E-tour System —The "Guide" Platform with Mobile Edge Computing

Qing Lin[1,a,*], Jale Ma[1,b]

[1] Intelligent Science and Information Engineering College ,Xi'an Peihua University,Xi'an 710125, China

[a] 530610232@qq.com, [b] 2281525307@qq.com

*corresponding author

Keywords: E-tour System, Tourism Platform, MEC, Intelligent recommendation.

Abstract: E-tour as the product of the integration of tourism and Internet technology is the future of tourism, which has impact profoundly human's life and it's consuming behavior. The traditional cloud-based E-tour platform is limited by the long-distance communication between the mobile terminal and the cloud center, and the centralized analysis and processing of massive data, which may easily lead to the delay of the real-time information and the unsuccessful response of the emergency emergencies. Our E-tour System-the "Guide" platform with Mobile Edge Computing(MEC) has the advantages of location awareness, delay sensitivity, and closer to tourists. It can not only recommend real-time and efficient tourism services to tourists, but also provide intelligent and auxiliary decision-making support to deal with emergencies.The platform can dynamically and expandably access a variety of mobile terminals and sensors, integrate multiple service systems, and provide application management services such as intelligent management for tourist attractions, as well as value-added application services related to tourism. It also can provide open services to third-party businesses involved in tourism.

1. Introduction

The rapid development of Internet communication technology or 5G wireless networks have profoundly affected the consuming behavior of tourists gradually. Tourism as a comprehensive industry that is highly dependent on information, real-time information recommendation and emergency response have become a breakthrough for the development of smart tourism[1]. The traditional cloud-based tourism management platform is limited by the long-distance communication between the mobile terminal and the cloud center, and the centralized analysis and processing of massive data, which may easily lead to the delay in obtaining real-time information of tourists and the unsuccessful response of scenic area management staff to emergency emergencies, and it is difficult to improve the overall image and competitiveness of tourist attractions. In view of the above problems, how to build a smart tourism management platform of "intelligent resource protection, intelligent management, industrial integration networking" based on the advantages of 5G networks urgently needs to be discussed and prepared. We have maed a E-rour system named "Guide" system based on Mobile Edge Computing(MEC) which has the advantages of location awareness, delay sensitivity. And it is closer to tourists on account of recommend real-time and efficient. It can not only recommend real-time and efficient tourism services to tourists, but also provide intelligent and auxiliary decision-making support to scenic area management staff to deal with emergencies.The platform can dynamically and expandably access a variety of mobile terminals and sensors, integrate multiple service systems, and provide application management services such as intelligent management for tourist attractions, as well as value-added application services related to tourism. It also can provide open services to third-party businesses involved in tourism.

2. Related works

Smart tourism, as the product of the integration of tourism and Internet technology, is still a new concept. It is the superior form of tourism informatization, which should be the full exchange, utilization and sharing of massive tourism information[2], and the integration of service processes and management focusing on public service, thereby achieving scientific and rational management and decision-making for service.

Radio frequency identification technology was used in the service industry as early as 2006 at the Pocono Mountain Resort in Pennsylvania. Since 2009[3], the EU has been vigorously developing telematics technology with the intention of establishing an EU-wide wireless communication network for traffic and tourism, including a tourist information service system[4], a tourist vehicle safety control system, a vehicle dispatch system, etc. South Korea has launched a national strategic development project called "u-Korea" and built a travel information service platform, “I Tour Seoul”, to help visitors get a more comfortable travel experience, which can be used through websites and mobile devices for travel advisory services. Singapore's iN2015[5] program has the vision of “An Intelligent Nation, A Global City, Powered By Infocomm”. In Europe, a smart guide mobile app, developed in collaboration with Germany and the UK, allows visitors to access touring services such as commentary, route planning, and scene re-enactment. China's Tourism Bureau[5] has promoted the national smart tourism pilot city, building an smart tourism system including tourism government, mobile Apps, online micro-malls, online and offline consulting centers, governmental network, holiday tourism information system, tourist information collection and analysis and management system, thereby promoting the pace of China's tourism industry towards smart tourism[6]. The biggest drawback of the existing guide apps is the one-to-one mode, where an App focuses on the presentation of a single attraction, with great limitations. For multiple attractions, multiple apps are required to be developed, which is expensive and time-consuming. A travel guiding service platform based on the Edge Network can take advantage of its localized processing, thus is enabled to give in time response to user requests[7], recommend real-time messages for users, and respond to emergencies in a timely manner, which not only relieves the communication pressure of the central network, but also improves the quality of service.

3. "Guide" system scenarios and architecture

For edge network scenarios, Our E-tour System named "Guide" platform uses network edge devices (such as small base stations) to conduct research on service-oriented local response and application-specific customized travel management platforms and models.

It considers specific scenarios such as the location correlation characteristics of tourists, sensor nodes, and edge networks, and aims at processing localization, obtaining personalization, and recommending intelligence to solve the problem of high service delays and unresponsive responses and improve tourism services quality.

The structure of the "Guide" system is shown in Figure 1:

(1) Terminal layer: It includes mobile users (i.e. tourists) and a monitoring network composed of various sensor nodes. As the core of smart tourism, mobile users are both consumers of services and producers of data. The sensor network monitors and collects various types of data, including scenic weather data, passenger flow, scenic ecological environment, and public opinion on the scenic network, and sends them to the edge network for further analysis and processing.

(2) Edge network layer: It includes SBSs and MBS (Macro-cell Base Station). SBS with both computing and storage capabilities is responsible for collecting sensory data from sensor networks, processing, analysis and mining, real-time monitoring and dynamic recommendation, and providing real-time services for mobile users. More importantly, SBS caches the content frequently visited by visitors locally, to quickly respond to subsequent visit requests from visitors. MBS, as a centralized management device, schedules, maintains, and monitors all SBSs. It is responsible for coordinating the division and cooperation of SBSs and redirecting unresponsive requests on SBSs to the Internet.

(3) Application layer: It is deployed at the edge network and cloud center respectively. Generally, tourism-related applications that are frequently visited by tourists and localized are deployed at the edge network. cloud-centric deployments should be more popular. There are many types of applications, including basic application services, value-added application services, and open application services. The deployment of cloud centers should be more popular, with a variety of application types, consisting of basic application services, value-added application services, and open application services.

(4) Communication link: It includes wireless communication and wired communication. Sensor nodes and mobiles are used to communicate with SBS wirelessly, and SBS and MBS, MBS and core network communicate through optical fiber.

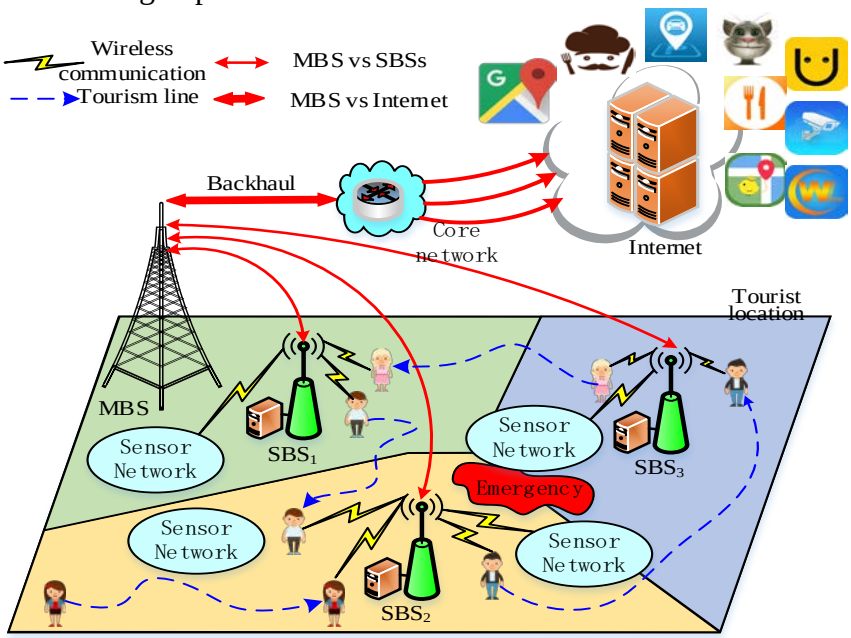

Fig.1. The "Guide" Scenario and architecture.

4. "Guide" system personalized acquisition and intelligent recommendation mode

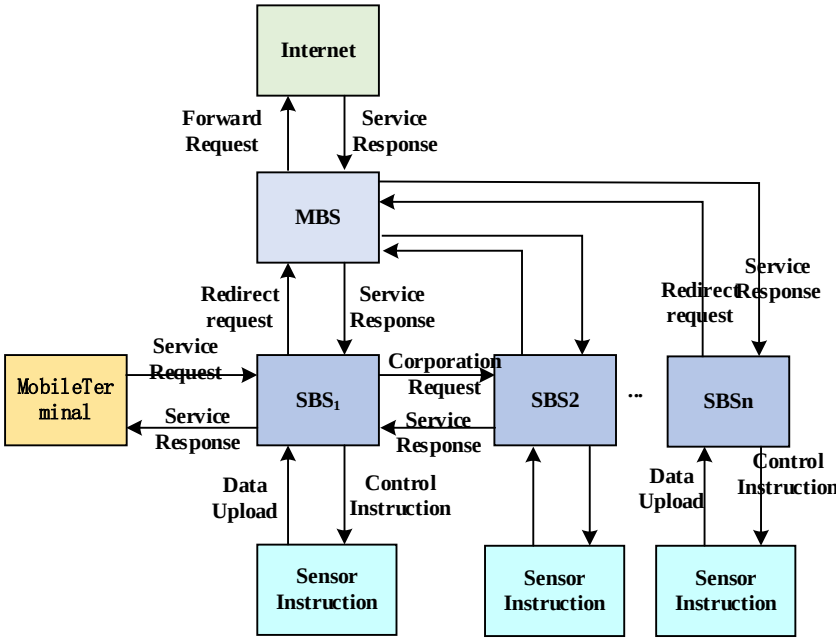

Fig.2. Service intelligent recommendation pattern.

In order to solve the challenges of the complexity, dynamic change and full utilization of the massive data, and realize the high-volume data processing and decision supporting services in scenic spots, the "guide" system implements the collaboration of multiple SBS and MBS, and uses data mining method to study personalized services and smart recommendation modes that match specific scenic spots, as shown in Figure 2. Multiple SBS are responsible for dispatching sensing nodes in their respective regions, monitoring data in their respective regions, and storing the perceptive data in the local SBS, and further processing the analysis. SBS work independently and collaboratively with each other to assist with tasks and share information. All SBS processing results are uploaded to MBS for aggregation, gaining global information while collaborating on each SBS information about the region.

On the one hand, the smart tourism platform is based on the data warehouse, adopts the method of associate analysis of cluster mining, performs data mining and space-time analysis on dangers at attractions, obtains the space-time mode of the information of the attractions' dangers and its pattern of changing, and then formulates the predictions and early warning plans for safety accidents at attractions.

On the other hand, the platform extracts hot spots from the GPS track of tourists, and performs clustering and hierarchical space-time data modeling analysis on the hot spots, from which to obtain popular attractions and tourist routes, tourist similarity and potential points of interest, and other hidden knowledge, to achieve passenger flow and passenger flow trend prediction, thereby easing the decision-making of intelligent scheduling of attraction resources.

Based on the preferences, visiting behaviors and different needs of the scenic spot, the intelligent touring platform deploys personalized application services for visitors. The platform also recommends more service based on the current visitor's visiting behavior. Similarly, the content frequently accessed by visitors is cached locally based on access affinity for service reuse.

5. "Guide" platform implementation

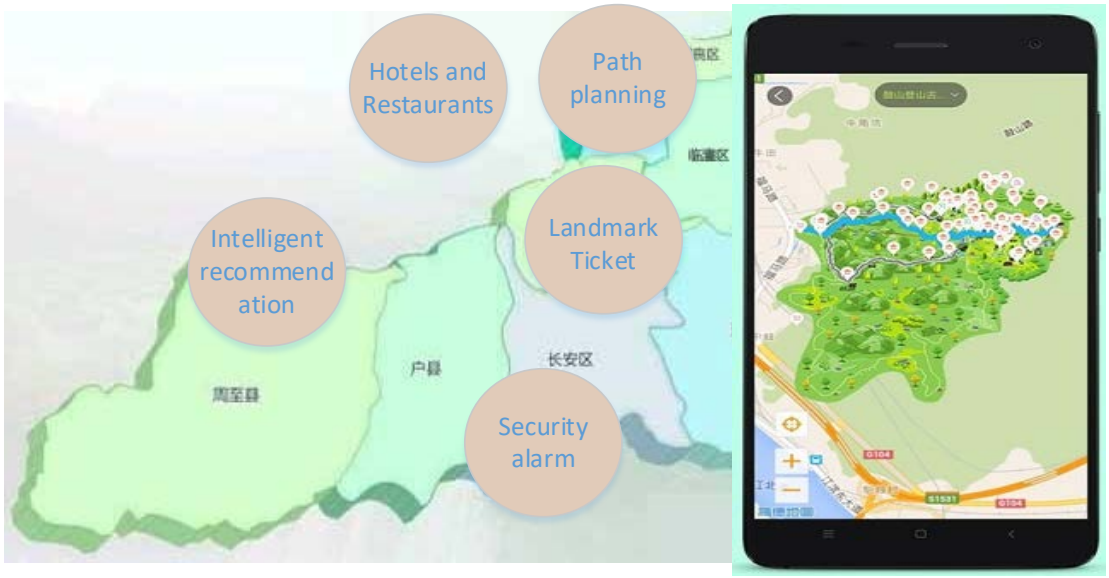

Fig. 3.The "Guide" platform implementation.

Based on the commercial wireless network environment, the " navigation " system designs and implements a smart tourism platform with city-level map as the background.

Firstly, mobile users perceive themselves and surrounding environment information in real time through various mobile devices they carry. On this basis, a virtual smart tourism service architecture for the scenic area is established to realize the interaction between mobile users and the virtual service architecture, and upload various perceptual data. The smart tourism platform analyzes and processes perceptual data, mines relevant information, and pushes services to mobile users through the service

architecture to implement several functions such as attraction tickets, catering accommodation, route planning, intelligent pathways, and security alert verification. On this basis, test and evaluate the efficiency of personalized acquisition of services and intelligent recommendation models. Secondly, design application deployment schemes and verify their operational efficiency. Finally, the analysis and evaluation of test results are carried out, and improvement and optimization measures are proposed.

6. Conclusion

Smart tourism is the future of tourism, which has a profound impact on the sustainable development of tourist attractions and tourism. At present, there are still some shortcomings in China's research in this field, there is a certain gap with foreign countries, the research has the characteristics of isolation, fragmentation and so on. Most of the research results in China are based on the research of foreign scholars, which cannot adapt to China’s tourism well. This makes China's tourist attractions in the actual operation of the lack of advanced theory of guidance, affecting the early entry of tourist attractions into the stage of smart tourism, making China's tourist attractions be in a disadvantageous position in the international competition. The design of the "guide" platform is realized with the unique advantages of China's 5G network, the study of the smart tourism service platform based on the edge network, promotes the research in this field of our country, and enrich the theoretical knowledge of research in this field.

Acknowledgement

This research was financially supported by the University-level Scientific Research Program of Xi’an Peihua University in 2019,“Research on Intelligent Tourism Service Platform Based on 5G Network”(No. PHKT19033)

References

[1] Lin Gang, Zheng Jun, Zhao Wenyan. (2018) Discussion on the model of E-tour city under big data. Computer Era.

[2] Alexander Smirnov, Alexey Kashevnik, Andrew Ponomarev. (2014) Smart Space-Based Tourist Recommendation System. International Conference on Next Generation Wired/Wireless Networking. Springer International Publishing.

[3] Sanjana Kadaba Viswanath, Chau Yuen, Xuefang Ku. (2015) Smart Tourist - Passive Mobility Tracking Through Mobile Application. International Internet of Things Summit. Springer International Publishing.

[4] Nugraha, Nur Budi, Suyoto, Pranowo, . (2017) Mobile Application Development for Smart Tourist Guide. Advanced Science Letters.

[5] Zhang L, Yang J. (2016) Smart tourism.

[6] Zhang Q, Wang Q, Hao J X, et al. (2016) Mapping smart tourism research in China: A semantic and social network analysis using CiteSpace.

[7] Hai-ling Liu, Jun-huai Li, Jun Peng. (2015) A novel recommendation system for the personalized smart tourism route: Design and implementation. 2015 IEEE 14th International Conference on Cognitive Informatics & Cognitive Computing (ICCI*CC).