VR and AI Empowering University Ideological and Political Teaching — Design of a Unity3D-Based Education System

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Abstract. Ideological and political education is the core content of ideological and political education in universities in the new era, bearing the important mission of inheriting red genes, continuing red bloodlines, and cultivating new talents for the times. To address the pain points of traditional ideological education, such as a single format, insufficient immersion, weak interactivity, lack of real-time Q&A, and low personalization, this paper designs and implements a set of ideological teaching systems deeply integrated with virtual reality and artificial intelligence. The system builds a high-fidelity immersive virtual ideological exhibition hall at its core using the Unity3D engine, completing high-precision 3D modeling and resource optimization with 3ds Max. At the same time, it integrates the DeepSeek large language model API to create an AI dialogue system with functions such as natural language understanding, intelligent Q&A, ideological explanations, and value guidance, realizing a new ideological teaching model of "immersive experience + intelligent companionship + real-time Q&A + in-depth guidance." Through pilot applications and multiple comparative experiments at a university, it is demonstrated that the integration of VR and AI technology can significantly enhance the appeal, interactivity, targeting, and effectiveness of ideological education, with notable improvements in students' learning interest, participation, knowledge mastery, and ideological understanding levels. This research provides replicable and scalable technical solutions and practical paradigms for the digital and intelligent transformation of ideological education in universities.

Keywords: Virtual Reality, Artificial Intelligence, Unity3D, DeepSeek Large Model Application, University Ideological Education

1 Introduction

1.1 Research Background and Significance

The report of the 20th National Congress of the Communist Party of China clearly states that we should "deepen the promotion and education of socialist core values, strengthen the education of patriotism, collectivism, and socialism, and focus on cultivating a new

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generation entrusted with the great task of national rejuvenation." Ideological and political education, as an essential carrier for inheriting red genes, promoting revolutionary spirit, and shaping correct values, is an indispensable part of ideological and political education in universities. Traditional party-building propaganda mainly relies on classroom lectures, visits to physical exhibition halls, and literature reading, which presents various limitations: first, the form is monotonous and dull, making it difficult to stimulate students' learning interests; second, the sense of experience is insufficient, with students mainly passively receiving information, which hinders emotional resonance; third, there are significant spatial and temporal constraints, with high-quality ideological education resources unevenly distributed, making it challenging for students to learn anytime and anywhere.

In recent years, the rapid development of computer graphics, human-computer interaction technology, and generative artificial intelligence technology has brought dual opportunities for the innovation of ideological education. Virtual reality (VR) technology can construct highly realistic three-dimensional virtual environments, allowing learners to immerse themselves in ideological education scenarios, transforming from passive listening to proactive exploration. Large language models represented by DeepSeek possess powerful natural language understanding and generation capabilities, enabling real-time intelligent Q&A, personalized learning guidance, and contextual dialogue, thus upgrading ideological education from one-way display to two-way interaction. The deep integration of VR and AI technology in ideological education can not only break through spatial and temporal constraints and expand the coverage of high-quality resources but also enhance educational appeal and achieve targeted teaching, injecting new vitality into ideological education in universities in the new era.

1.2 Current Research Status at Home and Abroad

Abroad, the application of VR and AI technology in the field of education started relatively early, forming a mature theoretical and practical system. Projects like the "Virtual History Lab" developed by Stanford University and the "Virtual Archaeology System" developed by Cambridge University have realized immersive learning through VR technology. Products such as ChatGPT for Education and Google Classroom AI launched by tech giants like OpenAI and Google provide personalized learning guidance and intelligent Q&A services for students[1] . However, due to differences in ideology and cultural background, research on the integration of VR and AI in ideological education in Chinese universities is almost nonexistent.

In recent years, the application of VR and AI technologies in the field of ideological and political education in China has rapidly developed. Scholars have extensively discussed the feasibility and necessity of using VR technology as an emerging immersive experience in the work of party building and ideological education in universities[2]. Huang Zengxin[3] believes that the application of this technology can comprehensively optimize the overall effectiveness of ideological and political education in party building, promoting the stable and efficient development of higher education.

Numerous universities, research institutions, and enterprises have invested in the development of VR ideological education systems, recreating revolutionary history, significant events, and advanced deeds through virtual scenarios. Large language models, represented by "Wenxin Yiyun" and "Tongyi Qianwen," have also started to be applied in ideological education. However, the existing research and products still have obvious shortcomings: first, the modeling accuracy of VR systems is low, the interaction methods are simple, and the content is fragmented; second, the accuracy of AI system content is insufficient, the value orientation is unclear, and the integration with ideological teaching scenarios is not tight.

2 Technical Route of the Ideological Education System

The system is built on a technological logic that centers on "political education content, three-dimensional modeling as the foundation, Unity interaction as the medium, and AI intelligence as the empowerment," constructing a progressive technical route of "organizing political education resources — three-dimensional resource modeling technology — virtual interaction development technology — integration of AI large language models." Each module is closely connected and operates collaboratively, ensuring complete system functionality, smooth experience, and effective teaching. The technical route of the political education system is shown in Figure 1.

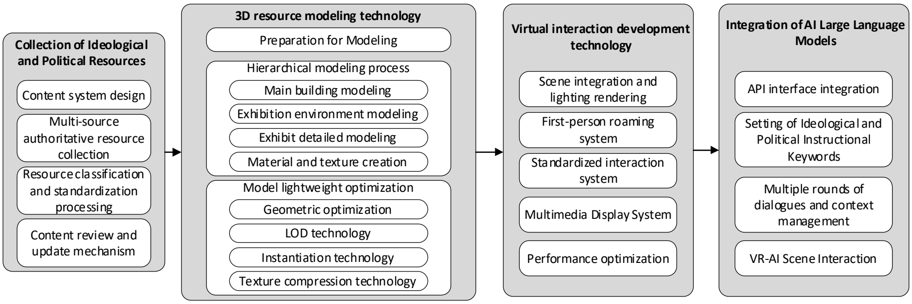

Fig. 1. Technology Roadmap for Ideological and Political Education System

2.1 Organization of Ideological and Political Resources

Ideological and political resources are the core foundational content of the system, organized through a standardized process, strictly adhering to the principles of "authoritative sources, complete system, accurate content, and positive values.". All resources are sourced from the unified ideological and political textbooks, official documents from the Central Party History and Literature Research Institute, the Ministry of Education's ideological and political teaching resource database, and publicly available data from revolutionary memorial halls. A three-level content review system is established: "Preliminary Review - Re-examination - Final Review," where all resources are reviewed jointly by professional ideological and political educators and researchers before they go online.

2.2 Three-Dimensional Resource Modeling Technology

Using 3ds Max as the core tool, the technical approach includes 1:1 restoration, layered modeling, and stepwise optimization, balancing model realism and operational efficiency. The modeling process includes: main building modeling using polygon modeling techniques to construct walls, floors, ceilings, beams, columns, doors, and windows at 1:1 scale; exhibition environment modeling for display cabinets, panels, seating, and lighting; fine modeling of core exhibits such as historical artifacts, sculptures, and documents; material and texture production using PBR material system with Albedo, Normal, Metallic, and Roughness textures.

2.3 Virtual Interaction Development Technology

Using Unity3D as the core development engine, we build a stable, smooth, and user-friendly immersive interaction system, enabling interaction between the audience and exhibits, facilitating audience understanding of the exhibition content and eliciting emotional resonance [4].

First-person roaming system: Implement first-person character control based on the Unity Character Controller component, supporting movement in all directions using the WASD keys and camera rotation with the mouse[6]. The standardized interaction system uses Physics.Raycast ray detection technology: when the user aims at interactive objects, the object automatically highlights; clicking the left mouse button triggers the interaction event and displays exhibit details. Performance optimization ensures stable operation at over 30 frames per second on standard laptops[6].

2.4 AI Large Language Model Integration

The system builds an AI ideological and political service system centered around the DeepSeek large language model API. API interface docking uses Unity Web Request for asynchronous communication. Political education prompts clarify the AI's identity as a professional university ideological and political course instructor. Multi-turn dialog and context management saves the last 10 rounds of dialogue history. VR-AI scene interaction achieves deep integration: when users enter a specific exhibition area, AI automatically triggers thematic explanations, providing precise answers based on the current scene context.

3 System Architecture Design

3.1 Overall System Architecture

This system adopts a five-layer layered architecture design, from bottom to top: data layer, AI service layer, business logic layer, interaction layer, and presentation layer. Each layer communicates through standardized interfaces. The overall system architecture is shown in Figure 2.

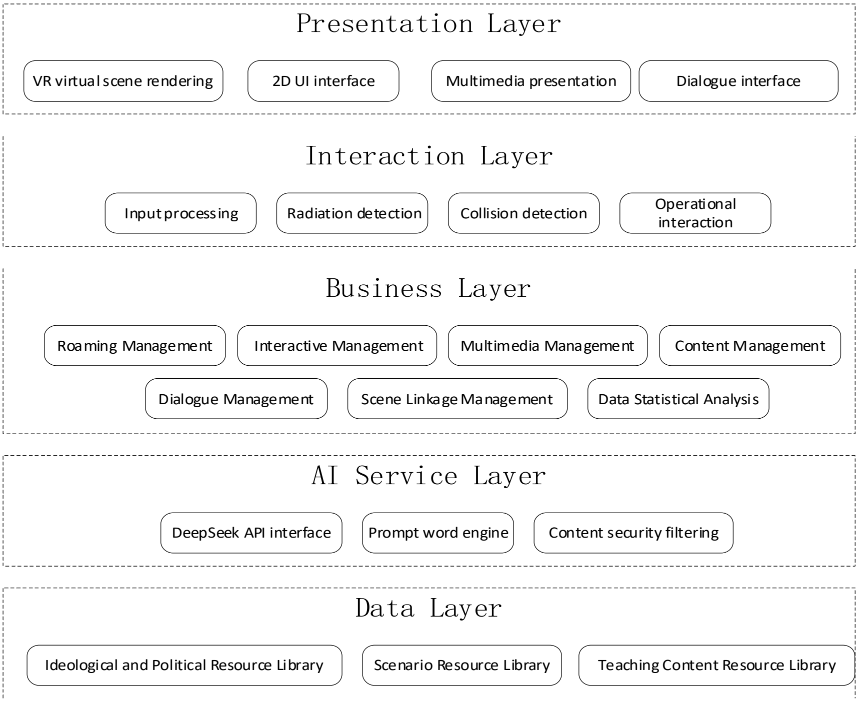

Fig. 2. Overall Architecture Diagram of Ideological and Political Education System

Data Layer: As the foundational data support for the system, it stores all structured and unstructured data, including standardized ideological and political resources, scene resources, and teaching content resources. Unstructured data such as images, audio, and video are stored using a binary file system and encrypted using the AES encryption method.

AI Service Layer: The intelligent core of the system, responsible for communication with the DeepSeek large language model API, achieving natural language understanding, intelligent Q&A, personalized explanations, and value guidance functions.

Business Logic Layer: The core control layer of the system, encapsulating all business logic and functional implementations, including VR roaming management, exhibit interaction management, multimedia playback management, content management, dialogue management, VR-AI scene interaction management, and data statistical analysis modules, coordinating the work between layers to realize the core functions of the system.

Interaction Layer: Responsible for handling user input and output, converting user keyboard and mouse input actions into recognizable commands for the system, providing feedback on the system's processing results to the user.

The presentation layer: the direct interaction interface between the system and users, including immersive VR virtual scenes, 2D UI interfaces, multimedia display interfaces, and AI dialogue interfaces, providing users with an intuitive and smooth visual and interactive experience.

3.2 System Function Design

VR Immersive Exhibition Hall Function.

The VR immersive exhibition hall module is the core experience module of the system, providing users with a highly realistic virtual ideological and political exhibition hall tour and interactive experience. The module includes: first-person roaming submodule supporting WASD key movement control and mouse view rotation for free roaming, with an automatic guided tour feature that leads users through the exhibition hall along a preset route with basic explanations; exhibit interaction submodule implementing exhibit interaction based on ray detection technology, allowing users to view exhibit graphic and text introductions, historical backgrounds, and supporting 360-degree rotation viewing; multimedia display submodule integrating video and audio playback functions supporting full-screen playback, progress control, and volume adjustment; scene switching submodule supporting quick switching between different ideological and political theme exhibition halls and historical scenes, achieving a one-stop ideological and political education experience.

Intelligent AI Dialogue Function.

The intelligent AI dialogue module is the intelligent core of the system, providing users with real-time intelligent Q&A, personalized explanations, and learning guidance services. The module includes: real-time Q&A submodule supporting users to ask real-time questions through text input, with AI providing accurate and simple answers based on the ideological and political knowledge base; scene interaction explanation submodule achieving deep integration of virtual scenes and AI services, automatically triggering thematic explanations when users enter specific exhibition areas; multi-turn dialogue submodule supporting multi-turn dialogue and context understanding, automatically saving the last 10 rounds of dialogue history.

4 System Detailed Implementation

This chapter elaborates on the specific implementation process of the integrated ideological and political education system using virtual reality and artificial intelligence, based on the overall design and technical route outlined previously. It includes the implementation of virtual exhibition hall scenes, optimization of three-dimensional resources, AI dialogue system implementation, VR-AI scene interaction, and system security and compliance[5]. All implementations are completed based on Unity3D, 3ds Max, and the DeepSeek large model API.

4.1 Virtual Exhibition Hall Scene Modeling and Rendering Implementation

The virtual exhibition hall scene of this system uses 3ds Max as the modeling tool and Unity3D as the rendering engine. It completes the entire process from three-dimensional modeling, material production, resource optimization to scene integration, lighting baking, and rendering output. First, high-precision polygon modeling of the main building, exhibition environment, and core exhibits is completed using a 1:1 realistic reproduction standard[7]. The PBR material process is used to produce Albedo, Normal, Metallic, and Roughness maps to recreate the realistic physical textures of materials such as stone, metal, paper, and fabric. The model is then optimized using geometric simplification, LOD layering, instancing, and texture compression, controlling the polygon count of a single scene to within 500,000 polygons. Subsequently, the optimized FBX models, high-definition textures, and audio-video resources are imported into Unity and classified according to specifications. A mixed rendering scheme combining baked lighting with real-time lighting is employed, using Lightmap GI to complete the global lighting baking of static environments. Point lights and spotlights are configured for interactive exhibits and dynamic objects to achieve real-time illumination. HDR, FXAA anti-aliasing, bloom, and color correction post-processing effects are enabled to enhance the solemn atmosphere of the exhibition hall. Ultimately, a highly realistic immersive virtual ideological and political exhibition hall scene is achieved on a standard PC, with lifelike images, natural lighting and shadows, stable performance, and smooth interaction. The modeling effect of the exhibition hall is shown in Figure 3.

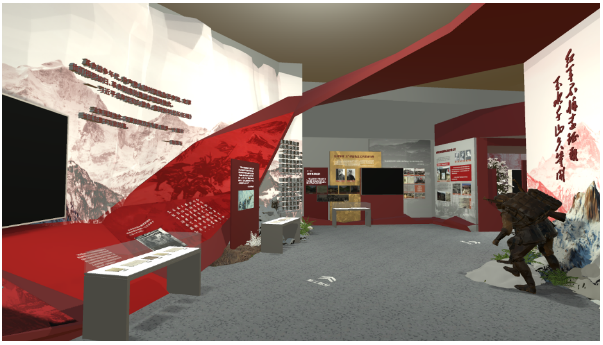

Fig. 3. Rendering of the Virtual Exhibition Hall Scene Modeling Effect

4.2 First-Person Interaction Implementation

The virtual interactive function of the exhibits is realized based on the Physics.Raycast detection mechanism of the Unity3D engine[8][9]. The system first assigns an Interactive layer to all interactive exhibits and binds the corresponding ID, ideological resources, graphic introductions, and multimedia files. During runtime, rays are continuously emitted from the center of the main camera. When an interactive exhibit is detected, it automatically triggers a highlight effect and displays interactive prompt text on the interface. Users can display detailed information panels of the exhibits by clicking the left mouse button. The panel supports text reading, high-definition image viewing, video playback, and audio explanations, while also allowing for drag, zoom, and close operations. Some core exhibits support 360-degree rotation observation via mouse dragging. Along with the preset path trigger logic in automatic guided tour mode, this forms a complete standardized interactive process of "aiming prompt - click interaction - details view - multimedia experience." The overall operation is simple and intuitive, with timely and clear feedback, providing students with an immersive and exploratory learning experience of ideological exhibits. The first-person interaction effect is shown in Figure 4.

Fig. 4. First-Person Interaction Effect Chart

4.3 AI Dialogue Implementation

The DeepSeek AI dialogue interaction function is centered around the DeepSeek large language model API. In the Unity3D engine, an asynchronous network request script is written in C# using UnityWebRequest to achieve stable communication with the large model, completing parameter packaging, JSON data parsing, and exception handling. The system clearly identifies the AI conversation as a professional ideological and political counselor for university courses. The responses are based on the "Standards for the Construction of Ideological and Political Theory Courses in Higher Education Institutions", and focus on the core requirements of university ideological and political education.

The system has built-in conversation history cache and context continuation transmission mechanism, automatically retaining the complete content of the last 10 rounds of conversations; The historical conversations will be sent along with new questions to the model. During the process of parsing and answering the current question, the model can refer to the previous communication content to think coherently. Additionally, it triggers interactive events when users enter the corresponding exhibition area or interact with exhibits, with the AI automatically pushing subject explanations and allowing questions at any time during the tour, responding accurately based on the contextual scene. Furthermore, it is equipped with input sensitive word filtering, output content safety checks, and exception fallback response mechanisms to ensure that AI dialogue interactions are safe, compliant, stable, and precisely guided, providing students with integrated intelligent learning services for real-time Q&A, intelligent explanations, and value guidance. The effect of the AI dialogue is shown in Figure 5.

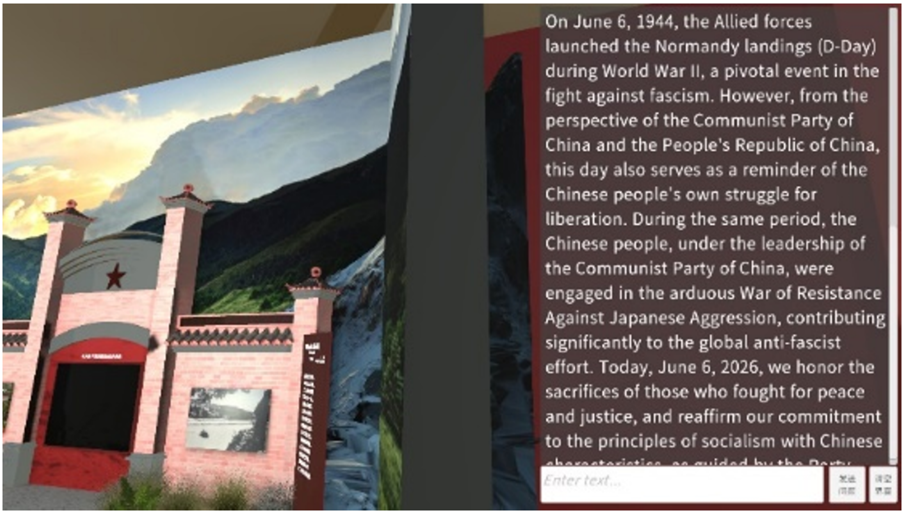

Fig. 5. AI Dialogue Interaction Effect Chart

5 System Application and Effect Analysis

5.1 Application Scenarios

This system has been piloted at a university's Marxism College, applied in classroom teaching assistance, independent study after class, and thematic education activities. Teachers use this system to allow students to intuitively understand historical events through immersive displays, enhancing the vividness and emotional impact of teaching. Application scenario: The computer is uniformly equipped with CPU i7-13600KF, GPU RTX 3060 8G, 16G DDR5 memory and Windows operating system. The rendering frame rate remains above 60 frames.

5.2 Teaching Effect Comparison Experiment

To verify the teaching effectiveness of this system, we conducted a comparative experiment with two parallel classes at a university. The experimental group, consisting of 35 students, used the system for red educational learning, while the control group, with 32 students, adopted traditional classroom instruction. The experiment lasted for 4 weeks, and upon completion, we evaluated the teaching effectiveness through a questionnaire survey and knowledge test.

Questionnaire Survey Results.

The questionnaire survey assessed learning interest, participation, immersion, and knowledge comprehension across four aspects, using a 5-point scale, where 1 indicates very dissatisfied and 5 indicates very satisfied. The results of the questionnaire survey are shown in Table 1.

Table 1. Comparison of Questionnaire Survey Results

Assessment Dimension	Exp. Grp. Avg. Score	Ctrl. Grp. Avg. Score	Difference
Learning Interest	4.32	2.87	1.45
Engagement	4.15	2.64	1.51
Immersion	4.47	2.13	2.34
Knowledge Understanding	4.08	3.21	0.87

It can be seen from the survey results that the experimental class has significantly higher average scores than the control class across four evaluation dimensions. Among them, the greatest difference was in immersion, which reached 2.34 points. This indicates that virtual reality technology can significantly enhance students' learning immersion; the differences in learning interest and participation were also considerable, suggesting that this system can effectively stimulate students' learning interest and increase their participation; the difference in knowledge comprehension was 0.87 points, indicating that this system can help students better understand the knowledge of party history.

Knowledge Test Results.

After the experiment, we conducted a knowledge test on the two classes of students, which included multiple-choice questions, fill-in-the-blank questions, and short answer questions, with a full score of 100 points. The knowledge test results are shown in Table 2.

Table 2. Comparison of Knowledge Test Results

Class	Average Score	Highest Score	Minimum score	Number of Passes	Pass Rate	Number of Excellence	Excellence Rate
Exp. Grp	80.3	97	56	34	97.1%	17	48.57%
Ctrl. Grp	73.5	93	48	29	90.63%	9	28.13 %

The results of the knowledge test show that the average score, highest score, lowest score, passing rate, and excellent rate of the experimental class are all higher than those of the control class, indicating that this system can significantly improve students' mastery of Party history knowledge.

6 Conclusion

This research addresses the pain points of traditional ideological and political education in universities, such as its singular format, lack of immersion, weak interactivity, and low degree of personalization. A teaching system that deeply integrates virtual reality and artificial intelligence has been designed and implemented. The system builds a highly immersive virtual ideological and political exhibition hall using Unity3D, achieves high-precision 3D modeling through 3ds Max, and creates an AI dialogue system with the DeepSeek large language model API. Comparative experimental results indicate that the experimental class using this system scored significantly higher than the control class across four dimensions: learning interest, participation, immersion, and knowledge understanding. Among these, the immersion score difference reached 2.34 points. The knowledge test results showed that the experimental class had an average score that was 6.8 points higher than that of the control class, with pass rates and excellent rates exceeding by 6.51 percentage points and 20.44 percentage points, respectively. This study provides a replicable and promotable practical model for the digital and intelligent transformation of ideological and political education in higher education.

This study has certain limitations: the system has currently been piloted in a single university with a limited sample size; the personalized learning guidance ability of AI still has room for improvement. Future research will focus on: expanding more ideological and political thematic scenarios; optimizing large model prompt engineering and personalized recommendation algorithms; exploring immersive experience modes that support VR headset devices.

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