action capture system, the campus virtual idols driven by real people have obvious advantages in action flexibility, interactive effect and so on. The specific implementation method is shown in Figure 2.

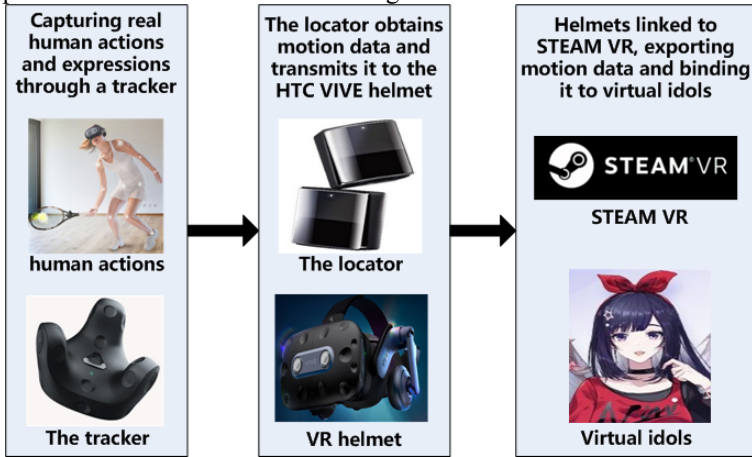


Fig. 2. Real time interactive Campus Virtual idol live broadcast scheme

3.4 Virtual Education Scene Design

The key to the success of real-time interactive Campus Virtual idol live broadcasting system is the design of virtual education scene. Only the educational and interactive virtual scenes can attract students' continuous participation. Virtual education scene includes professional skills learning scene and campus life scene.

Taking campus life scene design as an example: Restore the environment related to campus life in a virtual reality engine. In this environment, student virtual idols encounter problems in campus life and seek help from students who participate in live streaming interactions. "Students participating in live streaming interactions" help student virtual idols solve problems and achieve real-time interaction between campus virtual idols and students participating in live streaming interactions.

3.5 The Superposition of Campus Virtual Idol, Virtual Education Scene and Students Participating in Live Interaction

With the support of high-performance graphics workstations, this paper utilizes a virtual reality engine to overlay and synthesize data of "campus virtual idols, virtual educational scenes, and students participating in live streaming interactions."

The virtual reality engine used in this paper is Unreal Engine. Unreal is a development tool provided by Epic Games for online games, real-time visualization projects and immersive interactive experience projects. With unreal, you can develop a variety

of highly realistic real-time 3D content and experience. In the paper, the "Campus Virtual idol bound with real action and expression" and the modelled educational scene are imported into unreal. At the same time, a virtual camera is generated in unreal. The data source of the virtual camera is "the physical camera that captures the students participating in the live interaction", and it is synchronized with the physical camera through "time code and tracker"; In this way, the picture of "students participating in live interactive" enters unreal and interacts with "Campus Virtual idols bound with real action and expression" in real time in the virtual education scene.

3.6 Live Streaming Software Push to the Client or Broadcast Guide

With the help of the data output function of the Unreal Engine, this system synthesizes the data of "campus virtual idols, virtual education scenes, and students participating in live streaming interactions", and pushes it to the client or guide station through live streaming software. The synthesized scene is displayed on display devices such as large screens, computers, mobile phones, and projectors.

4 Practice and Effect Evaluation of Live Broadcast of Campus Virtual Idols

4.1 Practice of Live Broadcast of Campus Virtual Idols

At the entrance scene of College Freshmen in the school of cultural communication and design, the campus virtual idols warmly greeted the freshmen through large screen TV, and welcomed them to the school family to introduce the basic situation of the school and the skills of college study and life, The specific situation is shown in Figure 3.

Different from ordinary digital people, campus virtual puppets interact with freshmen in real time in physical space and answer students' questions and puzzles on the spot. Moreover, with the help of the action capture system integrating light and habit, as a virtual human, Axiang not only has vivid facial expressions, but also has a life size whole body interaction, with smooth movements, a stronger sense of immersion and interactivity.



Fig. 3. On site interaction between campus virtual idol a Xiang and Freshmen

4.2 Evaluation of Live Broadcast Effect of Campus Virtual Idols

In order to understand the effect of live broadcast of Campus Virtual idols, this paper issued a questionnaire and collected 55 valid questionnaires. The questionnaire was designed with Likert 5 scale, and the corresponding options were selected according to the degree of consent.

Table 1. The effect of live broadcast of Campus Virtual idols

Survey items	strongly agree	agree	neutral	disagree	strongly disagree
I hope the appearance of virtual idols with the characteristics of our school.	90.91%	7.27%	1.82%	0.00%	0.00%
I expect the scene of digital virtual human to happen on campus, which makes people more resonant.	87.27%	7.27%	5.45%	0.00%	0.00%
I think there will be a large number of digital virtual people in all walks of life in the future	94.55%	3.64%	1.82%	0.00%	0.00%
I think it is very meaningful to learn from virtual human.	69.09%	10.91%	7.27%	7.27%	5.45%
Using virtual human for teaching is helpful to improve the understanding knowledge	65.45%	10.91%	9.09%	9.09%	5.45%
I think learning with virtual human can improve the learning effect of operation skills	54.55%	10.91%	12.73%	12.73%	9.09%

I think learning with virtual human can enhance my interest in learning.	54.55%	10.91%	14.55%	10.91%	9.09%
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As can be seen from table 1, most of the respondents are optimistic about the application of digital virtual human, believing that there will be a large number of digital virtual human in all walks of life in the future. At the same time, I feel that the scene of the digital virtual human is more resonant in the campus, and I hope to see the virtual idol with the characteristics of our school. 80% of the respondents believed that it was very meaningful to learn with virtual people, and 76.36% of the respondents believed that using virtual people for teaching was helpful to improve the understanding and mastery of knowledge; 65.45% of the respondents believed that learning with virtual people could enhance their interest in learning.

5 Conclusions

By adopting the method of "action capture through the integration of light and inertia", virtual human live streaming can be achieved with "virtual and real communication, real-time interaction, and deep immersion". From the live broadcast of campus virtual idols and the survey results, it can be seen that young college students welcome educational live broadcasts of campus virtual idols, believing that learning with virtual humans can stimulate learning interest and improve learning effectiveness.

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