

Research on Intelligent Space Design of smart rural - Focus on Xikou village, Zhejiang Province, China

Miaomiao Zhu¹, Wan-Sok Jang², Young-Hwan Pan^{3*}

¹Ph.D. Course, Department of Smart Experience Design, TED, Kookmin University

¹Lecturer, School of Fine arts and Design, Huainan Normal University

²Professor, College of Communication, Qingdao University of Science

³Professor, Department of Smart Experience Design, TED, Kookmin University

스마트 향촌을 위한 지능형 공간 디자인 연구 - 중국 저장성 시커우촌을 중심으로

주요요¹, 장완석², 반영환^{3*}

¹국민대학교 스마트경험디자인학과 테크노디자인대학원 박사과정, ¹화이난사범대학교 예술디자인대학 강사

²칭다오과학기술대학교 커뮤니케이션대학 교수

³국민대학교 테크노디자인대학원 스마트경험디자인학과 교수

Abstract Smart rural construction is an important direction for the Chinese government to promote the cause of "Rural Revitalization". In this paper, in the Xikou village project of the "future community" smart rural demonstration development project proposed by the local government of Zhejiang Province, China, the researcher participated in the design of the intellectualization of the smart rural life circle from the perspective of UX design and through qualitative and quantitative research methods. Through field investigation, understand the users' needs for intelligent design of smart countryside, and on this basis, design the maximum space of the region as a cognitive smart rural demonstration park, and quantitatively analyze the user experience feedback after the completion of the project. Before and after the actual design and application of the "Xikou village" in the demonstration area, chapters 3 and 4 are the symbols that can remember the rural era, the Rural Cultural Exchange Square. In the intelligent office space and living space, the user needs are composed of the design results. In order to reduce the anxiety of residents and tourists caused by the intelligent environment, the artificial manual service part is also designed. Now, as a case of intelligent rural space design, resident residence is developing continuously.

Key Words : Smart rural, Space design, Internationalization, User experience, Xikou village, China

요약 스마트 향촌 건설은 중국 정부가 추진하는 '향촌 진흥' 사업의 중요한 추진 방향이다. 본 논문에서는 중국 저장성 지방정부에서 제시한 '미래 커뮤니티' 스마트 향촌 시범 발전사업인 시커우촌 프로젝트에 본 연구자가 참여하여 UX디자인 관점에서 정성적, 정량적 연구 방법을 통해 스마트 향촌 생활권의 지능화를 디자인하였다. 현지조사를 통해 스마트 향촌 지능화 디자인에 대한 사용자 수요를 파악하고, 이에 기초하여 지역 최대의 공간을 인지 가능한 수준의 스마트 향촌 시범 단지로 디자인하여 프로젝트 완료 후 사용자경험 피드백에 대해 계량화하여 분석하였다. 시범지역인 '시커우촌'에 실제 디자인 적용 전과 후를 3장과 4장에 향촌 시대를 기억할 수 있는 시그널, 향촌 문화교류 광장, 지능형 사무 공간과 생활 공간에 사용자 요구를 디자인 결과물로 구성하여 주민과 여행객이 지능형 환경으로 인한 불안감을 줄이기 위해 인위적인 수동 서비스 부분도 디자인하였다. 현재 주민이 거주하며 스마트 향촌 공간 디자인 사례로 활용되며 지속 발전 중이다.

주제어 : 스마트 향촌, 공간 디자인, 지능화, 사용자 경험, 중국 시커우촌

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*Corresponding Author : Younghwan Pan(peterpan@kookmin.ac.kr)

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1. Introduction

According to the data of China's Seventh National Census in 2021, the total rural population is 509.79 million, accounting for 36.11% of the total population [1]. The main direction of China's development in the future is to accelerate the pace of Rural Revitalization and achieve common prosperity. At this stage, China's smart city is developing steadily, and the strategic focus of future development is shifting to rural areas [2]. With the improvement of rural infrastructure and the popularity of network communication base stations, in 2018, the Chinese government proposed to implement the digital village strategy and overall planning. In May 2019, the state issued the outline of digital village development strategy, which defined the development ideas [3]. Around 2020, 22 provinces including Zhejiang and Jiangsu successively issued digital village development policy documents [4].

In March 2019, the Zhejiang provincial government issued the "pilot work plan for future community construction in Zhejiang Province", which selects urban and rural communities with good basic conditions and strong willingness to apply to join the pilot ranks in the province to form experience for subsequent promotion and application [5]. The content of this study is the project practice in the pilot construction area of "future community" in Xikou village, Quzhou City, Zhejiang Province. According to the smart rural landscape planning project of Xikou village completed by the author, the intelligent scene design practice is carried out. In the early stage of the project, we investigated the current situation of the countryside and the needs of users, practiced in the site space with large daily use needs of villagers, combined with the existing rural digital equipment foundation and

the villagers' cognitive acceptance of intelligent technology, respected the users' intelligent use habits, and created an applicable rural intelligent living scene space. Through the user experience data and information feedback of scenario design, a summary of practice is formed to provide reference experience for the comprehensive construction of smart rural.

2. Theoretical literature

2.1 Concept of smart rural

The word "smart" first appeared in the concept of "smart earth" proposed by IBM in 2008, followed by the construction concept of "smart city" successively carried out in many countries and regions around the world. Scholars at home and abroad have extensively discussed the connotation of the concept of smart city from a variety of perspectives. Chowdhury evaluates the key performance indicators of smart city through Delphi analysis from the technical level [6]; Anabel defines smart city from the perspective of development, focusing on realizing urban sustainable development through development and innovation [7]; Holland believes that information technology is only the foundation of smart city from the perspective of integration, and the good integration of information technology and urban economy, society, ecology and other fields is the core of smart city [8]. The purpose of smart city is to build human convenient infrastructure through communication network with the latest technology [9].

Like smart city, the core of the definition of smart village is to accurately define "smart". In the EU smart rural action, European countries define smart rural as taking advantage of new value-added opportunities to enhance traditional and new networks through digital

communication technology, innovation and better use of knowledge, so as to benefit rural areas and society [10]. Chinese scholars mainly continue the definition of smart city and apply it to rural areas, emphasizing the use of information technology to form new forms of intelligent processing based on massive information, industrial development and social management [11], improve the intelligent level of overall rural planning, construction, management and service [12], and promote rural, agricultural development and the improvement of farmers' lives [13].

2.2 Project practice of smart rural

2.2.1 Practice of international smart rural

The international research on smart rural is earlier than that in China, and has always been in the leading position in the construction and development of smart rural. In the 1980s, the United States took the lead in proposing "precision agriculture", which laid a good development foundation for the development of smart agriculture. Farmlogs and Cropx agricultural intelligent management and production enterprises, through big data precision agriculture and intelligent agricultural machinery and equipment, led the agricultural industry chain to realize new changes [14]; In 2001, South Korea issued the "information village" plan, which improved the super high speed rate of Internet in rural areas, fishing villages and mountain villages, increased e-commerce and other information content, and promoted the informatization of villagers' life and regional economic development [15]. In July 2015, India launched the "digital India" program, which helps to improve rural network infrastructure, narrow the urban-rural digital divide and lay the foundation for rural smart development [16]. In 2017, the European

Commission launched the "EU smart village action" plan to explore the development of rural wisdom. Italy implements the "inland region strategy" to cope with the reduction of rural population, France establishes urban-rural links through "reciprocal contracts", Finland implements the "smart village" plan to solve the problems of population reduction and digital transformation, and Germany implements the "digital village" plan to realize digital transformation. The EU's development of smart villages is mainly to cope with the plight of population reduction. It hopes to improve rural living conditions, promote rural digital transformation, strengthen urban-rural ties and promote rural prosperity and development [17].

2.2.2 Project practice of China's smart rural

In 2012, relevant contents of smart rural construction began to appear in China. The construction direction is from the perspective of urban-rural overall planning and urban-rural integration. The construction objectives of smart village are mainly agricultural intelligence, rural intelligent platform and rural Internet. Around 2013, rural broadband and network base stations were gradually fully covered. At the beginning of 2014, xibaidian village in Beijing built and implemented the "beautiful and smart rural", and put forward the development concept of "smart rural" through a series of agricultural and rural informatization application projects [18]. In 2015, Tonglu County, Zhejiang Province created a smart rural management platform by using computer technology, GPS technology and Internet technology to update the national agricultural policies, pension tourism and other consulting information in real time, changing the traditional single communication and interaction mode of rural life [19]. In 2016, China's first Internet plus smart rural tourism was launched in Sanmenxia,

and smart countryside began to develop to intelligent agriculture and smart rural tourism. At this stage, the practical development area of smart village is popularized all over the country, and all provinces and cities formulate implementation objectives, guidelines and policies in line with the development of their own regions according to their own characteristics [20].

2.3 Future community

International research and Practice on the future community are relatively early. From the earliest "future community" in the world to the prototype of Singapore's "neighborhood center" program, the exploration and construction of European block square, Toronto quayside future community, Japan's shared housing "Toyota wood City" and other related projects continue to appear all over the world, from ecological community, intelligent community, healthy community, to zero carbon community, smart community Shared community, and the content is constantly updated interactively [21]. In early 2019, Zhejiang Province took the lead in putting forward the target policy of starting the construction of "future community", positioning the future community as an "urban cell" distinguished from characteristic towns, an "urban unit" supporting the construction of beautiful villages, and an "urban community" corresponding to a smart city [22].

2.4 Enlightenment from project practice

There are differences in the practice of smart rural between China and the world due to regional functional needs. The construction layout is carried out according to the existing intelligent facilities and conditions in the countryside, villagers' intelligent cognitive level, rural environment, economy and culture. If the original rural intelligent conditions are

backward, increase the infrastructure construction and improve the intelligent demand level of villagers [23]; Ecologically fragile villages are committed to intelligent protection of ecological environment [24]; If the rural economy is dominated by tourism, improve the scope of intelligent construction of rural tourism [25]; In case of great demand for rural cultural inheritance and lack of educational resources, the regional scope of smart rural cultural construction space can be increased [26], and a smart rural educational resource sharing platform can be built [27]; Affected by the epidemic, the demand for health-related continues to strengthen, and the content of smart village construction in the field of health will be more diversified [28].

Therefore, on the basis of the continuation of the original rural culture, the construction of smart rural needs to start from the needs of users, closely follow the pulse of rural economic development, understand the basis of rural informatization and the acceptance degree of villagers' intellectualization, select appropriate technical means, develop smart rural technology paths that meet local needs, try the pilot of smart scenes in small areas first, and refer to the experience feedback of users after use, Form intelligent content suitable for the development needs of the village, and then carry out the comprehensive construction of smart rural.

3. Research methods

3.1 Research methods

This study takes the future community project of Xikou village, Quzhou, Zhejiang Province as a practical research case. From the perspective of empirical design, this study conducts field research on the rural project site through the method of qualitative research, collects and

summarizes the villagers' opinions and functional needs in the form of face-to-face, telephone interview and group interview, and carries out the project practice of intelligent scene space in smart rural. After the project is completed and put into use, collect feedback information after user experience through questionnaire survey and telephone interview, form data for quantitative analysis, draw conclusions and form experience summary that can be used for reference.

3.2 Research object


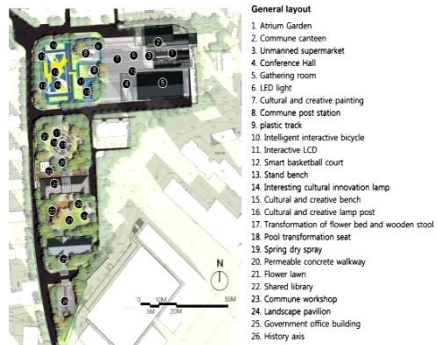
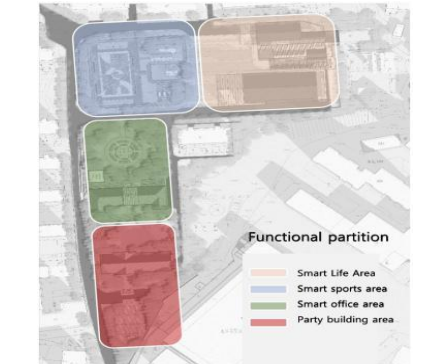
This research case is aimed at the villages with good rural economic development and perfect intelligent equipment foundation in China, and the scale and quantity of these villages are continuously increasing, and a large-scale quantity group will be formed in the future. Xikou village, the project site, is a pilot village of future community in Quzhou City, Zhejiang Province. The existing villagers around the site are the main users of the functional needs of the project practice site. At the same time, the use needs of tourists in the original rural tourism industry should be considered.

4. Intelligent scene space design process in smart rural

The members of the project implementation team spent three months mapping the field data, visiting and investigating the surrounding villagers, sorting out valuable rural cultural elements, understanding the basis of the existing digital construction in the countryside, the villagers' use of intelligent equipment, future construction planning and the existing tourism needs. Based on the environment of the project site and the technical level of the smart rural, through questionnaire survey and face-to-face interview, we understand the demand scope of rural smart village scene design, analyze the characteristics of the project practice site through SWOT, confirm the demand of the design object, complete the layout process of local area intelligent scene space design as shown in Table 1, and conduct a post use questionnaire survey for users (villagers and tourists) after the completion of the project, Conduct quantitative analysis, draw conclusions and summarize experience, so as to facilitate the follow-up and in-depth expansion of the project.

Table 1. Operation process of project practice research

Step	Landscape design steps	Explain
1. Conduct on-site measurement and investigation to understand the needs of on-site functions and problems to be solved		Planning scope: The future community of Xikou town is located in the center of Xikou town. The built-up area mainly includes Huangni mountain area and Xikou old area, covering an area of 1.6 hectares.

Step	Landscape design steps	Explain
2.Site mapping to understand building damage and availability		The original site of the plant is a pyrite staff living area with a history of more than 60 years. The original old building is retained and renovated, with a construction area of 3294 square meters.
3.Design concept and function layout		The original communes and buildings with rural memory are retained in the plane layout, and the new scene design of smart rural is added.
4.Intelligent scene function partition		Functional zoning diagram: According to the functions of the intelligent scene area, it is divided into three scenes: smart life, smart sports and smart office.

4.1 Project survey

4.1.1 Site status

The site is located in the center of Xikou Town, mainly including Huangni mountain area and Xikou old area, covering an area of 1.6 hectares. The original site is the pyrite workers' living area with a history of more than 60 years. There are more than 1000 villagers and 302 households around the site.

4.1.2 Intelligent conditions

The village economy is mainly based on traditional agricultural planting, taking into account the rural tourism industry, the infrastructure of rural tourism is perfect, the Internet is fully covered, the popularity rate of mobile phone for villagers is 91%, and the popularity of PC terminals is 83%. The common payment platform for villagers' daily life is mainly Alipay, WeChat and internet bank, and the intelligent condition is good.

4.1.3 Design requirements and problem status

Through telephone questionnaires and face-to-face interviews, collect and sort out the needs for local cultural customs and intelligent technical services, and determine the site function of the project practice, the symbolic elements of local memory, the content of intelligent scenes and the strategy of sustainable development in combination with the rural population structure and the current situation of rural tourism. Table 2 users' intelligent demand shows that villagers' demand is to meet daily life, cultural exchange and health, while taking into account the original tourism development; Tourists need to experience rural cultural life, tourism and leisure.

Table 2. User intelligent requirements

Intelligent demand	Villager	Tourist
Handle official business	Village affairs handling, farming and village affairs publicity	Room and ticket booking, tourism rights protection, information retrieval
Life	Daily shopping, culture and entertainment, learning and communication, fitness activities	Cultural entertainment, fitness, sports event participation, sightseeing

Problem status: the existing rural functional areas can not meet the requirements of smart rural construction and development; At present, the majority of villagers are young and middle-aged, but the aging trend is obvious. The demand for intelligence is simple and easy to use, avoiding cumbersome; Traditional rural planning cannot meet the functional needs of smart tourism; There is no specific practical guidance for the construction of smart rural, which belongs to the exploratory stage.

4.2 Building status

Site mapping and sorting of building data,

understanding of building damage and availability, drawing and improving building design. The original site of the plant is the living area of pyrite workers with a history of more than 60 years. Most of the original buildings are damaged, with a construction area of 3294 square meters. The original site buildings have a typical memory symbol of "commune culture" in the 1960s and 1970s.

4.3 Design concept

Based on the original local characteristics of the project site, retain the historical style and context of the buildings in the site, understand the development direction of rural economic construction, user needs, the basis and future planning of rural digital construction, create a modern intelligent rural community environment with "commune culture" as the design element, and reconstruct the rural "new community" by adhering to the goal of smart rural construction of "future community".

4.4 Functional zoning of intelligent scene space

4.4.1 Function scenario

Due to the wide range of production and living needs of villagers, involving travel, medical treatment, education, elderly care, ecological environment and other aspects, the project is only refined according to the areas with the greatest needs of villagers, as shown in Figure 1: smart office, smart life and smart sports. On this basis, it is subdivided into: shared canteen, commune auditorium, unmanned supermarket, shared library, smart office, smart playground, etc., to meet the basic functional needs of villagers' life, fitness, cultural and sports activities, village office, rural tourism and so on.



Fig. 1. Aerial view of intelligent zoning

4.4.2 Main areas of intelligent scene design

The scenes of smart life are divided into: the commune auditorium representing rural cultural memory shown in Figure 2 (the gathering room of rural sages and the shared canteen), the shared library for learning and communication shown in Figure 3, and the unmanned supermarket for shopping. The original staff canteen will be transformed into a shared canteen to provide catering services for the elderly over the age of 80 while meeting public and reception meals. The rural auditorium adjacent to the shared canteen has been transformed from the original cinema and opened to the society. It has become the venue for various large-scale rural literary and artistic performances and forum activities in the community, the local and even the whole Township and county. At the same time, it provides online conference booking services to give full play to the full-time function of the auditorium. The architectural appearance of the scene area retains the architectural element symbols of "commune" in Xikou Town, and adds new intelligent use functions. The shared canteen and unmanned supermarket of smart life use the mature electronic payment system to complete relevant functions. The shared library is divided into online and offline ways. Users can choose to borrow physical books by themselves, or directly connect to the general library of

relevant electronic pictures and texts to choose the reading form, which has the function of sharing educational resources.

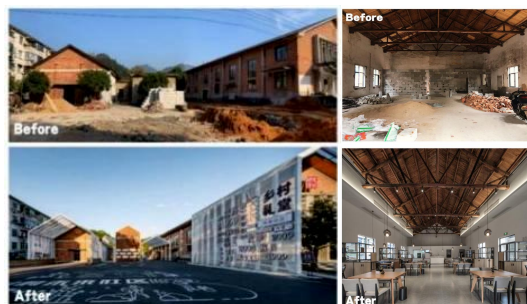


Fig. 2. Commune auditorium



Fig. 3. Shared internal and external space

The smart sports scene shown in Fig. 4 is mainly designed for rural sports venues. On the basis of meeting the villagers' daily fitness exercise, the traditional playground uses intelligent technical means to automatically collect the relevant information of the playground personnel by face recognition, record the daily fitness exercise, form data information and feed it back to the mobile phone and PC, and form personal health data and daily fitness information. Combined with the original rural tourism industry and the current popularity of short video broadcasting, relevant events can also be undertaken on the basis of fitness exercise in the smart playground in Figure 5. Participants can collect, edit and

broadcast videos to improve the popularity of rural attention, attract tourists and drive the sustainable development of tourism.

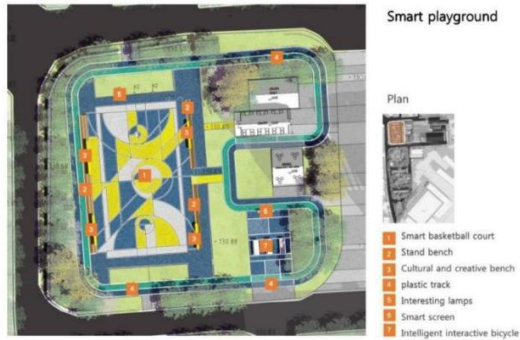


Fig. 4. Functional zoning of smart playground



Fig. 5. Smart playground

The smart office scenario shown in Fig. 6 mainly meets the needs of villagers and tourists for smart office. The needs of villagers are village affairs handling, daily information release and query. Tourists can conduct business consultation, automatic registration, booking and returning home stay, tourism services, etc. through the smart office system. The design of smart office scene provides humanized services according to the actual needs of the users. Users can work with full intelligence or combine semi intelligence and semi manual, so as to avoid the inconvenience of the elderly or intelligent devices who will not operate the crowd.



Fig. 6. Smart office area

4.5 Analysis of main technical paths in intelligent scene design

According to the needs of users' intelligent research in the early stage, users hope that the use of intelligent scene space is simple and easy to use, the realization and content of technical path, and carry out scene design by following users' usage habits and familiarity with intelligent software, so as to improve users' satisfaction.

The intelligent technical means, combined with the original intelligent basic equipment and based on the original villagers' information collection and face recognition system, increases the automatic collection of information comparison and online travel trace of people entering the village, which is especially suitable for the management and investigation of personnel during epidemic prevention and control; With the popularity of short videos in recent years, the intelligent interactive image collection system shown in Figure 7 can meet the needs of villagers and tourists for daily life information collection, short video production and broadcasting, and provide a technical path for the holding of various events in the smart playground; Finally, the layout of the intelligent community network power scheme shown in Figure 8 is carried out, the installation is simple,

plug and play, and the solution technology presents the path.

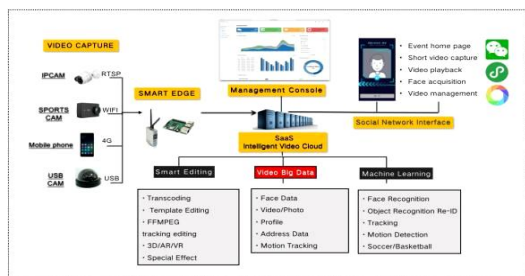


Fig. 7. Intelligent interactive image collection system

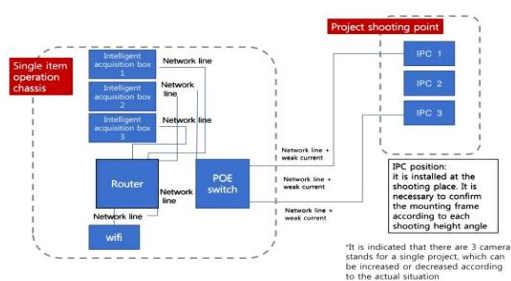


Fig. 8. Community network



4.5.1 Intelligent technology to collect and distribute short videos

The intelligent technology shown in Table 3 is adopted to automatically collect and distribute short videos. The first is to effectively manage the shooting equipment. For the schemes related to the shooting hardware configuration in different environments, add intelligent front-end acquisition setting and management, automatically switch it on and off in the unattended state, and upload the shooting as required; Secondly, the computer vision high cost performance smart edge intelligent front-end system integrates face feature detection, shape tracking (re ID) technology, customized object recognition, comprehensive improvement and optimization of intelligent video acquisition system, cloud intelligent editing special effect system, etc; The independent algorithm engine optimizes the AI

detection system to track and shoot the main shooting targets and optimize the shooting effect; Distributed algorithm structure, intelligent identification and collection during shooting, identification and judgment of main targets during processing, and amplification and tracking of main targets; Cloud intelligent editing, setting the main editing content and the source of editing stand, automatic operation, filter and light repair and adjustment, so as to achieve visual auxiliary processing, clearer picture and portrait effect, object recognition and follow intelligent editing; Image management platform, automatic monitoring and early warning of shooting and intelligent processing process, management of the status of shooting hardware, remote software upgrade, setting, management and adjustment of all contents and editing effects of the working system, and social distribution.

Table 3. Automatic collection and distribution of short video using intelligent technology

Step	Explain
1 Shooting equipment management	According to the shooting hardware configuration scheme under different environments, the intelligent front-end acquisition setting and management are added. When there is no management, the switch is turned on and off, and the shooting and uploading work is carried out as required.
2 Computer vision	The cost-effective smart edge intelligent front-end system integrates face feature detection, shape tracking (re ID) technology, customized object recognition, comprehensive improvement and optimization of intelligent video acquisition system, cloud intelligent editing special effect system, etc.
3 Autonomous algorithm engine	The AI detection system is optimized to track and shoot the main shooting targets and optimize the shooting effect. The distributed algorithm structure is used for intelligent identification and collection during shooting, identification and judgment of the main targets during processing, and amplification and tracking editing effects of the main targets.

4	 Cloud smart clip	Set the main clip content and clip stand source to work automatically. Filter and light repair and adjustment, achieve visual auxiliary processing, clearer picture and portrait effect recognition and follow intelligent editing.
5	 Image management platform	The shooting and intelligent processing process automatically monitors and alerts, manages the status of shooting hardware, upgrades software remotely, sets / manages / adjusts all contents and editing effects of the working system, and is equipped with social distribution.

4.5.2 smart office and self-service process

In the smart office scenario shown in Fig. 9, multiple paths are selected for intelligent office according to the user's habits. You can automatically brush your face, or you can choose the authentication comparison and confirmation information of the front desk staff to handle the relevant information, or you can choose the self-service machine to handle it after the person Id comparison, or you can check the consumption after the face comparison, and then you can enter the automatically monitored business hall or channel elevator after confirming the personnel information and relevant business. After the elevator passes the early information comparison and business screening, it will automatically reach the floor required by the handling personnel. And brush your face again and enter the floor room after confirmation. Through face brushing information and ID card comparison, when villagers or tourists handle public business, their personal travel information is also directly transmitted to the district and county personnel mobility supervision information system. Combined with the mobile travel data collection and supervision during the epidemic, their relevant travel information can be displayed at the same time.



Fig. 9. Smart office one face business process

Fig. 10 shows the operation link of the whole office registration, and the technical path processing is carried out according to the business requirements of the person who needs to handle it. The handler can choose the front desk service personnel to handle it and the self-service machine. After the comparison of the handler's certificates, the office staff and the self-service machine will upload the relevant information of the handler to the local public security management platform through the information management system (PMS). The handler can choose the form of manual handling or self-service handling to select the business scope, such as travel itinerary confirmation, room selection reservation and payment confirmation.

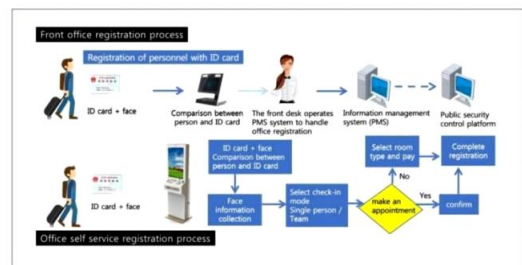


Fig. 10. Office registration operation

In the intelligent self-service office process to meet the requirements of commune canteen meal order settlement, rural parking charge, rural tourism reservation registration and other relevant requirements, as shown in Figure 11,

both villagers, outsiders and rural tourists can conduct self-service Office of relevant businesses through e-resident office platform. The online platform and offline self-service terminal are organically combined to drain each other and reduce the waiting time for business processing. It can automatically follow the whereabouts of the handler and provide effective and intelligent services throughout the process.

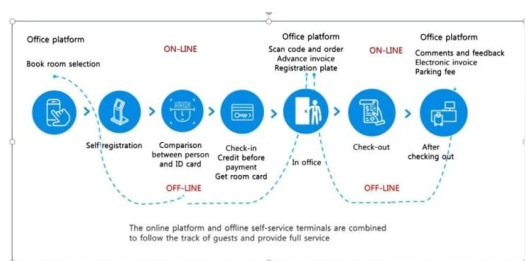


Fig. 11. Self service office process

4.6 Use feedback of intelligent scene space for service objects

4.6.1 Questionnaire object

Villagers and tourists give information feedback after experiencing the intelligent scene space of the project site. The members of the project team conducted a questionnaire survey in the form of paper questionnaire and mobile network questionnaire. A total of 169 valid questionnaires were collected, including 76 villagers' questionnaires, aged 18-50; 93 tourist questionnaires, aged 18-55.

4.6.2 Questionnaire content

The content of the questionnaire on user satisfaction with the use of space and intelligence mainly includes the content of the questionnaire on user satisfaction with the use of space and intelligence.

4.6.3 Survey results

In this paper, the data received are analyzed by SPSS. It is found that table 4 shows that 69.2% of the respondents prefer the semi artificial and semi intelligent mode.

Table 4. Selection of intelligent mode

	Frequency	Percent
Fully intelligent	52	30.8
Semi artificial and semi intelligent	117	69.2

In addition, it can be found from Table 5 that 53.3% of respondents prefer to increase manual services in smart office.

Table 5. Selection of adding labor services in the project

	Frequency	Percent
Intelligent life	56	33.1
Intellectual movement	23	13.6
Smart office	90	53.3

All scene experience satisfaction surveys use Likert scales ranging from 1 to 5. 1 means "very dissatisfied" and 5 means "very satisfied". The higher the score, the more satisfied you are with the scene. As shown in Table 6, the survey results show that after experiencing the scenes of commune auditorium, shared library and unmanned supermarket in smart life, the respondents are most satisfied with commune auditorium ($M = 3.29$).

Table 6. Comparison of satisfaction of smart life scene experience

	Min	Max	Mean	S.D
Commune auditorium	1	5	3.29	.855
Shared library	1	5	2.84	.804
Unmanned supermarket	1	5	3.04	.925

In addition, after experiencing all sections of smart rural, as shown in Table 7, the respondents were the most satisfied with smart sports ($M = 3.67$).

Table 7. Comparison of experience satisfaction of each section of smart rural

	Min	Max	Mean	S.D
Intelligent life	1	5	3.06	.719
Intellectual movement	2	5	3.67	.843
Smart office	2	5	3.50	.788

5. Conclusion

Through the practical research of this project, the following conclusions are drawn: the zoning of intelligent scene space according to the needs of users meets the needs of users; Compared with fully intelligent office, villagers and tourists prefer to choose semi artificial and semi intelligent office experience, and intend to increase the manual service part of intelligent office to reduce the insecurity of fully intelligent operation. The construction of intelligent village should be carried out step by step and not blindly pursue fully intelligent; In the satisfaction survey of smart life scene experience, the satisfaction with the commune auditorium representing the memory symbols of rural times and the stage of rural cultural exchange is high, and the demand for rural cultural construction space is high; Among the three sections of smart rural, the satisfaction with smart sports is the highest. It can be seen that the demand for daily fitness and health affected by the epidemic is the largest. At the same time, the short video distribution link in the smart sports section also increases the experience satisfaction of young people for this section. In the construction of smart rural in the future, there is more space for the construction of health content, and the forms can be more rich and diverse.

This study solves the disorder of practice and exploration in the process of smart rural construction and development in various provinces and cities. Based on the needs of

users, it creates a simple and easy-to-use intelligent space, respects the user's use habits and intelligent cognitive level, takes the user feedback as the experience summary, and explores the practical verification of intelligent scene space suitable for the village, so as to carry out the construction of smart rural in a large area and reduce the waste of useless area design. Provide valuable experience summary for future smart rural construction.

REFERENCES

- [1] National Bureau of Statistics. (2021) . Bulletin of the seventh China census(7). China National Bureau of Statistics.
http://www.stats.gov.cn/xxgk/sjfb/zxfb2020/202105/t20210511_1817202.html
- [2] J. X. Sun. (2021). Comprehensively promote rural revitalization in 2021. *Environmental Economy*, 2021(6), 8-9.
- [3] Xinhua News Agency. (2019). The general office of the State Council issued the outline of digital village development strategy. The Central People's Government of the People's Republic of China.
http://www.gov.cn/zhengce/2019-05/16/content_5392269.htm?tdsourcetag=s_pcqq_aiomsg
- [4] X. C. Xu & B. W. (2021). *Promote the comprehensive connection between digital village and Rural Revitalization*. China Social Science Network.
<https://baijiahao.baidu.com/s?id=1689299233717105724&wfr=spider&for=pc>
- [5] Zhejiang Provincial Development and Reform Commission. (2019). Zhejiang provincial government printed and distributed the pilot work plan for future community construction in Zhejiang Province.Zhejiang Provincial Development and Reform Commission.
http://fzggw.zj.gov.cn/art/2019/3/25/art_1599545_34126877.html
- [6] SN. Chowdhury. (2016. 5). The key performance indexes of intelligent city are evaluated by Delphi analysis. *2016 IEEE International Conference on the latest trends in electronics, information and communication technology*.(337-342). Bangalore : IEEE.
DOI : 10.1109/ RTEICT. 2016.7807838.

- [7] D. F. Anabel & M. R. Rodrigo. (2021). Artificial Intelligence in the Urban Environment: Smart Cities as Models for Developing Innovation and Sustainability. *Sustainability*, 12(19), 1-26.
DOI :10.3390/SU12197860
- [8] G. Holland. (2008). Will the real smart city please stand up. *Cities*, 12(3), 303-320.
- [9] C. S. Lai & Y. Jia. (2020). A Review of Technical Standards for Smart Cities. *Clean Technologies*, 2(3), 290-310.
- [10] S. Stojanova & G. Lentini. (2021). Smart Villages Policies: Past, *Present and Future*. *Sustainability*, 13(4), 1-28.
DOI : 10.3390/su13041663
- [11] B. Gu. (2012). On the construction of "smart village" from the perspective of overall urban and rural development. *Rural economy and science and technology*, 3(6), 136-137.
- [12] G. Zhou. (2016). Construction of "smart countryside" under the background of urban-rural integration. *Smart China*, 2016(6), 87-89.
- [13] X. Li. (2017). Smart Countryside:an important strategic choice for China's rural development in the new era. *Exploration of economic issues*, 2017(6), 53-58.
- [14] Wuxi Kaiyi Internet of things. (2019). The world's most advanced intelligent agriculture model is in the United States.Microblogging.
<https://weibo.com/ttarticle/p/show?id=2313501000014440370757894202>
- [15] C. Xiong & S. Fu. (2015). Experience and Enlightenment of the development of rural agricultural information service in Korea. *Agricultural science and technology management*, 34(6), 50-53.
- [16] V. Zavratnik & A. Kos. (2018). Smart villages: Comprehensive review of initiatives and practices. *Sustainability*, 10(7), 1-14.
DOI : 10.3390/su10072559
- [17] DV. Christiane & Mudri. (2019). Smart Villages in the EU and Beyond.UK: Emerald Publishing Limited.
DOI : 10.1108/978-1-78769-845-120191003
- [18] J. Liu & C. Bai. (2016). Practical exploration and Reflection on the construction of integrated innovation pilot of "beautiful and intelligent countryside". *Agricultural informatization*, 2016 (5), 67-75.
DOI : 10.16815/j.cnki.11-5436/s.2016.15.008
- [19] Y. Shao. (2015). Zhe jiang Tonglu builds a smart rural life by "clicking". China news network.
<https://www.chinanews.com.cn/df/2015/01-08/6950613.shtml>
- [20] Q. Lu. (2016). Research on the development mode of smart Rural Tourism under the Internet plus perspective. *Economic development research*, 2016(9), 161-163.
- [21] Lightning news. (2020). "Future community" -- building a "new cell" of smart city. Shandong Radio and television lightning news website.
<https://baijiahao.baidu.com/s?id=1673652848421094284&wfr=spider&for=pc>
- [22] Y. Tian. (2020) . Several theoretical problems in the construction of "future community". *Social science research*, 2020(2), 8-15.
- [23] C. Zhang. (2021). Digital countryside enables the modernization of agriculture and rural areas One belt, one road, Ninth public policy think tank forum and the Rural Revitalization and the "one belt and one road" *International Symposium*, 2021, 23-25.
- [24] Y. Pan. (2021). Application of ecological wisdom in rural construction. *Rural science and technology*, 2021(9), 16-17.
DOI : 10.19345/j.cnki. 1674-7909.2021.09.011.
- [25] Y. Miao & Y. Hu. (2022). Research on the Countermeasures of beautiful rural construction and rural tourism development under the Rural Revitalization Strategy. *Jiangsu business theory*, 2022(01), 74-76.
DOI : 10.13395/j.cnki. Issn.1009-0061.2022.01.019.
- [26] Y. Fu. (2021). Research on the construction path of rural cultural space under the strategy of Rural Revitalization. *Agricultural economy*, 2021(04), 59-61.
- [27] J. Y. Wang. (2020). How to promote the extension of reading service to the grass-roots level in Public Libraries -- Taking the "rural campus sharing plan" of Jinjiang library as an example. *Fujian Library Journal*, 3(4), 50-52.
- [28] Z. Du & G. Guo. (2020). Research on the development strategy of rural sports and Culture Festival from the perspective of Rural Revitalization Strategy. *Sports science and technology literature bulletin*, 28(11), 4-6.

주 묘 묘(Miaomiao Zhu)

[정회원]



- 2015년 7월 : 곤명이공대학 예술석사
- 2020년 3월 ~ 현재 : 국민대학교 테크노디자인전문대학원 경험디자인학과 박사과정
- 관심분야 : 서비스디자인, 사용자 체험
- E-Mail : woshimiao_521@163.com

장 완 석(Wan-Sok Jang)

[정회원]

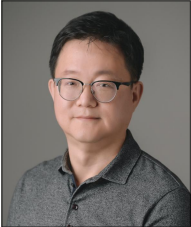


- 2004년 12월 : Wuhan University 미학과(박사)
- 2005년 7월 : Wuhan University of Technology 예술 디자인대학 교수
- 2020년 11월 ~ 현재 : 청도이공대학 전파대학 교수

- 관심분야 : 사용자 경험, 서비스 디자인
- E-Mail : wansok2000@hanmail.net

반 영 환(Pan-Young Hwan)

[정회원]



- 1991년 2월 : 한국과학기술원 산업공학(공학사)
- 1993년 2월 : 한국과학기술원 인간공학(공학석사)
- 1999년 8월 : 한국과학기술원 인간공학(공학박사)

- 2006년 9월 ~ 현재 : 국민대학교 테크노디자인전문대학원 교수
- 관심분야 : 인터랙션 디자인, 사용자 경험(UX)
- E-Mail : peterpan@kookmin.ac.kr