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# Construction of Intangible Cultural Heritage Spot Based on AR Technology——Taking the Intangible Cultural Heritage of the Li Nationality in the Areca Valley as An Example

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**Abstract.** The tourist area is a display area mainly for tourism and cultural visit. With the continuous advancement of the digitization process of scenic spots in China, a number of information software products showing the digital achievements of science and technology have been emerging continuously, and the technology of virtual and real fusion has become the main technical means at present. AR technology is adopted to display the intangible cultural heritage of the scenic spot. This paper analyses the advantages and disadvantages of existing scenic spot construction and analyzes the advantages of AR technology in the construction of scenic spot. Taking penang valley li intangible cultural heritage scenic spot as an example, this paper expounds the display mode of AR technology in the scenic spot. The visit and tour of the scenic area based on AR technology brings real visual stereo effect, mobile convenience and interest to hands, and also provides beneficial reference for the wide application and rapid improvement of AR technology, as well as digital innovation and rapid popularization of the historical background of intangible cultural heritage.

## 1. Introduction

China is a great cultural country with a history of 5,000 years. In the long river with a long history of the Chinese nation, a nation known as the "living fossil" - the Li Nation. According to the history records, the ancestors of the Li nationality settled in Hainan Island on the occasion of Yin Zhou 3000 years ago. This ancient nation, which appeared on the Chinese national land, has many traditional handicrafts. Most of them has been collected in the national and even the world's intangible cultural heritage catalogue. For example, Li Jin, which is listed in the world's non-legacy, is famous in the Spring and Autumn Period. It's the earliest cotton textiles in China condensed the wisdom and cultural essence of the ancient Li Nation. Since the 1950s, a large number of Neolithic cultural sites have been discovered in the Li ethnic group in Hainan. However, with the advent of the Internet age, the space for the survival of non-legacy cultural heritage is becoming narrower. Many non-legacy cultures with historical value are facing endangered or extinct because of the scarcity of effective inheritance. In response to the protection of the intangible cultural heritage of minorities, China has put forward corresponding protection measures in terms of policy and practice. The concept of "rescue protection, productive protection, holistic protection and legislative protection" is proposed for the overall direction. The construction of non-legacy areas effectively protects and inherits some of the non-legacy cultures, which not only promotes the development of tourism, but also allows visitors to experience the charm of local culture. The advantage is that it allows visitors to have an immersive



experience, while the traditional physical scenic spot has the disadvantage of static display, long replacement period of exhibits and large investment. The scenic area covers a large area and is limited by the time and space of the visit. Therefore, there are great restrictions on the protection of intangible cultural heritage. In the past, due to the imperfect development of information, the technical means used in the intangible cultural heritage were limited to photography, video and photos. Although this approach helped archaeologists and historians in the early 1950s and 1960s, it also preserved a large amount of valuable literature for future generations. However, with the changes of the times and the advancement and development of science and technology, people have found that traditional records can no longer meet today's needs. The biggest problem is that many photos and images are difficult to store for a long time, and they cannot be archived and integrated. The region has made it difficult to play its greatest value.

Therefore, it is imperative to increase the protection and inheritance of intangible cultural heritage by adding a convenient and effective digital multimedia technology. At present, AR technology (Augment Reality) is a technology that seamlessly synthesizes the real world and the virtual world. It not only displays the information of real world, but also displays the virtual information at the same time. It is a digital technology that is suitable for non-production and non-legacy cultural exhibition scenic spots. This technology has achieved multi-point penetration in the field of science education and e-sports entertainment, based on the AR technology, this paper expounds its display mode in the construction of scenic spots, which will play an active role in the construction of tourist attractions and the dissemination of non-legacy culture.

## **2. The characteristics, advantages and limitations of the construction of intangible cultural heritage based on AR technology in scenic spots**

AR (Augment Reality) technology is abbreviated as augmented reality technology. Augmented reality (AR) is a modern technology developed on the basis of the expansion and extension of virtual reality (VR) technology. Augmented reality technology can not only display real environment information, but also construct information of virtual environment. It is an entity information (visual information, sound, taste, touch, etc.) that is difficult to experience in a certain time and space of the real world. Through the science and technology such as computers, the simulations are superimposed, and the virtual information is simultaneously displayed and applied to the real world. The real environment and the virtual objects are superimposed in real time, so that the two exist in the same picture or space, and are perceived by the human senses, thereby achieving a sensory experience that transcends reality. The construction of scenic spots based on AR technology can change the shortcomings of the current traditional scenic spots, and thus increase the flexibility and convenience of sightseeing in the scenic spots, giving visitors a more intuitive and comprehensive way of visiting. Its superiority lies in the use of AR technology to place virtual objects in the real environment of the Areca Valley in the intangible cultural heritage area of Li Nationality (Figure 1). Compared with the industrialization of intangible cultural heritage resources, it has obvious characteristics and advantages, and can form a sustainable industrial chain for integrated research and industrial development projects, thus forming new technical means and innovative ideas for cultural products and industries of intangible cultural heritage. With AR (Augmented Reality) technology, the historical and cultural resources of intangible cultural heritage are transformed into a digitally preserved and interactive digital direction. In the sense of real theory, the content of intangible cultural heritage can be transformed into digital transformation by digital technology, forming digital cultural content corresponding to intangible culture, and then using AR (augmented reality) technology to form the number Cultural content is superimposed in real-time scenes. Real-time interactive experience with users, so that the corresponding problem solves the real problem that people can't see, touch, and experience in the process of understanding the intangible cultural heritage. As shown in Figure 1 and Figure 2, using the AR technology in the scenic spot, the virtual ancient Li villagers can be superimposed on the Li village protection area in the actual scenic spot. It will enable tourists to more directly understand and experience the traditional culture of the ancient Li Nationality villages and the daily life of the Li Nationality villagers (Figure 2). Or in the Li Jin exhibition hall of the actual scenic spot, it is only limited to show the Li Jin finished products, but cannot let tourists understand and view the interesting

process and special techniques of textile of Li Jin. At this time, the use of AR technology can effectively save the labor cost while satisfying the tourists' curiosity of Li Jin textile procession. Therefore, AR technology has great significance for the construction of intangible cultural heritage scenic spots: 1. AR technology provides a more complete display platform for intangible cultural heritage. 2. AR technology provides a new way of exploring traditional intangible cultural heritage scenic spots. 3. AR technology is used in the scenic area to create an interaction with visitors, which makes visitors more culturally involved. 4. Based on the AR technology, the development and operation of the industrialization of the intangible cultural heritage resources of the Li nationality will give the Li Nationality culture a better inheritance, which has important practical significance for the harmonious development of Hainan International Tourism Island.



**Figure 1:** Virtual realization of the ancient Li ethnic rural scene.



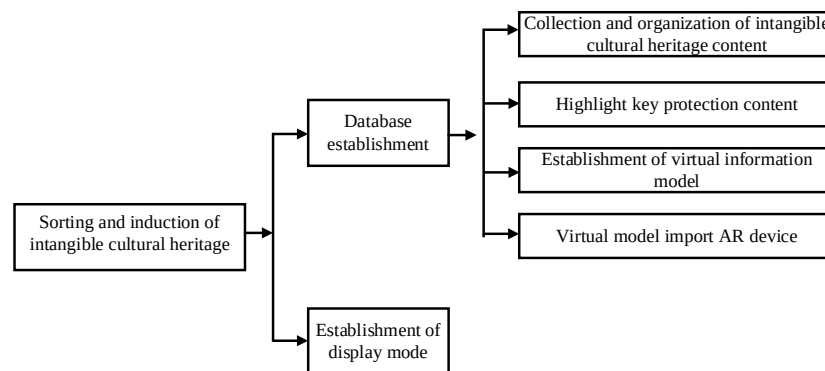
**Figure 2:** Virtual realization of the ancient Li ethnic rural scene.

The limitation is that the lack of digital technology itself has led to the coverage of the remaining handicrafts and cultural relics in the scenic area. However, there are also many inconveniences that come with it. It is also a problem that cannot be underestimated. On the one hand, digital media systems are vulnerable to virus infections and illegal network intrusions. An attacker can implant a virus into a system through a system's communication link, destroying data and causing the system to enter a paralyzed state for information theft. On the other hand, the Internet is shared and has a strong communication function. The content of the digital display is flawed in certain aspects, resulting in defects that are easily copied and maliciously attacked, thereby bringing about intellectual property protection of digital products. Although it is necessary to set passwords, firewalls, etc. for such problems, it will cause inconvenience to users.

### **3. Application of Li Nationality's Intangible Cultural Heritage in the Areca Valley Based on AR Technology**

Cultural monuments are one of the important platforms for the public to learn, to understand history and to visit cultural relics and inherit culture. Although the Li Nationality's culture is ancient, it is still alive. It promotes the wisdom and humanistic characteristics of the ancient Li people working in the country and has a high value of viewing and sightseeing. The use of the correct dissemination of tourism can promote the inheritance of history and culture. The Areca Valley is the largest and most complete demonstration area for the protection of intangible cultural heritage in Hainan Island. The planned area of the scenic spot is more than 5,000 mu. It consists of the original Ganzha Li Village, the original rain forest valley and the original Chiyao Miao Village. However, due to the large planned area and tropical location, there are some disadvantages such as inconvenient sightseeing. After in-depth exploration of the historical traces, folk customs and cultural connotations of the Li nationality in Hainan, the current collection of production tools, musical instruments and textile embroidery techniques left by the Li ruins and the Li people will be combined with digital imagery and digital animation. It is digitally transformed to form the digital cultural content corresponding to the intangible cultural heritage of the Li nationality.

The combination of the advantages of AR (Augmented Reality Technology) technology and the existing conditions of the Penang Valley scenic spot can be concluded that the route based on AR technology in the scenic spot construction is feasible and has certain forward-looking. It is understood that Microsoft has released an augmented reality head-mounted device for simulating games and watching videos and weather forecasts in Beijing time in January 2015. It can be seen that AR technology has been widely used in life. The convenience of AR technology can not only add flexibility and fun to the scenic spot, but also have the advantages of being indispensable for the cultural inheritance, publicity and display of the scenic spot and the permanent protection of intangible cultural heritage. As shown in Figure 3, the organization and induction of intangible cultural heritage types are mainly divided into the establishment of database and the establishment of display methods. The establishment of the database is the main core content, which is the premise of digital protection.



**Figure 3:** Intangible cultural heritage type database model.

### 3.1 *Sorting and induction of the intangible cultural heritage of the Li ethnic group*

The establishment of a high-quality talent technical team to organize the intangible cultural heritage and realize the use of AR technology in the core part of the Li nationality intangible cultural heritage. Give full play to the advantages of professional talents in all aspects, such as technology, art, new media and non-legacy data collection. Then, the Li nationality's intangible cultural heritage species will be comprehensively collected and integrated, such as the unique cultural totems of Li nationality, Li Jin, Li nationality, and the intangible cultural heritage of Li ethnicity and the production of Li farmhouse bark fabrics. In-depth analysis, mining and induction of various intangible cultural heritage projects will be carried out to improve the history and production methods of the projects. For example, the Li nationality can't perform artificial live performances, then you can use the AR technology to display the video about the Li wood fire-fighting skills, or make some animations about the firewood to meet the tourists. In order to understand the psychology, the historical content of the Li nationality's firewood skills was displayed in the form of text while displaying video animation.

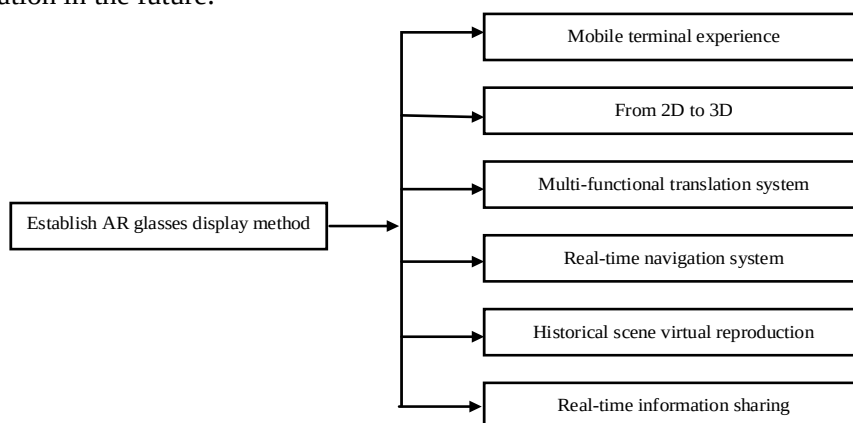
### 3.2 *Database establishment*

This article integrates the content that needs to be displayed in the scenic spot. The establishment of the database is the core content of digital protection and an important issue in the construction of digital scenic spots. The important part of database establishment is the construction of data structure and data display. In addition, the technical system of the mobile augmented reality has two parts: hardware and software. The hardware part mainly includes a carrier that displays the real environment where the user is currently located and the computer-generated virtual environment and the screen text at the same time, this is the AR glasses or smart phones worn by the user. In addition, a hardware computer platform is required to complete a series of complex operations such as fusion display, virtual picture drawing, and human-computer interaction. The support of the software part mainly includes the identification and tracking software of the object type and specific location of the current user environment, and the software for rendering and drawing the virtual three-dimensional object, and the hardware and software together constitute an augmented reality system.

### 3.3 Description and experience of the AR device

Using AR technology to create an AR glasses with modern technology, through which real-world information and virtual world information can be combined to form a new sensory experience, and the original space- and time-restricted entity information can be applied to the real world through science and technology to achieve the purpose that is perceived by human beings. Wearing this AR glasses can truly feel the cultural atmosphere that is not easily realized in reality, so as to increase the fun of learning intangible cultural heritage. In this process, visitors are more directly aware of the charm of intangible cultural heritage and at the same time inherit the intangible cultural heritage to better inheritance and development.

The most important features of mobile devices based on AR technology are virtual and real combination, high interactivity, and three-dimensional positioning. The application fields mainly focus on street view navigation, enhance reading materials, and increase the sense of experience. When visitors wear AR glasses to enter the scenic spot, a virtual animated character guide will guide the tourists to visit and explain the details of each scenic spot. Among them, when visitors enter the Li village, they can see the original life scene of the Li people through AR glasses, and achieve the immersive sensory experience. Make the scenic area use the limited scenic spots efficiently while carrying forward and inheriting the intangible cultural heritage. As shown in Figure 4, high-tech glasses based on AR technology can realize three-dimensional conversion of tickets for scenic spots in the field, and various humanized functions enable visitors to visit the scenic spots more comprehensively. The AR real-life application has more intuitive and richer visual information, and the real-time interactive experience is more realistic, which is one of the trends in the development of real-life navigation in the future.



**Figure 4:** AR glasses display method.

**3.3.1 Another way to show and visit.** On the one hand, crowded people can reach the scenic spot to use AR glasses for an immersive sightseeing experience. On the other hand, on the mobile side, through the APP of the scenic spot and using the AR glasses to realize the three-dimensional dynamic scenic spot display, the tourists can not only reduce the economy and time expenditure, but also can visit and learn the content of the intangible cultural heritage. AR technology joins the mobile app to enhance the interactive experience. The successful "AR+APP" case mainly includes BMW's "Mini Getaway" event, Apple's ARkit, and Google's ARcore. These cases are based on AR technology to enhance the application experience, combined with certain applications to increase the flexibility of use to obtain better adaptability and greater participation.

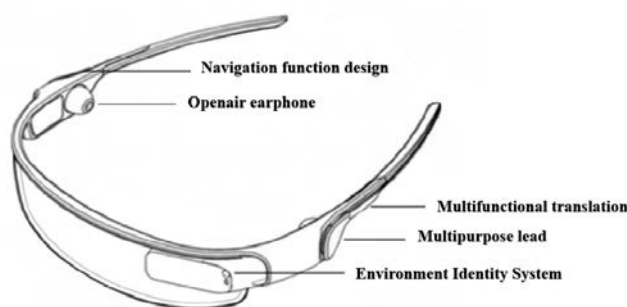
**3.3.2 Scenic Spots with AR Technology.** Tickets can be made with environmentally-friendly materials. Visitors can see the unique animals of the Li nationality as mascots on the scenic spots by wearing AR glasses. Visitors can use the AR glasses to select their favorite mascots on the tickets as virtual guides to accompany the tourists to the scenic spot for sightseeing, thus adding fun to the field tour. Tickets can be taken at the exit of the scenic spot after the visit to make it more collectible.

**3.3.3 Multi-functional translation using AR technology.** AR glasses offer different translation functions for different visitors' interest. For example, when tourists walk to an attraction, they see cultural totems that are unique to the Li and Miao nationalities, as well as symbols of specific meanings. At this time, the translation function in the device can be opened, and the corresponding symbols can be translated into Chinese characters, so that the tourists can understand the unique cultural background and implications of the Li and Miao nationalities, thereby uncovering the mystery of the culture of Li and Miao.

**3.3.4 Using AR technology to navigate the scene.** Due to the large size of the betel Areca valley and the relatively complicated route, it is easy for tourists to get around and even get lost. Real-time navigation is established by establishing a three-dimensional map through AR technology. For tourists with a poor sense of direction, this technology can provide visitors with intelligent navigation services. For example, when a visitor gets lost, open the real-life navigation in the device to display the current location, the surrounding attractions, the direction and distance from the target attraction. Allowing visitors to quickly and accurately understand the location of their scenic spots is more conducive to enriching the tourist experience in the scenic area.

**3.3.5 Village visit area using AR technology.** The Intangible cultural heritage village module, a Ganzha Li village module, a GuYin Miaojia module and a field Li farmhouse module, etc. When visitors arrives at the *target* village, AR glasses are used to realize the combination of the virtual environment and the real environment, so that visitors have the experience of being in the ancient Li village, so as to more fully display the historical appearance of the village and the living habits of the residents. Visitors can experience the inheritance and development of the village and experience the essence of the Li culture, and inherited and promoted the intangible cultural heritage of the Li nationality.

**3.3.6 Using AR technology to make a strategy.** In the scenic spot, visitors can find and record the surrounding catering, accommodation or special attractions through AR glasses and form corresponding travel guides, and upload them to the Internet to share with others. It is conducive to tourists to master a more comfortable scenic area play program. Through the application of AR real-life equipment, it brings a new way of sightseeing to the scenic spot, bringing new game modes to the users, bringing new social ways for tourists and creating a new lifestyle.



**Figure 5:** AR glasses.

#### **4. Conclusions**

The purpose of this paper is to illustrate the advantages of AR technology in the construction of intangible cultural heritage sites, and to provide a variety of scenic spots based on AR technology. Because AR technology can more flexibly display the diversity of intangible culture, it can be more fully presented to tourists. The inheritance and industrialization of intangible cultural heritage through AR technology is not only the integration of the spirit of intangible cultural heritage into modern life, but also the digital inheritance, recording and protection of intangible cultural heritage. Promoting the

widespread use of AR technology in scenic spots on the basis of the protection and inheritance of intangible cultural heritage.

## 5. Acknowledgments

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## 6. References

- [1] Yiwen Wang, Xi Deng, Kun Zhang, Yue Lang. 2018. The Intangible Cultural Heritage Show Mode Based on AR Technology in Museums - Take the Li Nationality Non-material Cultural Heritage as an Example: IEEE. 2018 3rd International Conference on Image, Vision and Computing (ICIVC 2018), Chongqing, China, vol. 03, 936-940.
- [2] Kun Zhang, Haifeng Wang, Chong Shen, Xiao-yan Chen. 2017. Research on the Technology Used to Inspect the Visual Appearance of Tropical Fruit, Based on Machine Vision Color Space: Advances in Intelligent Systems and Computing, vol. 752, 53-58.
- [3] Haifeng Wang, Kun Zhang, Zhuang Li. 2017. Characteristic Extraction, Classification and Identification Algorithm Based on Two Kinds of Eaglewood Micrographs: IEEE. 2017 2nd International Conference on Image, Vision and Computing (ICIVC 2017), Chengdu, China, vol. 01, 272-276.
- [4] Cai Su, Wang Peiwen, Yang Yang, Liu Enrui. 2016. An Overview of Educational Application of Augmented Reality (AR) Technology: Journal of Distance Education, 5 (2016), 27-40.
- [5] Du Yi. 2016. Research on the Protection and Development of Historical and Cultural Resources Based on AR Technology under the "One Belt and One Road" Strategy: Taking the Case of "Rebuilding the Civilization of the Changjiang River" as an Example: Journalism Research Guide, 4 (2016), 54-55.
- [6] Junhua Song. 2012. Cultural Production and Productive Safeguarding of Intangible Cultural Heritage: Cultural Heritage, 2012(1),1-5+157.
- [7] Yihong Lin. 2011. Research on the Protection of Intangible Cultural Heritage Based on the Perspective of Digital Technology—Taking the Traditional Literary Dyeing Embroidery Process of Li Nationality as an Example: Ethnic Art Studies, 2011(5), 116-121.
- [8] Mingyue Wang. 2015. Reflection on the Digital Risk and Path of Intangible Cultural Heritage Protection: Cultural Heritage, 2015(3), 30-40.
- [9] Xi Deng, Xiaohui Wang. 2015. Animation to Realizing Research of the Li Nationality Intangible Cultural Heritage: Research and Exploration in Laboratory, 2015, 34(6), 1-5.
- [10] Kun Zhang, Xiaoyan Chen, Haifeng Wang. 2017. Research on External Quality Inspection Technology of Tropical Fruits Based on Computer Vision. Springer Proceedings in Business and Economics, International Conference on Data Science and Business Analytics (ICDSBA 2017), 2017, 165-174.