

Retraction

Retracted: Research on the Immersive Classroom Teaching Mode of Colleges and Universities Based on Virtual Reality

Journal of Sensors

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] C. Hu and J. Li, "Research on the Immersive Classroom Teaching Mode of Colleges and Universities Based on Virtual Reality," *Journal of Sensors*, vol. 2022, Article ID 3585149, 10 pages, 2022.

Research Article

Research on the Immersive Classroom Teaching Mode of Colleges and Universities Based on Virtual Reality

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In order to improve the teaching effect of colleges and universities and eliminate the disadvantage of the traditional teaching mode, this paper applies virtual reality technology to the immersive teaching mode of colleges and universities and uses four-dimensional light field parameterization to describe the acquisition process and reproduction process of integrated imaging. Moreover, this paper studies the propagation characteristics of the light field during the reproduction of the integrated imaging system and establishes an evaluation method for the 3D scene reproduction capability of the integrated imaging system using light field parameters. In addition, this paper analyzes the problem of parameter matching between the acquisition end and the display end in the current integrated imaging system and does a detailed study on the method of light field conversion and gives the interpolation method of the light field image. Finally, this paper constructs an immersive teaching system for colleges and universities based on virtual reality and verifies the performance of the system through experimental research. From the experimental research results, it can be seen that the immersive classroom teaching model in colleges and universities based on virtual reality proposed in this paper has good teaching effects.

1. Introduction

With the continuous development of MOOCs, microclasses, and flipped classrooms, their shortcomings have also become more prominent. Although they can satisfy people's desire for knowledge, the boring video teaching also makes the learning process lack of immersion, interactivity, and interest. However, the emergence of virtual reality technology can make up for the shortcomings presented by the current MOOC, microclass, and flipped classroom. Therefore, classroom design research based on immersive virtual reality has a strong practical significance [1]. The immersive virtual reality classroom is a bold attempt to combine current information science technology with innovative teaching concepts. It inherits the short-cut, large-scale, and free and open characteristics of the existing online education, and it combines immersive virtual reality technology. Moreover, the virtual reality classroom will present a strong sense of immersion, interactivity, and conception [2]. Immersive classrooms in

colleges and universities are studying how to integrate immersive virtual reality technology into modern classrooms to supplement existing teaching media and methods, which provide students with a more personalized learning space and achieve classroom optimization [3].

Virtual reality technology originated in the United States. The first country to apply virtual reality technology to teaching was the United States. At the same time, the highest level of virtual reality technology is also represented by American universities and research institutes. East Carolina University in the United States established the first virtual reality technology laboratory in 1992. In addition, the University of Houston, Harvard University, and other universities have also begun to use the virtual reality technology for teaching. In addition to the United States, virtual reality education in developed countries such as Japan and Europe is also at a leading level. Compared with the United States, China started relatively late in the VR field. However, with the expansion of China's network technology and the

improvement of the level of science and technology, VR education has attracted the interest and attention of the Chinese people.

This article combines virtual reality technology to reform the teaching mode of colleges and universities, constructs an immersive teaching classroom in colleges and universities, adopts the immersive teaching model for teaching, and improves the teaching quality of colleges and universities.

2. Related Work

The teaching process should be full of concrete experience and gradually extend to abstract experience. Learning activity theory believes that real or simulated learning environment can promote learners' cognition and internalization. The immersive virtual reality system is based on a variety of perception technologies, such as visual sensing, somatosensory and voice recognition, and tactile feedback, forming a full range of perceptual experience [4]. It can render a realistic teaching environment through audiovisual elements, such as light, pictures, sound effects, and colors, which is conducive for learners to actively construct knowledge in an intuitive learning context [5], and inspire learners to have a strong scientific research interest. The characteristic of science classroom is to construct scientific concepts and form correct scientific values through observation and experimentation. Therefore, real natural scenes are essential for the understanding and memory of knowledge [6]. In traditional classrooms, it is difficult for students to have access to real natural objects and landscapes, while virtual reality technology can use computers and other hardware devices to create highly simulated teaching situations and solve the problems of traditional classroom site factors and excessive practical expenses. [7]. At the same time, students can be completely immersed in the teaching environment closely related to the learning content, carry out repeated practice, and gain experience, thereby improving scientific literacy [8]. In a science classroom based on immersive virtual reality, learners use head-mounted high-definition displays to project themselves into a full-scene 3D environment. By operating and controlling the teaching scene, learners can naturally realize interactive learning activities. In the classroom, students use virtual reality equipment to enter the virtual environment as virtual characters of the teaching content to observe and experience scientific phenomena immersively. Science classrooms based on immersive virtual reality technology can provide students with an interactive and intuitive learning environment and stimulate students' interest in learning through strong senses, thereby enhancing students' cognition.

Virtual reality science classrooms can provide students with a variety of learning methods and practice the educational concept of "teach students in accordance with their aptitude." Virtual reality science classrooms will change the boringness of traditional classrooms and provide students with opportunities for active exploration. Students can communicate and discuss online or offline with classmates and teachers at any time and conduct interactive learning [9]. With the support of immersive virtual reality technology,

teaching strategies can produce better learning effects than traditional teaching classrooms. In terms of interaction methods, immersive virtual reality technology breaks through the keyboard input and mouse operation of traditional virtual technology and adopts technologies, such as head-eye tracking, gesture recognition, and voice recognition, which are more in line with people's interaction habits [10]. Virtual reality technology provides support for various teaching strategies of learning activities and effectively improves the efficiency of learning activities. Through the creation of a highly immersive simulation environment [11], virtual reality technology can effectively stimulate the various senses of learners to observe and can internalize abstract concepts through experiential learning and actively test knowledge and skills. Learners use virtual reality equipment to observe scientific phenomena and experience scientific changes personally, learn to actively think about scientific phenomena, ask scientific questions, and achieve the effect of inferring from one another. Virtual reality technology can also promote the exploratory learning of scientific knowledge. Students can actively discover scientific problems and carry out exploratory experiences through hands-on and middle school in a virtual teaching context [12], thereby drawing conclusions. Inquiry-based teaching methods can stimulate students' research interest and learning activities, and simulation operations can also enhance students' sense of participation, improve hands-on ability and cultivate creative thinking, and enhance the effect of inquiry-based learning.

Virtual reality classrooms can improve students' learning motivation and promote the development of scientific thinking. The powerful interactive function of virtual reality technology transfers operations to the virtual teaching environment in a natural way in real time, realizing immersive learning activities [13]. Learners use input devices such as operating handles or data gloves to form a time series of learning behaviors and then use human-computer interaction interfaces to transmit data to the computer [14] to realize the analysis of students' learning behaviors and give operational results to form data feedback. Students can check for omissions based on detailed scores, thereby consolidating knowledge. Teachers can also log in to the learning management system to inquire about the learning situation of students and analyze the important and difficult points in teaching through visual data, so as to improve the teaching process and teaching methods and improve the quality of teaching [15].

3. Four-Dimensional Light Field Model of Integrated Imaging System

When all the light distribution in a three-dimensional scene is recorded and described, the optical appearance of the scene can be recorded. Correspondingly, when all the recorded light distribution is reproduced, the appearance of the three-dimensional scene is also reproduced, so that people can directly observe the three-dimensional scene.

The light distribution in the scene can be completely described by the plenoptic function, which uses seven

variables to describe the radiation of any light in the light field with a wavelength of λ at time t :

$$P = P(x, y, z, \theta, \phi, \lambda, t). \quad (1)$$

The light equation uses $(x, y, \text{ and } z)$ to describe the position of the light and (θ, ϕ) describe the direction of the light. The plenoptic function must describe all the lights in a scene. Due to the complexity of the plenoptic function, it is almost impossible to obtain the plenoptic function of a scene completely. Therefore, people use reduced-dimensional and discretized light field functions to approximate the light in the light field.

According to the principle of light color perception, the spectrum can be decomposed into three primary colors (red, green, and blue) to be perceived. Therefore, the spectral dimension in the light field can be reflected on the output of the function through color and intensity information. The time dimension can also be subtracted from the function when the optical properties of the scene are not considered to change with time. When the radiation intensity of light along a straight line is assumed to be constant, the three-dimensional space coordinates in the plenoptic function can be reduced to two-dimensional space coordinates, which together with the two-directional dimensions describe the position and direction information of the light. The light field function after the above-mentioned dimensionality reduction processing is called the four-dimensional light field function.

Two planes are used to characterize the light in the light field, as shown in Figure 1:

The four-dimensional light field function is [16]

$$L = L(u, v, s, t). \quad (2)$$

The function uses four parameters $u, v, s, \text{ and } t$ to describe the position and direction information of the light and describe the intensity and color (spectrum) information of the light through the R, G, and B values of the light L . Camahort uses points and directions on two spheres or one sphere to characterize the light in the light field, as shown in Figure 2.

Integrated imaging is to record three-dimensional scenes through planar devices. Therefore, the use of a planar four-dimensional light field can greatly simplify the process of combining the four-dimensional light field with integrated imaging. In the four-dimensional light field model given below, a reference plane is used, and the light is described by the intersection of a certain ray and the plane and the direction of light propagation, as shown in Figure 3.

The four-dimensional light field function is [17]

$$L = L(x, y, \alpha, \beta). \quad (3)$$

In the formula, x and y represent the position of the intersection of the light and the display plane on the plane, and α and β represent the angle of the light deviating from the horizontal plane and the vertical plane. For the convenience of writing, the four-dimensional light field mentioned

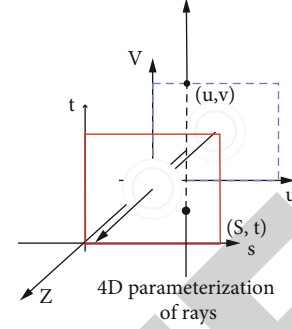


FIGURE 1: Points on two planes are used to describe the light in the light field.

below all adopt the four-dimensional light field model given here.

In order to measure the imaging performance of an integrated imaging system, the performance parameters of a four-dimensional light field can be used to characterize the parameter performance of an integrated imaging system:

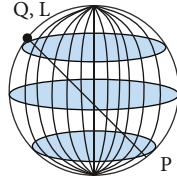
$$\{N_{pt(x,y)}, L_{(x,y)}, N_{angle(x,y)}, \Theta_{angle(x,y)}\}. \quad (4)$$

The sampling plane is the plane where the integrated imaging microlens array is located. On this sampling plane, N_{pl} represents the number of macro pixels, that is, the number of sampling points, which corresponds to the number of microunit lenses (pinholes) in integrated imaging. $L_{(x,y)}$ represents the sampling range, that is, the width and height of the sampling area. N_{angle} refers to the number of viewpoints in each macro pixel, that is, in the recording process, how much light from different directions can be recorded by each macro pixel, which is equivalent to the number of pixels in each micro unit image in integrated imaging. Θ_{angle} is used to represent the field of view angle of each macro pixel, L/N_{pt} represents the spatial sampling frequency, and Θ_{angle}/N_{angle} represents the angular sampling frequency.

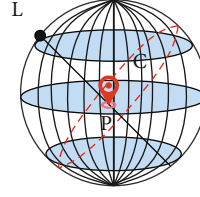
Each parameter may have different values in the horizontal and vertical directions, so x and y are used to refer to the horizontal and vertical directions, respectively. In order to facilitate the analysis, the following article only analyzes in one direction.

In a real scene, the collection of all optical radiation constitutes a plenoptic function. However, during the acquisition process, it is impossible to record all the optical radiation in the scene. We can only discretize and record the radiation intensity of a certain wavelength or a few wavelengths within a certain spatial range and angle range in the scene for a certain period of time. Next, we analyze the capture process of traditional cameras and integrated imaging systems and quantitatively analyze and compare the two systems' ability to collect and record light field information in the scene.

The shooting process of a traditional camera can be considered as a process of recording the light passing through



(a) Select two points on the sphere to describe any light L



(b) Use the normal plane C of the in-sphere optical L and the intersection P of the intersection P of L and C to describe the L

FIGURE 2: A spherical surface is used to describe the light in the light field.

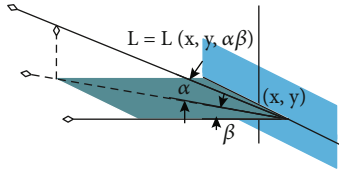


FIGURE 3: A point on a plane and the propagation direction angle of a ray are used to describe a ray.

the focal plane. This process integrates the light rays that can enter the camera at each point on the focus plane to obtain the pixel value of its corresponding pixel, as shown in Figure 4.

By analyzing the photographing process of a traditional camera from the perspective of the light field, we can understand as follows. The traditional photography process collects light emitted in a certain direction on a plane (focusing surface), and the number of spatial sampling points of the light field on the focus plane is the same as the number of pixels. There is only one angular sampling point, that is, only the rays that propagate from the sampling point on the focus plane to the camera lens can be sampled. Considering that most of the objects in the real scene can be approximately regarded as Lambertians, the optical observation results of the same object point from different angles are approximately unchanged. Therefore, when the focus plane is approximately coincident with the object in the scene, the integral of the light from the object to the camera lens can accurately reflect the optical appearance of the object point on the object. When the focus plane of the camera does not coincide with the object, the light propagating toward the lens through a point on the focus plane contains information about different objects. After integration, neither object A nor object B can be reflected, which becomes a blur point. At this time, objects A and B are out of the camera's depth of field.

From the above analysis, it can be seen that when in focus, the light emitted from a point on the focusing surface toward the camera is approximately the same, which can reflect the same object point information. However, when defocusing, the light emitted from the points on the focusing surface in different directions reflects the information of different object points. After the integration of the camera, blurred pixels are obtained. By reducing the clear aperture of the camera (increasing the F-number), the integration of light in different directions on the focusing surface can be

reduced, thereby increasing the depth of field. In addition, through analysis, it can be considered that when the clear aperture of the camera is small enough and the objects in the scene are within the depth of field, the camera collects the light emitted in different directions through the point of the aperture on the plane where the lens is located, as shown in Figure 5.

When the clear aperture of the camera is small enough, the lens can be equivalent to a small hole, and only the light that propagates toward this small hole in the scene can be recorded. At this time, the plane where the small hole is located, that is, the plane where the camera lens is located, can be regarded as an equivalent sampling plane. On this sampling plane, the number of spatial sampling points is 1, and the number of angular sampling points is the number of pixels. The spatial sampling points in the scene are transformed into angular sampling points on the plane where the lens is located.

The acquisition results of traditional cameras are two-dimensional, which cannot reproduce the near and far position and depth information of the object. The reason can be attributed to the collected scene images only have spatial sampling and lack angle sampling. However, from the analysis of a camera with a sufficiently small lens aperture, the recording process of the camera can be equivalent to the recording process of the plane light field where the lens is located, but because there is only one spatial sampling point, only the angle information of this light field can be recorded. In other words, by increasing the number of lenses on this plane, the number of spatial sampling points for this light field can be increased. In integrated imaging, the microlens array used to collect the scene can just meet the needs of multiple lenses for collecting different sampling points of the same light field.

As mentioned earlier, only when the space of the lens can be approximated as a pinhole can there be an equivalent sampling plane of the light field. However, the use efficiency of the pinhole array for light is too low, so people generally use a microlens array as an optical element for imaging. There must be a depth of field problem when using a lens, and the depth of field can be calculated by the depth of field formula [18]:

$$\begin{aligned} \Delta L_1 &= \frac{F\delta L^2}{f^2 + f\delta L}, \\ \Delta L_2 &= \frac{F\delta L^2}{f^2 - f\delta L}. \end{aligned} \quad (5)$$

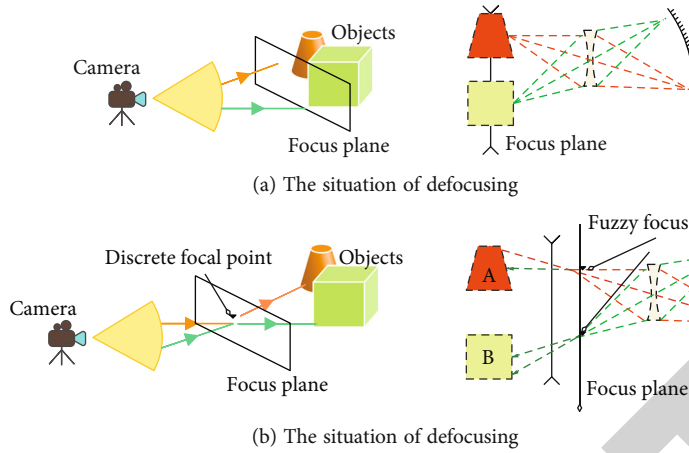


FIGURE 4: Acquisition mode of traditional camera.

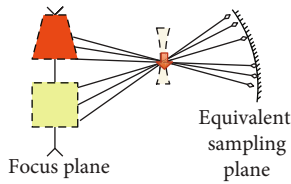


FIGURE 5: Focus plane and its equivalent sampling plane.

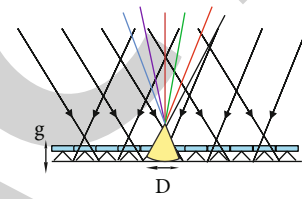


FIGURE 6: Schematic diagram of the collection process of the microlens array.

In the formula, ΔL_1 and ΔL_2 , respectively, refer to the foreground depth and the back depth of field, F refers to the F number of the microunit lens, δ is the allowable size of the diffuse spot, that is, the CCD/CMOS pixel size, and f is the focal length of the microunit lens. In general, since the focal length f of the microunit lens is very small, the depth of field of the optical elements used in the acquisition process in the integrated imaging system is very large. The use of the light field camera's acquisition method can make all the scenes fall within the depth of field. Since all objects in the scene can fall within the depth of field of the microlens without blurring due to defocusing, the microlens array can be equivalently regarded as a pinhole array during analysis.

The following will analyze the light field information parameters that can be obtained through the analysis of the collection process of the microlens array. The unit microlens is equivalently regarded as a small hole, as shown in Figure 6.

The number of macro pixels is equal to the number of microlenses, and the number of angular sampling points is the same as the number of pixels covered under each microlens. The spatial sampling range, that is, the range occupied by the microlens array, can be obtained by the following formula [19]:

$$L_x = N_{plx} \times D. \quad (6)$$

The angular sampling range is the angular range within which the pixels covered by each microunit lens

can receive light, which can be obtained by the following formula [20]:

$$\Theta_{\text{angle}} = \arctan \frac{D}{2g}. \quad (7)$$

The application of the micro-unit lens solves the problem of simultaneous spatial sampling and angular sampling in the light field sampling process. However, when the micro-unit lens array is directly used for light field image collection, the range of light field collection is similar to the size of the micro-unit lens array. In a real shot scene, because the scene is usually much larger than the micro-unit lens array, the information collection in the scene is incomplete. In the process of collecting the real scene, it can be found that there is little difference in the angle sampling of the scene between two points very close in space. If the approximate continuity of the angle sampling of the micro-unit lens array is discarded, and the spacing between the micro-unit lenses is enlarged, the range of spatial sampling can be increased.

As shown in Figure 7, when using a parallel projection camera array to collect the light field, the main optical axis directions of all cameras are parallel, and the parameters (focal length, F number, etc.) are set to the same. At this time, it can be considered to collect the light field at the position where the camera's common focus plane is located. The spatial sampling range is the union of all the fields of view in the camera array, and the angular sampling range is the

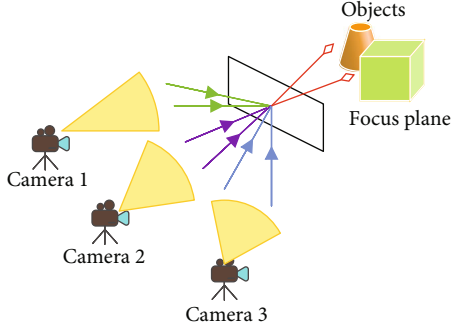


FIGURE 7: The acquisition process of the light field by the camera array.

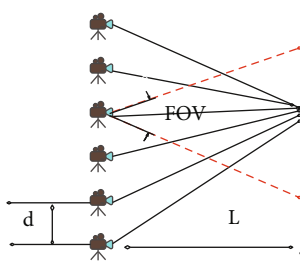


FIGURE 8: Schematic diagram of the parameters of the camera array collecting light field information.

same as the field of view of a single camera. In order to make the captured image clear, each camera in the camera array must have a sufficiently large depth of field.

As shown in Figure 8, the interval between the cameras in the camera array is d , the distance between the focus plane and the camera is l , and the field of view of a single camera is FOV . Then, in the process of sampling the light field, the angle sampling range is also FOV , and the number of angle sampling points is

$$N_{\text{angle}} = \frac{FOV \cdot l}{d}. \quad (8)$$

The number of spatial sampling points is approximately equal to the number of pixels of the camera's photosensitive element.

The application of the camera array can solve the problem that the sampling range of the microunit lens array is too small for the light field. However, the camera array device is huge, and the optical axis of each camera in the array needs to be aligned during use, and a complicated calibration process is required. On this basis, scholars proposed many improved light field cameras with similar structures and different parameters.

As shown in Figure 9, the light field camera transforms the scene into a reduced image through the transformation of the main mirror and then uses the microunit lens array to shoot the image formed by the main mirror to expand its collection range. At this time, the light field recorded by the microunit lens is no longer the original light field but the light field transformed by the main mirror. Therefore,

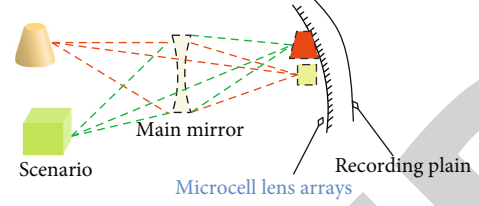


FIGURE 9: Schematic diagram of the structure of the light field camera.

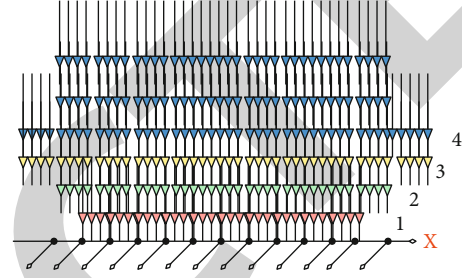


FIGURE 10: Schematic diagram of light field propagating in one direction.

the acquisition capability of the light field camera is closely related to the parameters of the main mirror, and its acquisition range can be characterized by the angle of view as follows:

$$FOV = 2 \arctan \frac{S}{2f}. \quad (9)$$

In the formula, S is the size of the recording panel, and f is the focal length of the main lens. The angle sampling range of the scene depends on the position of the point in the scene relative to the camera. The angle can be characterized by the angle formed by the camera lens to the object point as follows:

$$\theta \approx \frac{D}{L}. \quad (10)$$

In the formula, D refers to the diameter of the lens, and L refers to the distance between the object point and the camera.

The display modes of integrated imaging include real image mode, virtual image mode, and focus mode. When the display mode works in the focus mode, the microlens array can be approximately equivalent to a small hole model. The display process and the acquisition process are exactly the reverse process, and the parameter derivation is similar to the shooting process of the microlens array, and only the pixel parameters of the display panel need to be replaced with the pixel parameters of the acquisition panel.

Under the existing conditions, the pixels of the display panel cannot be small enough to meet the display requirements. Therefore, in the display of integrated imaging, in order to obtain a better viewing effect, it usually works in

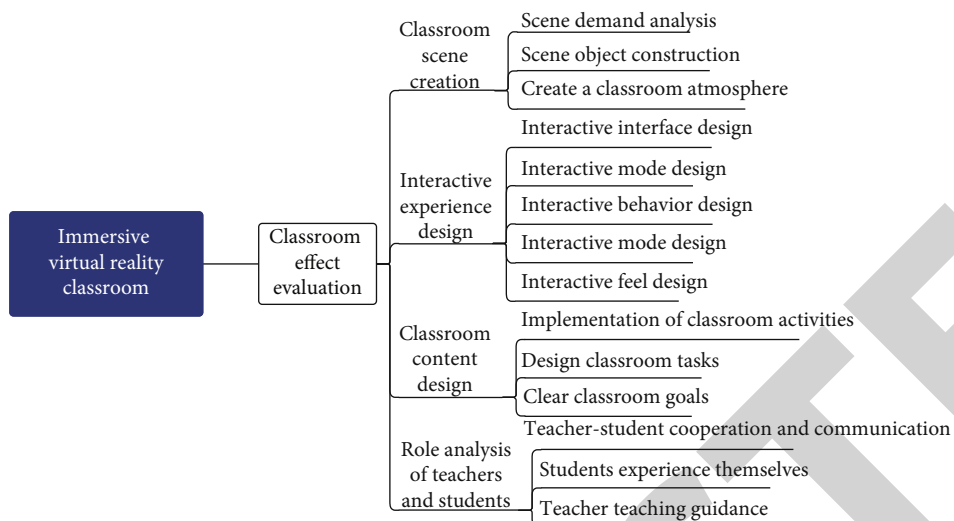


FIGURE 11: The overall structure of the immersive virtual reality classroom.

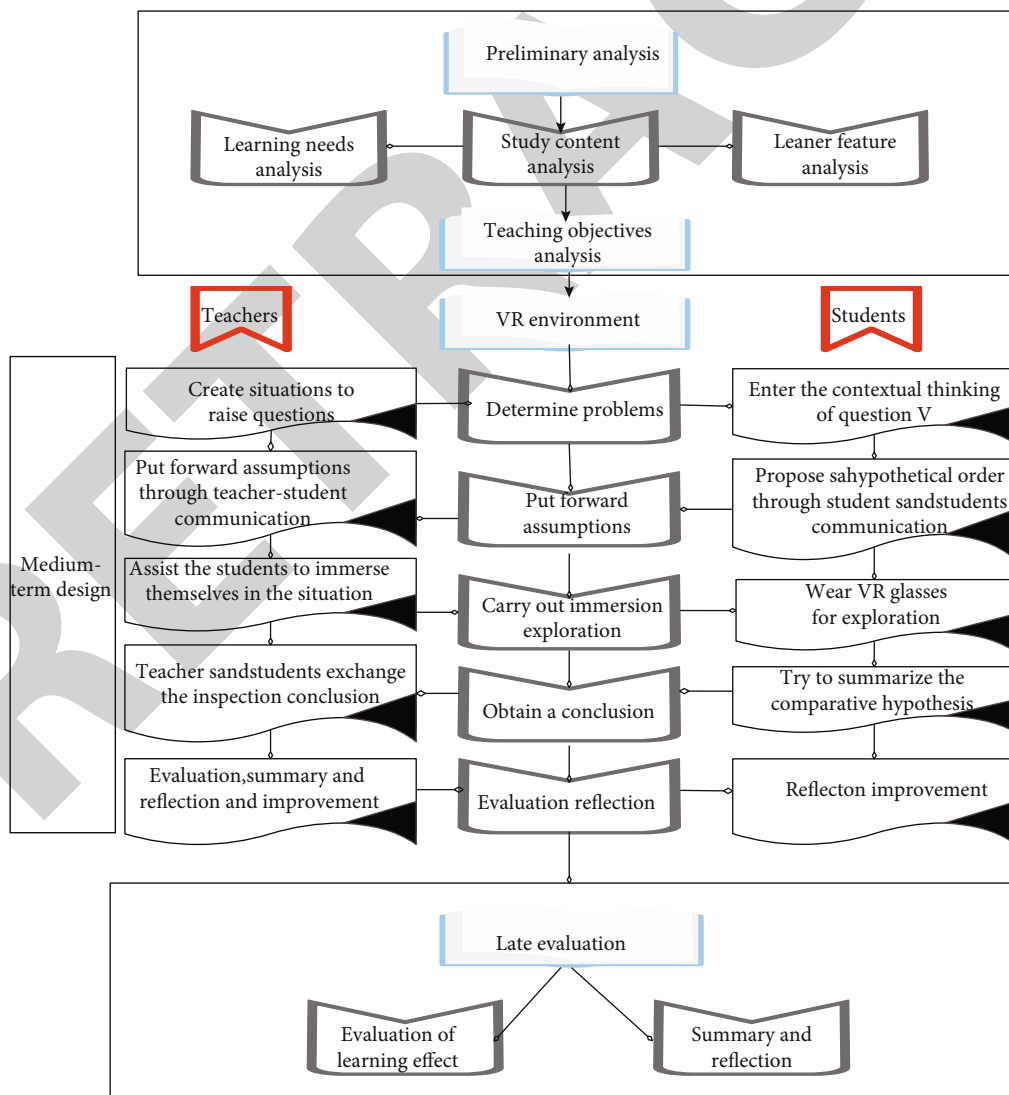


FIGURE 12: Immersive teaching mode based on VR.

TABLE 1: Verification of the effect of VR-based immersive teaching mode.

Number	Immersion	Teaching effect	Number	Immersion	Teaching effect
1	84.26	86.38	21	88.01	93.01
2	78.69	86.27	22	82.46	89.01
3	77.17	89.63	23	84.82	85.68
4	79.12	83.74	24	89.92	84.64
5	77.55	85.64	25	77.01	94.53
6	78.29	89.84	26	77.39	94.81
7	76.04	83.17	27	84.36	88.82
8	88.71	83.49	28	86.75	84.92
9	88.96	87.00	29	85.68	92.02
10	88.57	93.44	30	80.70	86.67
11	80.62	91.57	31	76.52	83.80
12	87.85	93.29	32	81.57	94.52
13	78.79	83.34	33	86.59	84.84
14	84.74	92.43	34	80.08	88.97
15	91.00	87.17	35	89.06	90.97
16	87.61	86.70	36	82.52	83.88
17	79.44	90.16	37	78.11	90.00
18	82.35	83.58	38	82.96	89.86
19	89.18	86.54	39	84.64	85.43
20	85.46	88.05	40	81.60	87.75

the real image mode and the virtual image mode. At this time, in each microunit lens in the lens array images, the corresponding microunit image on its common surface and the microunit lens can no longer be equivalent to a small hole model.

Through calculation, it can be known that the spatial sampling range becomes

$$L = L_{kns} \left(N_{kns} + \frac{l}{g} \right). \quad (11)$$

However, the spatial sampling range without angular sampling loss is reduced, which can be expressed as follows:

$$L = L_{kns} \left(N_{kns} - \frac{l}{g} \right). \quad (12)$$

In the formula, L_{kns} refers to the size of a single micro lens, and N_{kns} is the number of micro lenses.

The four-dimensional light field function is only a subset of the seven-dimensional plenoptic function, and the information loss is caused by the sampling during the acquisition of the four-dimensional light field. It, respectively, shows the distribution of light field sampling points on the sampling plane ($z=0$) and several special interfaces (corresponding to the planes ①~④ in Figure 10).

It can be seen from the figure that the spatial sampling rate on plane ① has reached a maximum. If the object (Lambertian) is just on plane ①, then the finest spatial sampling of the surface information of the object can be completed.

However, the maximum spatial sampling rate sacrifices the angular sampling rate. The angular sampling rate on this plane is extremely small (no matter where, only one angle of light can be sampled at that point), and it no longer has viewing angle information.

In the method given in this paper, only two transmission processes are used: the propagation of optics in free space and the transformation of light by an ideal lens. The transmission matrix of light propagating in free space is

$$L_t = \begin{bmatrix} 1 & t \\ 0 & 1 \end{bmatrix}. \quad (13)$$

The transmission matrix of light passing through the lens is

$$L_f = \begin{bmatrix} 1 & t \\ -\frac{1}{f} & 1 \end{bmatrix}. \quad (14)$$

4. Immersive Classroom Teaching Model in Colleges and Universities Based on Virtual Reality

The overall structure of the immersive virtual reality classroom is shown in Figure 11.

The VR-based immersive teaching mode caters to the requirements of the new curriculum standards, and it is necessary to return the classroom to the students and pay

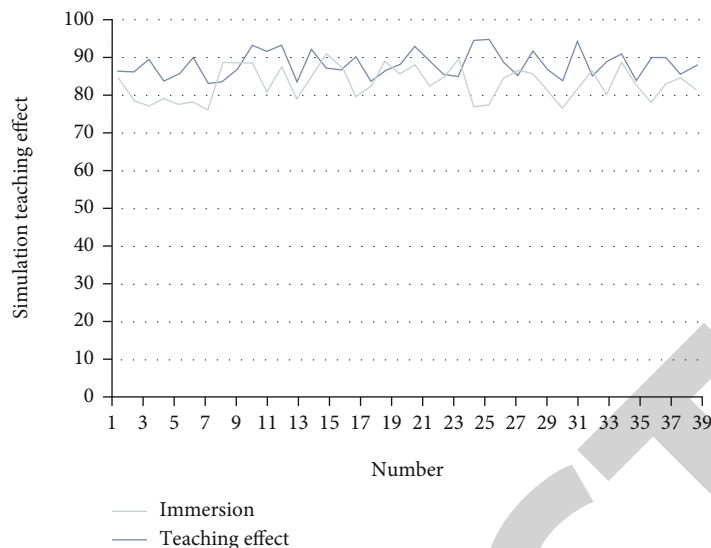


FIGURE 13: Statistical diagram of the simulation teaching effect.

attention to the student-oriented. Moreover, VR-based immersive teaching emphasizes that students are the mainstay and teachers are supplemented. The VR-based immersive teaching design model is shown in Figure 12.

On this basis, the simulation teaching effect of the model proposed in this paper is verified, and the results shown in Table 1 and Figure 13 are obtained.

From the above research, we can see that the VR-based immersive teaching model proposed in this paper can effectively change the shortcomings of the traditional teaching model and promote the improvement of teaching quality in universities.

5. Conclusion

Major breakthroughs in VR technology are accompanied by the emergence of 5G technology. The application of VR virtual reality in the field of education is becoming more and more extensive. In this context, it is also very important to study virtual reality immersive classrooms. The use of virtual reality technology can greatly improve the concentration of students. The concentration of students in the immersive virtual reality environment is 6 times that of the traditional environment. Moreover, students who study in an immersive virtual reality environment greatly improved in their ability to acquire and retain knowledge. This article combines virtual reality technology to reform the teaching mode of colleges and universities, constructs an immersive teaching classroom in colleges and universities, and adopts the immersive teaching model to improve the teaching quality of colleges and universities. Through the research of experimental results, it can be seen that the VR-based immersive teaching model proposed in this paper can effectively change the shortcomings of the traditional teaching model and has a certain role in improving the quality of teaching in colleges and universities.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare no competing interests.

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