

Interactive Storybook Design Based on Google Web Designer

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Abstract: With the wave of emerging technologies sweeping almost all physical printing industries, the emergence of various electronic resources began to seriously affect the dominance of paper books. Meanwhile, forms of media such as video and games seem to be more appealing to children. The purpose of this paper is to study interactive storybook design based on Google web designer. On the basis of previous studies, this paper comprehensively combs the application research of Google platform, WebGL and OpenGL, and puts forward views on the definition of interaction design objectives. Combined with the interactive characteristics of Google platform, the overall design and planning of the story book is designed and presented. Through the questionnaire survey of 100 users, the user experience effect of the design is tested.

1. Introduction

In recent years, with the rapid development of computer technology, numbers have been applied to every aspect of daily learning. The application of digitization in books is a trend that follows The Times. Digital interaction design in books is also the trend of The Times [1-2]. In the future, designers may want to focus on technology and digitisation of content to provide a more interactive experience for participants. Therefore, the future design of storybooks will show us more virtualization, art and intelligence. More importantly, the important features of interaction design will become more and more obvious [3-4]. In such environmental development, people can participate in the design of reading experience and exercise subjective efficiency [5].

S. Zia's research aims to develop web applications that encourage children to read English storybooks. The app uses storybooks, interactions and time to measure the reading process. The research was conducted at the University of Management and Sciences (MSU) through an applied survey. There were 43 respondents from MSU students. The results show that many students believe that interactive storybooks can help children learn words better and improve their language level [6]. One limitation is that you need to interact completely manually with your browser and Web site. This limitation was the starting point and primary motivation for developing web

navigation models and tools. Yasmin Makki Mohialden designed the Google Chrome extension for browsing the web through voice commands. This tool is proposed as a hand-held-free web navigation solution, which provides a new interaction mechanism and a new way to access web content [7]. A Web extension is a piece of software that can be installed on a Web browser. The web extension link is displayed as an icon on the browser toolbar. Extensions can work automatically or by clicking the extension icon, depending on the functionality in the extension software. Sanjay P. Ahuja has developed a web extension for Google Chrome that validates online text by clicking the extension button. When the button is clicked, the underlying algorithm in the extension software retrieves the text from the currently displayed web page. Validation and authentication of text is performed by comparing the retrieved text to a text database [8].

The main objective of this study is interactive storybook design. Based on the user's interactive experience, this paper analyzes the key technologies in the process of using Google web, and summarizes the characteristics of the popular Google Chrome browser design trend. Taking the story book "A Lonely Owl" as an example, this paper expounds the design and development process and analyzes the user experience effect.

2. Application and Design Objectives of Related Technologies

2.1 Google Platform

The Google platform allows access to almost any smart device, including laptops or tablets, smartphones, etc. Not limited by time and space. With one click or two, you can access the Google meeting interface anytime and anywhere through most mobile devices and enjoy smooth communication experience [9-10].

Unlike the ZOOM platform, which is 40 minutes free, the Google meeting system is not only free to use, but also has no time limit, so there is no barrier to its spread.

2.2 Basic Knowledge of WebGL and OpenGL

Here we compare web GL(webgraphiclibrary)OpenGL(opengraphicsbrary) for a brief introduction. WebGL is accepted by the public as a drawing standard, and its advantage lies in its ability to operate in three dimensions. In other words, a drawing can produce a three-dimensional effect. The design was implemented according to their standards. WebGL is traditionally used in conjunction with JavaScript, mainly through the application of the OpenGL JavaScript programming interface. In terms of drawing, WebGL can display graphics drawn by canvas in HTML5, so WebGL is actually the renderer [11-12].

WebGL directly reads the results measured on the computer CPU and can be used with the computer hardware. In this way, human-computer interaction with 3D presentations and images can run smoothly. WebGL is now widely used, so all computer graphics related to 3D are basically used on WebGL [13-14]. In addition to some 3D web pages, WebGL is also used for large 3D games. Thanks to WebGL, people who don't know how to implement 3D effects can create a web page or game with 3D effects. When rendering a 3D model using a browser, WebGL developers can use the computer's system display chip to display the scene on the screen [15].

In addition to WebGL, we also use the more important OpenGL programming interface in JavaScript. OpenGL is a standard for defining programming interfaces across programming platforms and languages. Although OpenGL is a programming interface, its use is limited to the graphics and graphics programming interface. OpenGL is also one of the few powerful interfaces in many areas. He was good at some things. Some programmers could easily develop computer software using the OpenGL programming interface. OpenGL is a compatible programming

interface that connects directly to designed software (hardware independent) and works on every operating system. Therefore, programs designed using OpenGL interface are very portable [16].

2.3 Interaction Design Objectives

Interaction design refers to the behavior of objects, environments, and systems, as well as the design and definition of the aspects that convey that behavior. Interaction design starts with planning and describing the behavior of things, and describes the most effective way to convey that behavior. Interactive design is a discipline that focuses on product behavior and the use of closely related product forms. Predict how the use of products will affect the relationship between products and users and users' understanding of products [17-18].

User interfaces aim to make the virtual world of electronic information more interactive and pleasant to the real world we live in. It should help people understand the idea of the interaction process, understand the methods used, and show the relationship between the various elements involved in the interaction. All of these elements can be collected and separated reasonably and accurately to meet the needs and values of the user. User interfaces should not be designed like works of art that require the recipient to speak highly of or highlight the "skills" of the designer; But the effectiveness of the interface can be measured to some extent. Good user interface design enables users to do their work more efficiently, inspires their love for the workflow, and awakens their connection to the world.

3. Storybook Design and Development Process

3.1 Determine the Development Tool

GoogleChrome is a web browser developed by Google. From installation speed to application speed is its most important feature. The browser also has its own unique features: fast open web pages, efficient Javascript scripts, simple web and Web search capabilities, and unique independent threading operations. In addition, it has fewer resources, fewer plug-ins, and fewer configuration options. However, this does not prevent the storybook design to choose Google browser.

Because this design uses the HTML5 standard language, the WebGL drawing standard, and the OpenGL programming interface, the browser choice must also fully support HTML5 and WebGL as well as the OpenGL-compatible programming interface. After testing and filtering each browser, the Google chrome Engine was a good fit for this project, so you also relied on Google chrome when creating the application framework.

3.2 Overall Design and Planning of Storybooks

3.2.1 The core of the story

The story of A Lonely Owl is a fairy tale about a little owl in the forest. He was the only owl in the forest and often felt lonely, so he decided to go deeper into the forest to find a mate. On this basis, the development of the story is based on the interaction between the owl protagonist and other animal characters in the forest, expressing the concern of other animal characters and the Owl protagonist on the road, showing the harmony between different races. Finally, in the dialogue with the God of trees, the whole meaning of history in general is elevated to promote harmony among readers of different races, nations and individuals in the world, as long as they feel friendship. The main character Owl thread is shown in Figure 1.



Figure 1. Line draft of the leading owl

3.2.2 Interactive design

In this design, the whole three-dimensional panoramic display system is divided into three parts: intelligent navigation, panoramic display and human-computer interaction.

(1) Three-dimensional panoramic scene framing. The specific scene selected in this design is a forest. Attention should be paid to the integrity and continuity of the scene when framing.

(2) After obtaining the scenes in all directions of the forest, spherical algorithm is selected to process them and complete the stereo mapping. Traditional optical system achieves 360. Panoramic imaging mainly depends on lens rotation and image Mosaic magnification, which has the following relations:

$$\beta = -\frac{l^1}{l} = \frac{f}{l-f} \quad (1)$$

Since the PAL lens is very small, the above formula can be converted to:

$$\beta = -\frac{1}{l/f - 1} = -\frac{f}{l} (\frac{l}{f} \gg 1) \quad (2)$$

In other words, the magnification is inversely proportional to the distance.

Zooming in or out of a panorama is actually the process of zooming in or out of view accordingly, that is, increasing or decreasing the number of corresponding positions of spherical rectangular surfaces. Specific programs are implemented as follows:

$$\text{var geometry} = \text{new THREE.Geo metry}(); \quad (3)$$

The size of the panorama in this design is 4096*2048. In the segmentation process, the image is divided into 32 blocks. As a small rectangular surface, 32 pieces of small rectangular surface form a sphere, which can not only meet the panorama display, but also avoid the smooth browsing caused by too many rectangular faces. Figure 2 shows the panorama divided into 32 small rectangular faces, which then form a sphere.

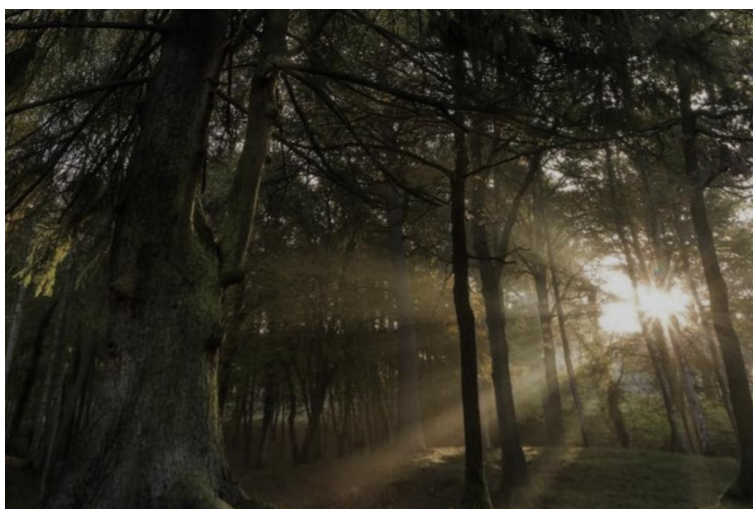


Figure 2: Spherical surface display composed of 32 pieces of segmentation method

(3) During the implementation of panorama display module, we need to download all required development components in advance. In this design, three.js is mainly used for development. Most of the relevant human-computer interaction functions embedded in this module are mouse and keyboard events, and we only need to use three.js and JavaScript scripting language to complete most human-computer interaction functions.

4. Interactive Storybook User Experience

4.1 Basic Information of User Experience Testing

A Lone Owl user experience test collected 100 questionnaires, 100 of which were valid, 100% effective. After data analysis and classification, the basic user statistics are as follows:

In terms of gender distribution, there are more male users than female users, indicating that men are the main force in interactive storybook use, with 58% male and 42% female.

From the perspective of age distribution, users are mainly concentrated in the age group of 7-12 years old, with a total of 44 people; 36 users aged 3 to 6; The rest are users over 12 years old, accounting for 20%; The high percentage of users between the ages of 7 and 12 indicates that interactive storybook use is dominated by children.

From the distribution of learning level, there are a large number of primary school children, 44 in total, followed by preschool children, 36 in total.

In terms of smartphone operating systems owned by users, Android has a slightly larger number of users, with 64 in total. The rest are IOS system, a total of 36 people, as shown in Figure 3.

Users generally use smartphones to get storybooks from Google more often, with 66 saying they read on their smartphones every day and only 34 using Google when they need to. This shows that most users have formed the habit of reading books on mobile devices such as cell phones.

According to the release time of the story book "A Lonely Owl," 73 users spent less than an hour, and the remaining 27 users spent more than an hour.

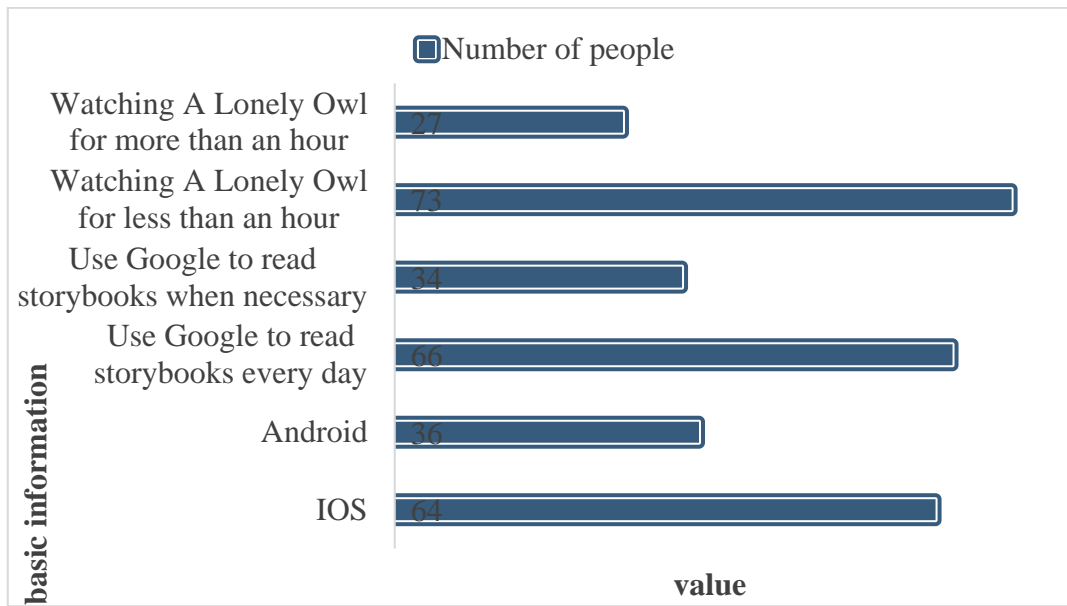


Figure 3: Mobile phone system, usage frequency and usage duration

It is worth noting that most users are participating in an interactive storybook experience for the first time, which has positive implications for user experience research.

4.2 Overall Evaluation of User Experience

The user experience of A Lone Owl is the psychological experience of users interacting with the Google platform and the external environment, which is subjective. After the completion of the test task, users evaluated the level of user experience from the perspective of pleasure according to the completion of the task and subjective feelings. The evaluation uses a five-point Likert scale, with the highest being "strongly approve" 5 points. The description of the user experience evaluation is positive, that is, the higher the user score, the higher the user experience level. Table 1 shows the user experience test score statistics.

Table 1: Statistics of user experience evaluation scores

Dimension	index	Observation items	Mean value of observation items	Mean ranking of observation items
Pleasure	Sensory experience	Reasonable interface frame layout	3.7	8
		Comfortable interface colors	4.4	4
		Interface style makes me feel comfortable	4.5	3
	Interactive experience	I can easily find the entrance of each function	4.1	5
		The story is clearly expressed	4.0	6
		The operation mode conforms to my usage habits	3.9	7
	Emotional experience	It is convenient for my study and life	4.8	1
		I would be happy to recommend it to others	4.6	2

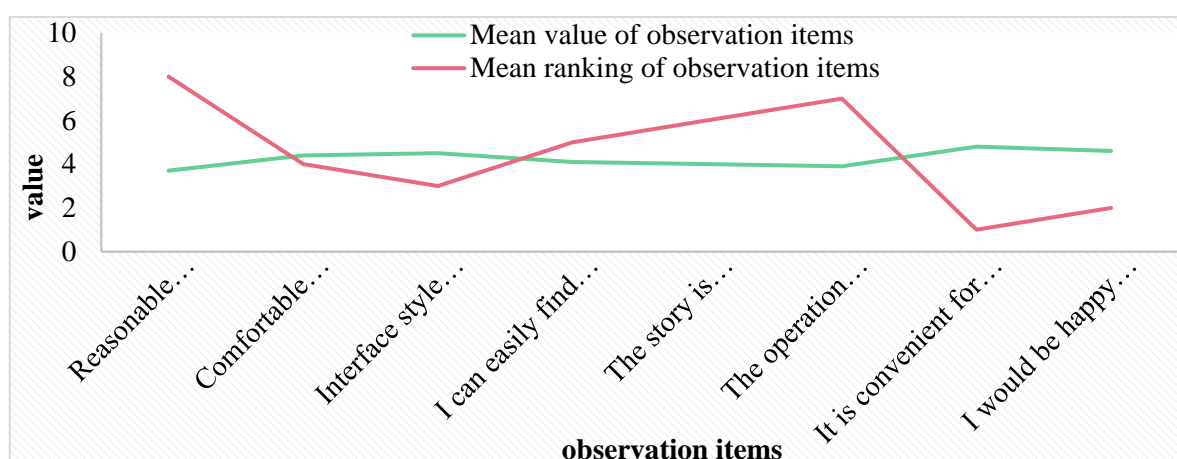


Figure 4: User Experience Results

As can be seen from Table 1, the user experience evaluation index system contains eight observation items. Among them, there are 6 items with an average of more than 4 points, and 2 observation items with 3 to 4 points, as shown in Figure 4. In short, the user experience of A Lone Owl is often good for basic needs. The evaluation users think the interactive storybook design is comfortable in color, easy to understand ICONS, advanced functions, useful for study and life, willing to use for a long time and recommend to others.

5. Conclusions

The positive meaning of the digital revolution is reflected in the development of functions. The interactivity of books is also a new direction of development. At present, there is real space in the digital Culture Center, and hopefully there will be real space in the future for digital interactive storybooks. From the point of view of this paper, more researchers can innovate on this problem. Although there are many objections to the use of digitalization in books, it is said that it is necessary to preserve the original characteristics of the printed book, but the digital interactive design of books is the trend of the future and must be recognized, otherwise it will be obsolete.

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