Interactive Design Method of Mobile Art Education APP Interface Based on Virtual Reality Technology

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Abstract. In view of the shortcomings of low fit and long conversion time of the mobile art education APP interface generated by traditional methods, this paper proposes an interactive design method of the mobile art education APP interface based on virtual reality technology. Through the adjustment of brightness and hue, the mobile art education APP interface is preprocessed. By adjusting brightness and tone, filtering and processing the mobile art education APP interface, the contrast and detail information in the interface are improved. Detect mutation points in the interface image of the art education APP by solving the first and second derivatives of the image. Extract the edges of the interface image of the mobile art education app using the local maximum of the gradient vector model. Combining the functional interface layout and 3D model construction, the visual information of the art education APP interface was designed. By using Non-local Means to denoise the image of the interactive interface of the mobile art education APP, an optimized interactive interface of the mobile art education APP was generated. The experimental results show that the method in this paper can generate the interactive interface of the mobile art education APP, provide users with an immersive roaming experience, and improve the fit and transition smoothness of the mobile art education APP interface.

Keywords: Virtual reality technology · Mobile terminal · Art education · APP interface · Interaction design

1 Introduction

Since the National Education Commission formally put forward the concept of distance education in 1994, online education has gradually come into everyone's vision. In 1995, the China Education and Research Network was launched. In 2001, the "school to school connection" project for primary and secondary schools was implemented in an all-round way to drive the modernization of education with informatization and strive to realize the leap forward development of basic education. Encourage school education to build an open platform with network curriculum system and the application and management of education network open curriculum, and support the construction of education system

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with Chinese characteristics. For the various problems faced by mobile art education and the increasingly fierce competition of art education mobile applications, the school, as a group with a large number of professional courses, professional textbooks, scientific research content resources, can provide educational resources different from the content produced by some educational software in the current application market. Through the integration of its own educational resources. A large number of online courses [1] will be produced. Moreover, as an educational entity, the school can better and more actively promote the exchange and interaction of offline learning by using the network platform; Through the development of art education software applications, it provides students with massive learning content information resources, facilitates students to use their spare time more freely and efficiently, and also strengthens the interaction between teachers and students; Open online courses mainly benefit student user groups. At the same time, for those who do not have enough conditions to enter the offline classroom, they can obtain basic cultural level quality education through the mobile art education APP. The development of online education platform has great positive significance. Therefore, the demand for mobile art education APP is growing. As a platform that can provide online education, the mobile art education APP can meet the national strategic needs for the development of art education.

In the domestic research, Zhu Jihong et al. [2]. by summarizing the interaction design theory of preschool children's APP interface at home and abroad and comparing excellent APP cases, using the cognitive development of preschool children's vision, hearing, touch and motion, and combining Piaget's cognitive theory and the related theoretical research of children's cognitive development psychology, five aspects of excellent preschool children's APP design strategies are summarized. And apply it to project practice. Through the design practice of specific cases, the applicability of the research on the cognitive development of preschool children was preliminarily verified in the interactive design of APP interface, and the design strategy in line with the characteristics of children's cognitive development was proposed to meet the children's sense of honor and achievement in online learning, thus boosting the enthusiasm and attention of preschool children in online learning. Li Yang et al. [3] proposed a design idea of digital media mobile terminal interface based on human-computer interaction technology in order to design and meet the requirements of diversified and comprehensive functions of user interface. Through the introduction and research of human-computer interaction interface, the usability of human-computer interaction interface evaluation and testing is emphatically analyzed, and the model is optimized and improved by combining with GOMS model, and a new optimized GOMS layered quantitative model is proposed. Detailed analysis of the digital media interface information display mode of multi screen interactive human-computer interaction, as well as the television, mobile phone multi screen human-computer interaction digital media system interface, including system information architecture, grid system, drawing interface block diagram, multi screen interactive interaction model, as well as ensuring consistency of visual style, detailed interface design, charts and focus state. Applying the design system to the actual test, it is found that the design idea of the system can be based on human-computer interaction technology to achieve the effective combination of multi screen interaction and digital media, and also create a better scene interaction experience for the future development of digital media mobile terminals.

In foreign research, Chen Y et al. [4] realized the art design of real-time image interactive interface of advertising screen under the augmented reality technology and visual communication technology, digitalization enhanced the real situation, enriched the visual experience of advertising audience, and turned advertising into an interactive form. This paper analyzes the specific contents of composition, graphics, color, proportion, brightness and design principles in advertisements. We conducted a questionnaire survey and combined the above six indicators. Query a large number of documents for analysis, and conduct theoretical analysis on the design of real-time interactive image interface of advertising screen based on augmented reality technology. According to the experimental results obtained in this study, the data shows that the P-value of six age groups' scores on advertising texts is less than 0.05. There are significant differences; At the same time, the P value of each indicator in the advertisement is also less than 0.05. This significant difference indicates that text readability is an important factor in text interaction in interactive interfaces.

In the era of mobile Internet, online learning has formed a trend. The mobile art education APP on the market has been loved, recognized and used by many parents and students because it has broken through the restrictions of time and space. Therefore, this paper applies virtual reality technology to the interface interaction design of the mobile art education APP, so as to improve users' experience of using the mobile art education APP interface. The main content and innovative content of this study are as follows:

(1) By preprocessing the interface of the mobile art education app, key information is extracted to reduce redundant content and improve user experience.
(2) Utilize image processing technology to extract image edges from the interface of mobile art education apps, highlight important elements, and enhance visual effects.
(3) By optimizing the user interaction process through a reasonable functional interface layout, it improves the convenience and efficiency of user operations.
(4) Introducing 3D model design technology to make the art education app interface more three-dimensional, enhancing users' immersion and visual appeal.
(5) Based on the design and processing results in the previous steps, generate a mobile art education APP interface with innovative interactive methods and interface effects, providing a richer and more intuitive user experience.

2 Interface Interaction Design Method of Mobile Art Education APP

2.1 Pretreatment of Mobile Art Education APP Interface

In the process of preprocessing the mobile art education APP interface, the adaptive Gaussian filter is used to filter the art education APP interface, and the gradient direction of the interface image is converted into the derivative of the horizontal and vertical directions through the Guassian function to determine the gradient direction of the interface, and then the corrected interactive interface image is obtained. The Drago logarithm operator is used to adjust the corrected interactive interface hue [5]. According to the mapping relationship between the interactive interface brightness and the scene brightness, the brightness value compression of the interface pixel value and the visible detail level are obtained, and the art education APP interface image after the hue and brightness are improved is obtained.

When using adaptive Gaussian filter to process the art education APP interface, it is necessary to determine the gradient direction β size. Convert β into the derivatives of Vertical and horizontal directions through the Guassian function, and convolved with the art education APP interface at the same time to get the vertical gradient angle β^* of the interface at (x, y). To sum up, there are:

$$E_x = \frac{G(x, y, \beta)}{\partial x} \cdot M(x, y) \tag{1}$$

$$E_y = \frac{G(x, y, \beta)}{\partial y} \cdot M(x, y) \tag{2}$$

$$\beta^*(x, y) = \arctan\left[\frac{E_y(x, y)}{E_x(x, y)}\right] \tag{3}$$

Among them, E_x represents the horizontal derivative of β, E_y represents the vertical derivative of β, and $M(x, y)$ represents the Prehistoric art education APP interface.

The relationship between direction angle β and vertical angle β^* is as follows:

$$\beta = \beta^* + 90^\circ \tag{4}$$

Combining the above processes, the art education APP interface filtered by the adaptive Gaussian filter can be obtained:

$$L(x, y) = \frac{M(x, y) - G(x, y)}{1 - G(x, y)\beta} \tag{5}$$

Among them, $L(x, y)$ represent the filtered clear art education APP interface, $G(x, y)$ represents noise.

After the definition of the art education APP interface is corrected, the Drago logarithm operator is used to adjust the interface hue, so that the evaluation result of the interface saliency is more accurate.

Drago logarithm operator can adjust the brightness, detail preservation and contrast of the art education APP interface well, and the mapping relationship between the interface brightness and the scene brightness is as follows:

$$\lambda_d = \frac{\lambda_d^{\max} \cdot 0.01}{\lg\left(\lambda_d^{\max} + 1\right)} \times \frac{\ln(\lambda_w + 1)}{\ln\left\{2 + \left[\xi \lambda_w / \lambda_d^{\max}\right]\right\}} \tag{6}$$

Among them, λ_w represents the brightness adjustment threshold in the dark of the art education APP interface, λ_d represents the brightness of the art education APP interface, $\lambda_d^{\max}$ represents the maximum brightness of the art education APP interface, where $\lambda_d^{\max} = 100$. ξ represents the degree of compression and visible detail of the brightness value of the art education APP interface. The higher the ξ value, the more serious the brightness value is compressed.

The interface of the art education APP cleared by the adaptive Gaussian filter is dark, and the details will be affected to some extent. Therefore, by improving the brightness and contrast of the dark area of the interface, the interface details can be effectively maintained. According to experience. The value of ξ can be defined as [1.3,1.6].

By using formula (6) and analyzing the ξ value, we can get the interface image of the mobile art education APP after the brightness and hue are improved, which is expressed as:

$$H(x, y) = \lambda_d \times \lambda_w \times \xi \tag{7}$$

In the above formula, $H(x, y)$ represents the mobile end art education APP interface after color tone and brightness adjustment.

Through the adjustment of brightness and hue, the mobile art education APP interface was preprocessed.

2.2 Extract the Image Edge of the Mobile Art Education APP Interface

After the mobile art education APP interface has been preprocessed, the first and second derivatives of the art education APP interface image are solved, and the mutation points of the art education APP interface image are detected according to the characteristics of the derivatives, assuming $\gamma(x)$ meet:

$$\int_{-\infty}^{+\infty} \gamma(x)dx = 1, \lim_{x \to \infty} \gamma(x) = 0 \tag{8}$$

Then $\gamma(x)$ represents the smoothing function. Generally, Gaussian function is selected. Generally, the Gaussian function is selected. The smoothing function has a high low-frequency weight and functions as a low-pass filter. When the high-frequency components of the original signal and the smoothing function in the APP interface image are suppressed during convolution, the APP interface image signal is smoothed. If present:

$$\begin{cases} \varepsilon^1 = \dfrac{d\gamma(x)}{dx} \\ \varepsilon^2 = \dfrac{d\gamma^2(x)}{dx^2} \end{cases} \tag{9}$$

Then order:

$$\begin{cases} \sigma^1 = f(s, x) = f * \varepsilon_s^1(x) \\ \sigma^2 = f(s, x) = f * \varepsilon_s^2(x) \end{cases} \tag{10}$$

The first derivative of $f(x)$ smoothed by $\gamma(x)$ is proportional to the Non-local Means function $\sigma^1 f(s, x)$, and the second derivative of function $f(x)$ smoothed by $\gamma_s(x)$ is proportional to $\sigma^2 f(s, x)$. In order to detect signals in the APP interface image, large-scale s is selected, and $f(x)$ and $\gamma(x)$ are convolved to eliminate signal waves in the APP interface image. By detecting the maximum value of the APP interface image after the

Non-local Means, the edge points of the APP interface image can be obtained. After the wavelet function is applied [6], the first-order derivative of the smoothing function is taken, and the edge points of the APP interface image are determined based on the information after the Non-local Means, achieving edge detection of the APP interface image.

Assuming that the pixel of the APP interface image is $N \times N$, then there is $I = \{d_{m,n}\}_{1 \in m,n \in N}$, decompose the APP interface image in $J = \log_2 N + 1$ scales, select scales $s = 2^j, 1, \cdots j, \cdots, J$, and select $\gamma(x, y)$ as Gaussian function, then $\gamma(x, y)$ is second order derivable, with the following expression:

$$\begin{cases} \varphi^1(x, y) = \dfrac{\gamma(x, y)}{\partial x} \\ \varphi^2(x, y) = \dfrac{\gamma(x, y)}{\partial y} \end{cases} \tag{11}$$

where, $\varphi^1(x, y)$ and $\varphi^2(x, y)$ represent two-dimensional wavelet functions, and 2^j Discretization of $\varphi^1(x, y)$ and $\varphi^2(x, y)$ can obtain binary wavelet functions:

$$\begin{cases} \varepsilon^1_{2^j}(x, y) = \dfrac{1}{2^j}\varphi^1\left(\dfrac{x}{2^j}, \dfrac{y}{2^j}\right) \\ \varepsilon^2_{2^j}(x, y) = \dfrac{1}{2^j}\varphi^2\left(\dfrac{x}{2^j}, \dfrac{y}{2^j}\right) \end{cases} \tag{12}$$

The scale is 2^j, and discrete dyadic Non-local Means function can be obtained. According to the two-dimensional discrete Non-local Means transform, the following can be obtained:

$$\begin{cases} \sigma^1_{2^j} = f * \varepsilon^1_{2^j}(x, y) \\ \sigma^2_{2^j} = f * \varepsilon^2_{2^j}(x, y) \end{cases} \tag{13}$$

The gradient vector can be expressed as:

$$\begin{bmatrix} \sigma^1_{2^i} f(x, y) \\ \sigma^2_{2^i} f(x, y) \end{bmatrix} = s\vec{\nabla}(f * \gamma)(x, y) \tag{14}$$

Among them, $\sigma^1_{2^i} f(x, y)$ and $\sigma^2_{2^i} f(x, y)$ represent the partial derivatives in the x and y directions of the page image, respectively. The modulus of Non-local Means in 2^j can be expressed as:

$$M_{2^i} f(x, y) = \sqrt{\left|\sigma^1_{2^i} f(x, y)\right|^2 \left|\sigma^2_{2^i} f(x, y)\right|^2} \tag{15}$$

Argument:

$$A_{2^i} f(x, y) = \arctan \frac{\sigma^1_{2^i} f(x, y)}{\sigma^2_{2^i} f(x, y)} \tag{16}$$

The gradient vector $s\vec{\nabla}(f * \gamma)(x, y)$ and $M_{2^i} f(x, y)$ are proportional, and the argument $A_{2^i} f(x, y)$ is the angle between the gradient vector and the horizontal direction of the APP interface image. The edge direction and argument direction of the APP interface image are the same. The local maximum of the gradient vector model can be used to determine the edge of the APP interface image.

2.3 Visual Information of Design Art Education APP Interface

The visual information design of the art education APP interface is the main part of the interaction design of the mobile art education APP interface based on virtual reality. The visual information design consists of three parts: functional interface layout, three-dimensional object model construction and scene space model construction.

2.3.1 Function Interface Layout

The functional interface design is completed by the interactive interface layout optimization model, which is based on the interface visual attention division model and the function criticality analysis results, and sets the optimization objective function as the optimal visual attention division of the final layout of the interactive interface, so as to build the functional interface layout optimization model based on visual attention division.

The following definitions are implemented for the functional interface layout optimization model based on visual attention division:

$\cdot A = \{a_{ij}\}$ represents the visual attention level of the units occupied by a certain functional module in the visual area with different levels, where a_{ij} represents the visual attention level of the units occupied by functional module i in the visual area j;

$\cdot B = \{b_{ij}\}$ represents the visual attention level of the visual area where the central coordinate of a certain functional module is located, where b_{ij} represents the visual attention level of the central coordinate of functional module i in the visual distance region j;

$\cdot C = \{c_{ij}\}$ represents the number of units occupied by a certain functional module in the visual expectation with different levels, where c_{ij} represents the number of units occupied by functional module i in the visual area j.

In the above definition, $i = 1, 2, \cdots, n$ and n represent the number of functional modules, while $j = 1, 2, 3$ respectively describe the three visual areas of the functional interface in the art education APP interface.

Select the K_1 method to determine the criticality of different functional modules in the functional interface [7], compare the criticality of all functional modules in pairs, and describe the relative criticality of functional modules with the following formula, namely:

$$g_k = \frac{\partial_{k-1}}{\partial_k} \tag{17}$$

Among them, ∂_k represents the criticality of functional module ℓ_k.

The criticality of functional module ℓ_k can be determined using the following formula:

$$\partial_i = \left(1 + \sum_{k=2}^{n} \prod_{i=k}^{n} g_i\right)^{-1} \tag{18}$$

In the process of functional interface design, there is a positive correlation with g_k, A, B and C, that is, the more critical the application direction of the art education APP interface, the larger the area of the function module in the interface, and the closer to the visual center.The intensity of visual attention division is described by formula (19):

$$Z = \sum_{i=1}^{n} \sum_{j=1}^{3} g_i a_{ij} b_{ij} c_{ij} \tag{19}$$

The upper limit value of visual attention division intensity represented by Y, which is $Y = \max Z$, is obtained as follows:

$$Y = \max \sum_{i=1}^{n} \sum_{j=1}^{3} g_i a_{ij} b_{ij} c_{ij} \tag{20}$$

The higher the Z value, the more critical functional modules are divided by the visual attention of the user in the art education APP interface. The ppaper swarm optimization algorithm is selected to solve the functional interface layout optimization model based on visual attention division. The inertia weight is introduced to ensure the global and local search and optimization ability of the ppaper swarm, and the functional interface layout is completed[8]. For different areas in the functional interface, the image information of the art education APP interface needed in different areas is generated through 3D model construction.

2.3.2 Building 3D Model

The image information in the art education APP interface includes 3D objects and scene space, both of which are generated by 3D model building method. The main process of building a 3D model is shown in Fig. 1:

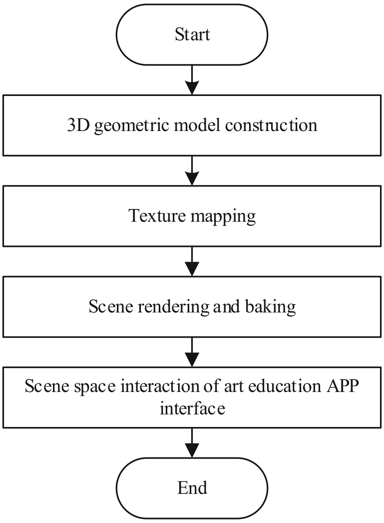

Fig. 1. 3D model construction process

Step 1: 3D geometric model construction.

Import the plan[9]obtained in the data collection process into the 3DS MAX software, and stretch the art education APP interface scene space according to the relevant information of the obtained art education APP interface scene space; For the complex art education APP interface scene space, several art education APP interface scene space units can be obtained by difference, and the art education APP interface scene space units can be synthesized as a whole using different modeling methods to build a 3D model of the art education APP interface scene space.

Step 2: Texture mapping.

In order to improve the authenticity of the scene space of the art education APP interface, texture mapping is applied to the scene space of the art education APP interface using the material editor. In general, different surfaces of the scene space of an art education APP interface need to map different textures. Under this condition, it is necessary to use multi-dimensional/sub object materials to load several maps on different sub materials with the same material.

Step 3: Scene rendering and baking.

After setting reasonable lights to simulate sunlight in the scene space, render the scene space of the art education APP interface. In order to obtain the optimal rendering effect, continuously adjust the brightness and position of the lights. Bake in a reasonable way after rendering, and store the scene space rendering results of the art education APP interface to a file in tga format.

Step 4: Scene space interaction of art education APP interface.

Import a tga format file into the VR Platform editor, optimize the scene space of the art education APP interface, and create a walking camera (simulating the height and walking speed of objects under human walking conditions) and a flying camera (simulating the overlooking scene above the scene space of the art education APP interface) in the scene space. Determine whether collision detection is required according to the actual application needs, and determine the balance between the scene space of the virtual art education APP interface and the smoothness of roaming interaction by compressing the texture to reduce the video memory consumption of the texture map.

2.4 Generation of Mobile Art Education APP Interactive Interface

Based on the visual information of the art education APP interface, the mobile art education APP interactive interface is generated by denoising the image of the mobile art education APP interactive interface.

There are many methods to eliminate image noise. Non-local Means threshold denoising is an efficient denoising method. Images that are not smooth or have sudden changes in grayscale are noise. An important link to improve the clarity of the art education APP interface is to denoise the art education APP interface image [10]. The steps of Non-local Means are:

Step 1: Compare the modulus and Non-local Means coefficients of each layer of coefficients after Non-local Means decomposition, and process the coefficients;

Step 2: After the Non-local Means coefficients are processed, the denoised image of the art education APP interface is restored. According to the principle of Non-local Means analysis, after the Non-local Means changes the Gaussian noise, it will be evenly distributed in the phase space. For the art education APP interface, it has its own limitations and is localized by layout.

The key and core of Non-local Means is to select and adjust the threshold, and select the appropriate threshold in the Non-local Means domain. In the process of denoising, the selection of threshold directly affects the quality of the art education APP interface image after denoising. The threshold estimation expression is as follows:

$$th = \sqrt{2\zeta \log n} \tag{21}$$

Among them, ζ and n represent the variance of noise and the number of pixels in the interface image of the art education APP, respectively, while th represents the threshold. According to relevant regulations, when $\zeta = 2$ is close to 2, the denoising effect of the art education APP interface image is better, and the denoising of the art education APP interface image is completed while retaining the edge details of the art education APP interface.

After the image of the art education APP interface is denoised, the virtual reality technology is used to generate the mobile art education APP interactive interface. The specific process can be divided into two links, namely, the design content link and the visual experience link. The interaction between the two links is shown in Fig. 2.

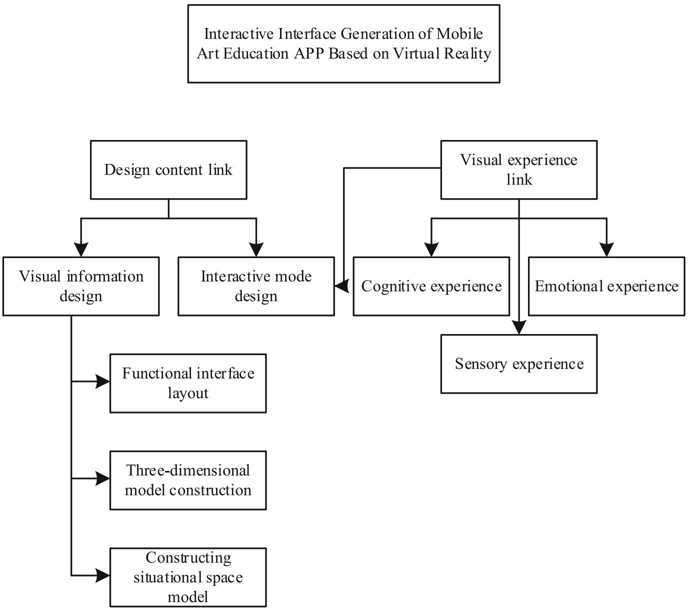

Fig. 2. Generation process of interactive interface of mobile art education APP based on virtual reality

The design content link can be divided into two parts, namely, visual information design and interaction mode design. The interactive interface layout design and interface content design are completed through the design content. The visual experience link can be divided into three parts: cognitive experience, emotional experience and sensory experience. On the basis of interactive interface layout design and interface content design, combined with the interaction mode design in the design content link, users can improve their visual experience of the mobile art education APP interface.

3 Experimental Analysis

In order to verify the application performance of the method in this paper in the interface interaction design of the mobile art education APP, an art education APP is taken as the application object, and the method in this paper is used to generate the interaction interface of the art education APP.

3.1 Evaluate the Visual Significance of the Mobile Art Education APP Interface

Before the experiment, the visual saliency of the generated APP interface is evaluated, assuming $V_{r_{s,o}}(x)$ represents the visual salient features of the reference interface image, it is divided into several image blocks, and the local effective contrast of the T-th block is defined as:

$$C_{vr}(T) = \frac{\chi_{vr}(T)}{\mu_{vr}(T)} \tag{22}$$

In the formula, $C_{vr}(T)$ represents the local effective contrast of block T, $\chi_{vr}(T)$ represents the minimum standard deviation in sub block T, and $\mu_{vr}(T)$ represents the mean of sub block T.

Assuming that φ represents the detection threshold for visual saliency of the art education APP interface, considering the moderating effect of visual channel (s, o), the value of φ is defined as -0.13, then according to the calculation of formula (22), the threshold judgment criteria for the significance of the art education APP interface can be defined as:

$$\xi_{s,o}(T) = C_{vr}(T) \cdot \mathrm{CSF}\big[f_o(s)\big] \tag{23}$$

where, $\xi_{s,o}(T)$ represents the criteria for judging the significance threshold of the art education APP interface, $\mathrm{CSF}\big[f_o(s)\big]$ represents the weight coefficient of the visual direction of the art education APP interface.

The fovea theory points out that the spatial resolution of the central region of the fovea is higher than that of the central region. According to the calculation of formula (23), the space function of art education APP interface under the fovea theory is defined as:

$$K(T) = \frac{d_t}{d_t + d(T)/d_0} \tag{24}$$

Among them, $d(T)$ represents the distance from the center of the sub block T to the center of the art education APP interface, d_0 represents the distance from the edge of the art education APP interface to the center, and d_t is taken as 4.1.

According to the foveal visual effect, the Root-mean-square deviation value of visual channel (s, o) can be deduced:

$$M(s, o) = \frac{1}{T}\sum_{T} \xi_{s,o}(T) \cdot \frac{D_{(s,o)}(T)}{K(T)} \tag{25}$$

where, $D_{(s,o)}(T)$ represents the significance of channel (s, o) in the art education APP interface.

Overlay the saliency of all channels to get the evaluation results of visual saliency of art education APP interface:

$$VT = \sum_{s=1}^{M}\sum_{o=1}^{N}\left(F_{(s,o)}(T) - \mathrm{MSE}(s, o)\right) \tag{26}$$

where, VT represents the evaluation results of visual saliency of art education APP interface, N represents the number of channels in the visual direction of the art education APP interface, M represents the quantity of $V_{r_{s,o}}(x)$, $F_{(s,o)}(T)$ represents the significance of all channels of the art education APP interface.

3.2 Results Generated from the Art Education APP Interface

After the visual saliency evaluation of the art education APP interface is completed, the interactive interface of the art education APP is generated using the method in the text, as shown in Fig. 3.

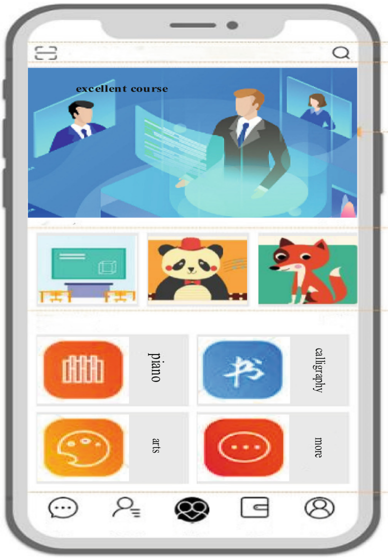

Fig. 3. The result of the mobile art education APP interactive interface

According to the results in Fig. 3, in the art education APP interface generated by the method in the paper, the immersive roaming experience is provided for users through virtual reality technology, and the user's experience is improved through different senses such as vision and hearing.

3.3 Comparative Analysis

The fit of the APP interface refers to the degree to which the design and layout of the application interface match user needs and usage habits. A well fitted interface can meet users' operational needs and provide an intuitive and consistent user experience. Conversion fluency refers to the smoothness of switching, transitioning, and animation effects between various elements in the application interface. An interface with high conversion smoothness can make users feel that the switching between interface elements is natural and without stuttering, providing a smooth and comfortable user interaction experience. Therefore, fit mainly focuses on the matching of interface design, while transition smoothness emphasizes the transition effect and animation performance between interface elements, which are important indicators for evaluating and optimizing application interface design. Therefore, based on the above two indicators as the judgment content, a comparative test is designed.

In order to avoid the oneness of the experimental results, the interaction design method based on children's cognitive development, the interaction design method based on human-computer interaction technology and the interaction design method based on augmented reality and visual communication were introduced for comparison, and the fit and transition smoothness of the art education APP interface were tested. The results are as follows.

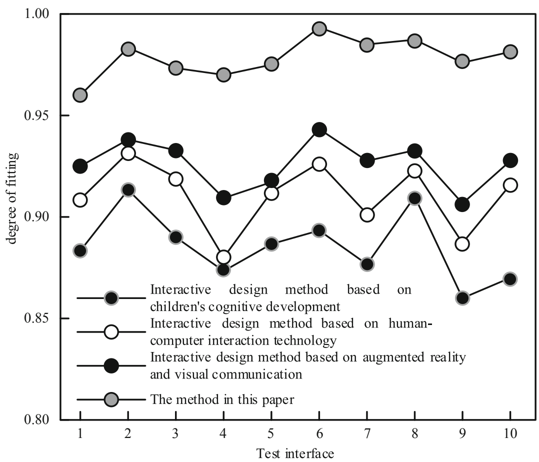

Fig. 4. Fit of art education APP interface

It can be seen from the results in Fig. 4 that the fitting degree of the art education APP interface is above 0.95 when using the method in the paper. However, when using the interaction design method based on children's cognitive development, the interaction design method based on human-computer interaction technology, and the interaction design method based on augmented reality and visual communication, the fitting degree of the art education APP interface is lower than 0.95, which indicates that the interaction interface generated by this method has a high fitting degree, which can provide users with a more realistic sensory experience.

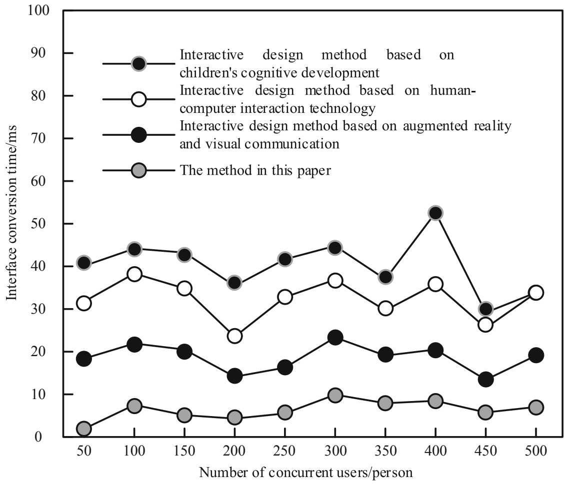

Fig. 5. Conversion fluency of art education APP interface

The results in Fig. 5 show that compared with the interaction design method based on children's cognitive development, the interaction design method based on human-computer interaction technology, and the interaction design method based on augmented reality and visual communication, the art education APP interface generated by the method in the text has a high transition fluency.

4 Conclusion

This paper proposes an interactive design method of mobile art education APP interface based on virtual reality technology. Through experimental testing, it is found that this method can generate the interactive interface of mobile art education APP, and provide users with immersive roaming experience. However, there are still many shortcomings in this research. In the future research, we hope to take into account the impact of color factors on user operation vision, so as to enhance the user experience. Meanwhile, with the continuous development and diversification of mobile devices, future research will be conducted on how to design art education APP interfaces that adapt to different screen sizes, resolutions, and operating systems, ensuring a good user experience on various devices.

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