AUGMENTED REALITY APPLICATION FOR LEARNING CHINESE HISTORY AND CULTURE

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ABSTRACT

CNstory (Chinese history scrolls) is an immersive augmented reality (AR) book that takes you through the glorious history of China, exploring key moments and transitions between dynasties that shaped the country's evolution. This AR experience invites readers on a fascinating journey through a transformative era that defined China's cultural, political, and social landscape.The story spans several centuries, telling the rise and fall of dynasties, starting from myths and legends, going through the prosperous times of ancient dynasties such as Xia, Shang and Zhou, to the unification of Qin, the prosperous times of Han, Tang and Song, as well as the transformation of Ming and Qing dynasties, and finally Until the founding of the People's Republic of China. The content of the book includes the changing order and specific years of all dynasties in Chinese history. In addition, some historically influential events have been selected in chronological order to fill in the history of each period.CNstory (Chinese history scrolls) aims to bring history to life and provide a dynamic learning experience that goes beyond traditional books. This AR book blends academic research, visual storytelling, and interactive technology to invite readers on an unforgettable journey through the dynamic and profound changes in China's dynastic history. The development of the CNstory AR book application will use the Agile software development methodology. The software used for designing the interface is Adobe photoshop version 2020, while for AR application will be developed using Unity.
Keywords: Chinese history, learning, AR

INTRODUCTION

In today's era of rapid technological development and continuous digital innovation, the protection and promotion of cultural heritage have found new ways through immersive and interactive experiences. One of the breakthrough methods is to integrate augmented reality (AR) technology into educational software, with a special focus on Chinese history. The intersection of augmented reality with history and culture provides a unique opportunity for cultural promotion, allowing people to become more interested

in exploring China’s rich culture.

China's history is very complex. The country has gone through dynasty changes, landmark events at critical junctures, and key events that shaped the national identity. However, traditional methods of disseminating historical knowledge often face challenges in capturing the attention and interest of contemporary audiences, especially younger generations who are often more accustomed to new experiences of dynamic and interactive learning due to rapid advances in technology. The AR Book will emerge as a transformative solution, offering a new immersive platform that bridges the gap between traditional text-only narratives and modern technology.

In this technological era, technological applications have been integrated into people's lives, learning through the "AR + knowledge" model has become a new way of learning. The "AR + " mode is an enhanced version of the learning app’s functionality, where multimedia elements appear on your mobile device from the physical book in the real-world environment in front of you.

This study aims to investigate the impact of promoting Chinese history through an augmented reality book initiative. By combining the tangible nature of books with printed history graphics and the dynamic capabilities of AR technology, the initiative aims to enhance the learning experience so that history, presented through the chronology of events, is more accessible, engaging, and relevant. The research will explore many aspects of the project, delving into its potential to promote cultural appreciation, stimulate curiosity, and contribute to a deeper understanding of China's historical heritage via AR technology.

RESEARCH METHODOLOGY

The application was developed using an agile methodology that consists of six phases, as shown in Figure 1. This is to ensure that the development can be completed within the given time frame. Agile methods also reduce the risk of complex projects. In addition, any changes during the development process can also be made faster.

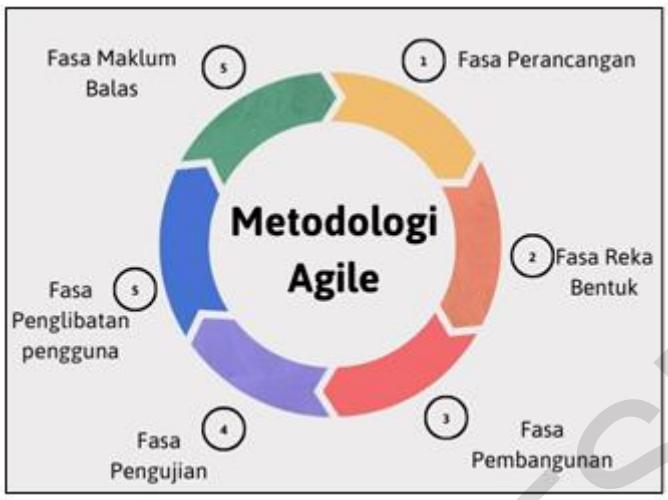

Figure 1 Agile methodology model

Here is a breakdown of the various phases of the Agile methodology:

1.Planning and Organizing User Requirements

1.1. Determine the overall project goals and gain a deep understanding of user needs through direct interaction.

1.2. Translate user needs and user wishes into something that the user wants that can be measured and understood by all parties.

1.3. Assign priorities to each user story to determine the development phase.

2. Design

2.1. Design a user-friendly interface that is convenient for people of all ages, especially young people.

2.2. Create a database so that information can be stored and accessed by users when they need it.

2.3. The system architecture design simplifies the process when the system is running and is always ready to provide satisfactory services to users.

3.System Development

3.1. Break down the work into short sprints, usually 2 to 4 weeks, and each sprint will produce a prototype that can be tested by users.

3.2. Each sprint focuses on a certain number of user stories that have been defined previously.

3.3. Develop a system with a clear plan and that meets all user needs.

4. Testing and Feedback Recovery

4.1. Conduct user testing at the end of each sprint to get immediate feedback from end users.

4.2. Make improvements based on feedback to quickly adapt to changing requirements.

5. End User Involvement

5.1. Actively involve end users in every stage of development, ensuring that they participate in the testing process, provide feedback, and participate in design decisions.

6. Evaluation and Adjustment

6.1. Hold an evaluation meeting at the end of each sprint to evaluate performance, identify emerging issues, and plan improvements to the development process.

RESULTS AND DISCUSSION

CNstory (Chinese history scrolls) has been successfully developed and all the files are complete. The application implementation has been carried out according to the requirements and functional design determined in the requirements and design specifications. The programming language used is C# through the Unity platform, and InfoMod is used to develop Android-based applications. As for the database, Reimport excel is used to manage and store streaming data in the application. The application has an information dataset for users to use, and an AR scanning function for users to use.

To achieve these goals, several key functions such as language settings, camera scanning, and text annotation field explanations have been implemented. The main color used is light yellow to reduce eye fatigue and also provide convenience for student users and people who use electronic devices for a long time. The components in the application are neatly arranged, and the Chinese and English bilingual use is accurate, so that users can use the application well and easily.

When the user opens the application, the system will first display the startup screen for a few seconds before entering the main interface, as shown in Figure 2. Users can use the system directly, and all the operations of the program are set to be simple and easy to understand.

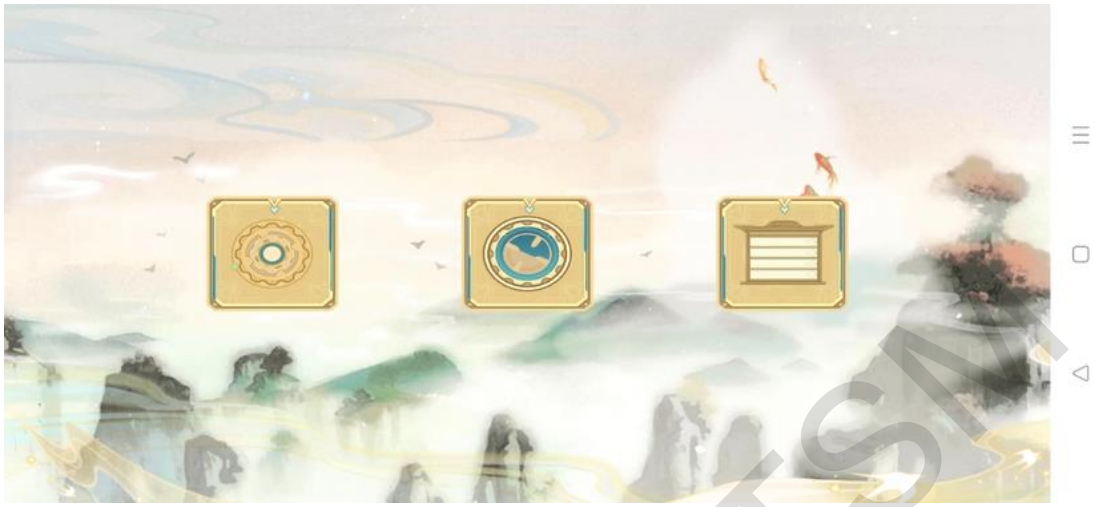

Figure 2 Startup screen user interface

Figure 3 Adjusting the clarity setting

Figure 4 Switching the language setting

After the user enters the system, the application can be used. The user will see the settings button on the left side of the application's main menu, as shown in Figure 3. The settings interface displays a menu list where the user can adjust the clarity of the program's media display. The user can also select the appropriate language based on their preferences. As shown in Figure 4. The application is available in two languages: Chinese and English.

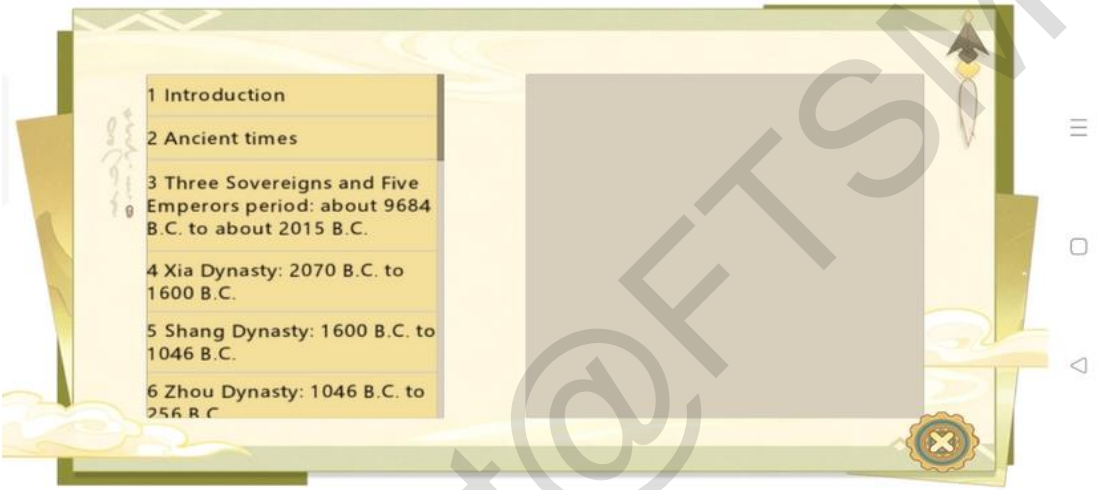

Figure 5 Text panel interface

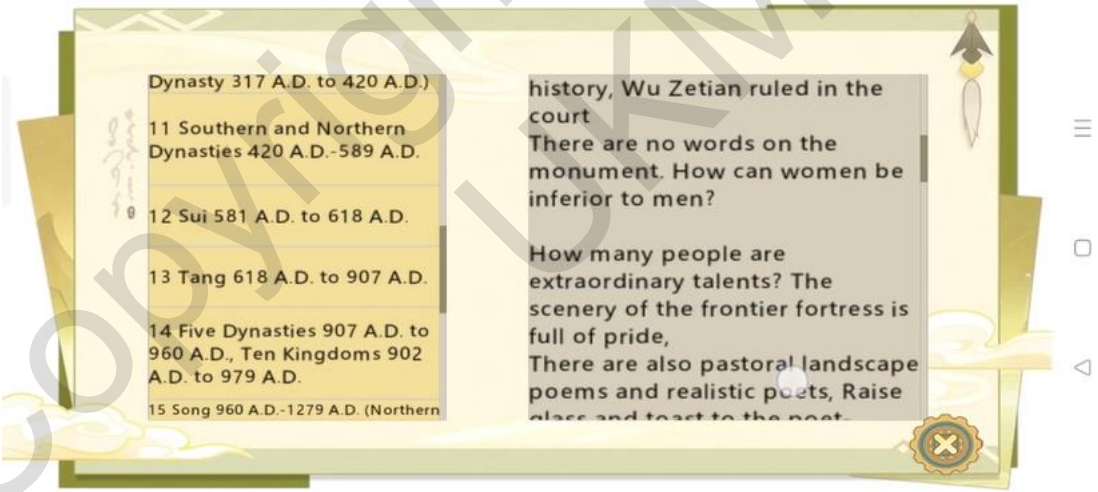

Figure 6 Select chapter to display content

Figure 5 shows the content displayed when the user enters the text board interface. However, when the user selects a different chapter, all text information of the selected chapter will be displayed separately, as shown in Figure 6.

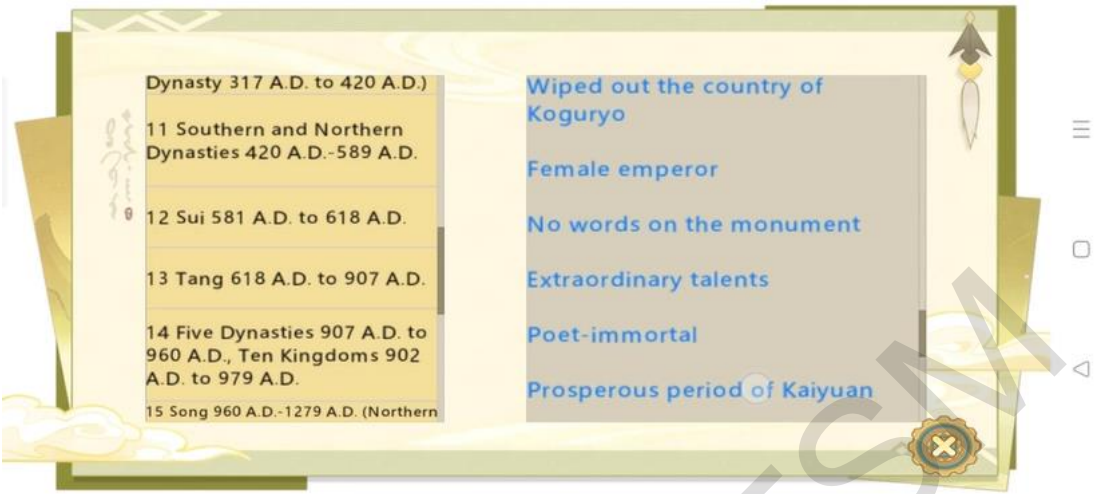

Figure 7 Annotation text is distinguished by blue

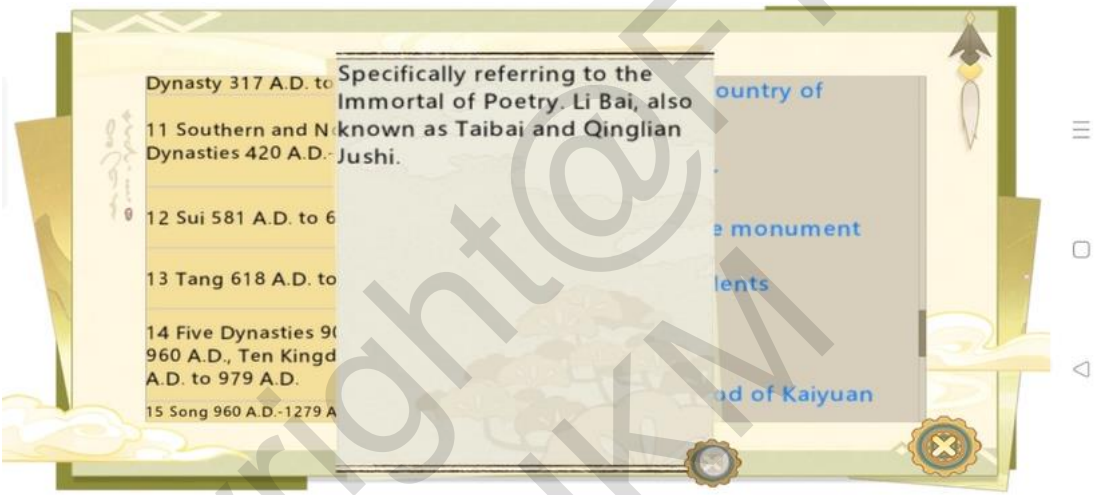

Figure 8 Explanation content is displayed separately

Figure 7 shows the annotation part of the text content. Users can see the text area distinguished by blue font by sliding. This makes the annotation part more eye-catching. When the user selects one of the annotations, as shown in Figure 8, the explanation content will be displayed separately. This can avoid the change of the overall format of the text due to the addition of text.

Figure 9 Camera scanning a specific picture

Figure 9 is the interface of starting the camera after the user selects the scan button. The user can use the supporting book of the application to scan the given pattern. You can see that the scanned and recognized picture will float on the physical book, which is the embodiment of AR.

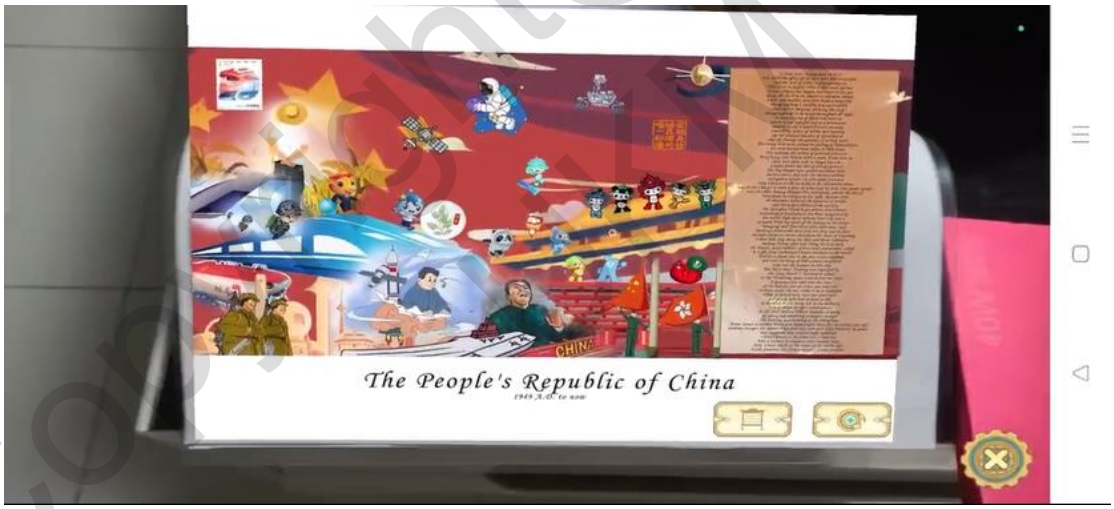

Figure 10 Button selection for video and text

Figure 10 shows the interface displayed after the application successfully recognizes the image. There are two buttons in the lower right corner of the screen. The user can select the button to jump to the text content or video content.

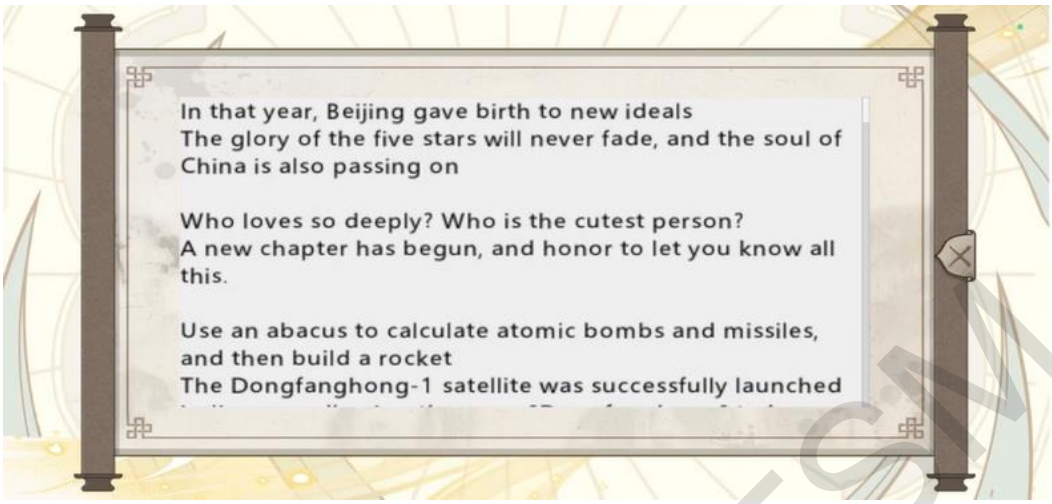

Figure 11 Select text button

Figure 11 shows the interface for the user to select the text section. The text section of the scanned image chapter will be displayed separately.

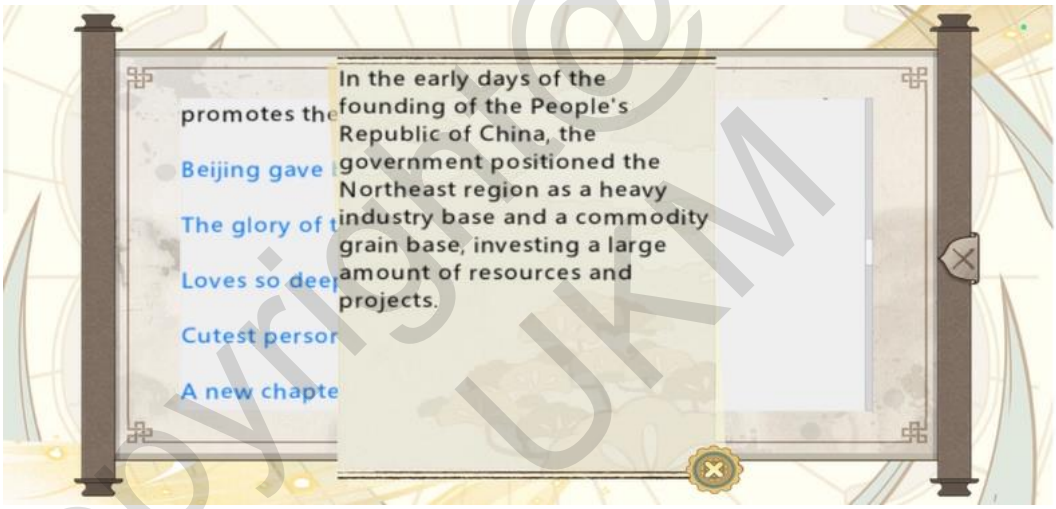

Figure 12 View the comments section

Figure 12 shows the same annotation content and functions as the text board interface.

Figure 13 View video section

Figure 13 shows the user choosing to enter the video interface. The user can play or adjust the volume through the operation bar below

Usability Testing

Usability testing is a process of final testing by real users to ensure that the developed service application provides the required functionality before it is released to the public. The purpose of usability testing is to evaluate the usability of the system, collect quantitative data, and assess user satisfaction.

The test questionnaire was divided into 5 parts to understand the application usage experience and user satisfaction. A total of 20 respondents participated in this test.

Table 4.1 Demographics of respondents (Part 1)

Part 1	Respondent Data	Amounte	Percentag
	Gender		
	Female	11	45%
	Male	9	55%
	Age		
	12-18	7	35%
	18-25	8	40%
	Greater than 25	5	25%

Identity		
middle school student	7	35%
college student	8	40%
teacher	2	10%
Other backgrounds	3	15%

According to Table 4.1, there are 11 female respondents, accounting for 45%. The age group is mostly students between 12 and 25 years old. In addition, this survey specifically sought out 10% of the respondents who were working as teachers.

Table 4.2 Interface Design (Part 2)

Part 2: Interface Design	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree	Mean
Is the program simple and easy to understand	0	1(5%)	2(10%)	4(20%)	13(65%)	4.45
Is the icon style of the program interesting	0	0	3(15%)	4(20%)	13(65%)	4.5
The program has a suitable color scheme	0	1(5%)	1(5%)	3(15%)	15(75%)	4.6
The interface of this program is pleasing to the eye (good)	0	0	3(15%)	4(20%)	13(65%)	4.5

In part 2, it shows the positive feedback of users on the game interface design. More than 65% of the users believe that the application has an attractive interface design.

Table 4.3 Readability and Navigation (Part 3)

Part 3: Readability and Navigation	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree	Mean
The use of the entire application is clear and easy to navigate	0	1(5%)	1(5%)	4(20%)	14(70%)	4.55
Easy to understand program layout	0	0	3(15%)	2(10%)	15(75%)	4.6
This application has all the features and functionalities I expect	0	1(5%)	2(10%)	4(20%)	13(65%)	4.45
Clear organization of information on the application screen	0	0	3(15%)	3(15%)	14(70%)	4.55

Table 4.3 The feedback received was positive about the navigation and AR readability of the app. On average, 10% of users disagreed, and 5% of users gave less positive feedback. However, the overall satisfaction was still above half.

Table 4.4 Accuracy (Part 4)

Part 4: Accuracy	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree	Mean
The provided content is simple and easy to understand	0	0	1(5%)	3(15%)	16(80%)	4.75
The provided annotations provide clear explanations	0	0	1(5%)	3(15%)	16(80%)	4.75
Simple and easy to understand image information	0	0	2(10%)	4(20%)	14(70%)	4.6
Provide accurate content and facts based on reliable sources	0	0	2(10%)	3(15%)	15(75%)	4.65

Table 4.4 shows the results obtained in Section 4. The results show that users gave positive feedback on the accuracy of the data used and displayed by the CNstory application.

Table 4.5 Availability and Efficiency (Part 5)

Part 5: Availability and Efficiency	Strongly disagree	Disagree	Somewhat agree	Agree	Strongly agree	Mean
The text content effectively helps me understand	0	0	2(10%)	2(10%)	16(80%)	4.7

The sequence of content provided by this program is easy to understand	0	0	0	3(15%)	17(85%)	4.85
Interesting multimedia elements can make learning Chinese history more enjoyable	0	0	1(5%)	4(20%)	15(75%)	4.7
I can effectively learn Chinese history using this application	0	0	0	5(25%)	15(75%)	4.75

As shown in Table 4.5, the results of this section also show that users gave very positive feedback on the usability and efficiency of the application, believing that it helps users increase their interest and understanding of Chinese history.

Improvement Suggestions

Clearly, this CNstory (Chinese history scroll) AR book app has great potential in increasing people's interest in the subject of history. Therefore, improvements are needed to multimediaize this historical-themed AR book application for optimal performance. The first is to make the app available on a wider range of platforms, such as Apple iOS system devices.

In addition, the application can be turned into a more complex and diversified application, so that users can not only view the dynasty changes in China in history but also use the application to view more specific historical events and development processes in different periods or dynasties. Therefore, users can use this application for different dynasty needs.

Next, the CNstory (Chinese history scroll) application should improve its user authentication by adding user profiles. This will make it easier for users to see the

progress and notes being viewed in the software. Not to mention adding authentication like email or profile picture can help increase the security of your application data.

CONCLUSION

Overall, CNstory (Chinese history scroll) has been developed to achieve the set goals. It is hoped that through the launch of this application, users will be interested in and learn about Chinese history. It is also hoped that this move will contribute not only to the promotion of learning Chinese history, but also to the promotion of education in all other subjects.

Advantage Of the CNstory Application

This AR book app is developed with care. Therefore, this application has its uniqueness and advantages. Not only does the program expose users to historical events that are often considered confusing, but its multimedia approach makes learning the basics of history easier. Furthermore, the application uses all the main elements of multimedia, namely graphics, text, animation, audio and video. This adds more interaction and appeal to different users. The implemented AR 3D graphics make the application simple and user-friendly, not forgetting that the narration of historical events enabled by multimedia allows users to learn historical knowledge like listening to a story. Notes on the historical event table written in the chronological order of their appearance in the book are also prepared for users' reference.

Disadvantages Of the CNstory Application

Although the application is carefully developed using available resources, this CNstory (Chinese history scroll) AR book application also has some weaknesses. First of all, the application is only developed for Android platform devices and cannot be used on Apple iOS system devices. Additionally, although the application requires a user account login, it does not provide any personalization of the user's profile, such as placing profile pictures, emails, etc. Although the application stores online data in a cloud database, the functionality provided is not integrated with the Internet. This means that users cannot add friends with other players or display friends' profiles and communicate with other users.

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