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Research paper

Development of Personalized Travel Products for Smart Tour Guidance Services

JeongWoo Jwa[1]*

[1] *Department of Telecommunication Eng., Jeju National University, Jeju Special Self-Governing Province, 63243, Republic of Korea*
**Corresponding author E-mail: E-mail: lcr02@jejunu.ac.kr*

Abstract

Smart tourism is the application of the key technologies of the 4th industrial revolution. This research proposes a smart tourism system to develop the personalized travel products for smart tour guidance services. The proposed smart tourism system consists of a smart tourism app and a smart tourism server. Adobe XD is used to UI/UX design of the android based smart tourism app. The smart tourism server provides the recommend travel products to FITs before or during the trip. FITs can create the personalized travel product using the chosen recommend travel products, tour information such as tourist attractions, lodgments, and restaurants. During the trip, FITs can use smart tour guidance services according to the tour schedule in the personalized travel product. In the developed smart tourism system, FITs can modify the personalized travel product during their trips and register them as the recommend travel products after their trips.

Keywords: *smart tourism, android app, free independent travelers (FITs), UI/UX design, context awareness.*

1. Introduction

Smart tourism is the application of the 4th industrial revolution based on Internet of Things (IoT), communication systems, cloud computing, big data, and artificial intelligence (AI) [1]-[4]. Smart tourism system can support tourist activities before, during, and after the trip using the key technologies of the 4th industrial revolution. Smart tourism system provides the personalized travel products which can be created based on the tourism big data analytics. Tourists can select the personalized travel products using tourist context before or during their trips. The personalized travel products should include tour information to provide tour guidance services interworking with communication infra such as free WiFi and beacons in sightseeing spots. The personalized travel products also include sightseeing spots, restaurants, and hotels as that in e-Tourism system.

The tour information includes Mobility-as-a-Service (MaaS) [5] based on the multimodal navi. MaaS provides a myriad of innovative mobility service providers such as ridesharing and e-hailing services, bike-sharing programs, and car-sharing services as well as on demand pop-up bus services. The modeling and categorization of pedestrian path components is developed for smart tour guide services [6]. The pedestrian networks have attributes of node and link to provide information on the geometry of the map for the pedestrian navigation system. Therefore, the pedestrian networks include road types, pedestrian facilities, road types, pedestrian facilities, surrounding environments, road conditions, road surfaces, and annotations. The pedestrian networks have annotations of links to create the shapefile of the walking tourist attraction. The pedestrian networks have the geographic information more valuable for smart tour guide. The pedestrian network is developed using on-site GPS trajectories matched with photos in sightseeing spots. The developed pedestrian network can be used to create the digital tourist map on the geographic information system (GIS) system in the smart tourism system. The digital tourist map includes tour information. The digital tourist map displays on the mobile maps such as Naver Maps, Kakao Maps, and Google Maps. Tourists can choose multimodal navi routes and geotagged tourist contents such as storytelling, curation, guidance, etc., which are provided in conjunction with location information, sensors, beacons installed at tourism destinations. They are used to provide smart tour guide services at tourism attractions during the trip [7][8]. Tourists can use smart tour guidance services using the tour information in the personalized travel products during their trips.

The android based smart tourism app [9] is developed for free independent travelers (FITs) based on big data analytics of KT BigSight^{TM} [10]. The Jeju special self-governing province develops the tourist big data platform and provides big data analytics [11][12]. The tourist big data platform provides tourists information on tourism destinations by data analysis of call data records (CDRs) of mobile communication network, tourist's access logs collected by communication infra such as free WiFi access points (APs) and beacons installed in tourist destinations, and big data collected from public and private sectors. The location-based multilingual audio tour guide system using the server-based TTS engine [13] can provide smart tour guidance services interworking with beacons and GPS data on tourist spots during the trip. The audio tour guide services using geotagged tourist contents provide safe and comfortable route and path guidance for pedestrians and handicapped or elderly people. The smart tourism app using the beacon information from the beacon SDK (Tamra SDK) [14] will be developed for smart tourism. In this paper, the smart tourism system is proposed to provide smart tourism to FITs.

2. Development of Personalized Travel Products for Smart Tour Guidance Services

2.1. Development of Smart Tourism System

Smart tourism as a part of smart city supports tourist activities before, during, and after the trip using the key technologies of the 4th industrial revolution. Before the trip, tourists can select recommended travel products and tourist information. Tourists can modify the travel products and make the personalized travel products. During the trip, tourists can use smart tour guidance services using the personalized travel products and can modify the travel products. After the trip, tourists can register the personalized travel products to the smart tour system as the new recommended travel products. The android based smart tourism app is developed to provide the recommend travel products using big data analytics before the trip. The location-based multilingual audio tour guide system is also developed to provide smart tour guide services during the trip. The android based smart tourism app should be developed to provide the personalized travel products for FITs. Adobe XD [15] is used to the UI/UX design of the smart tourism app.

Figure 1 shows the block diagram of the proposed smart tourism system. The proposed smart tourism system consists of a smart tourism app, a smart tourism server, and interworking systems such as a multimodal navi server, a weather information server, a tourist big data server, etc. The smart tourist app can create my travel product and provide the smart tour guidance service. Before or during the trip, my travel product can be created using the recommended travel products and tour information provided by the smart tourism server. During the trip, the smart tour guidance service is provided according to the tour schedule of my travel product interworking with a multimodal navi, communication infra such as free WiFi APs, beacon, and mobile networks. The multilingual audio tour guide system can provide smart tour guidance services using geotagged tourist contents in my travel product. My travel product can provide safe and comfortable route and path guidance services. The smart tourism server can create recommended and personalized travel products, tour information interworking with a multimodal navi server and the tourist big data servers. The digital tourist map is also developed in the smart tourism server based on the pedestrian networks on the GIS system and the mobile maps.

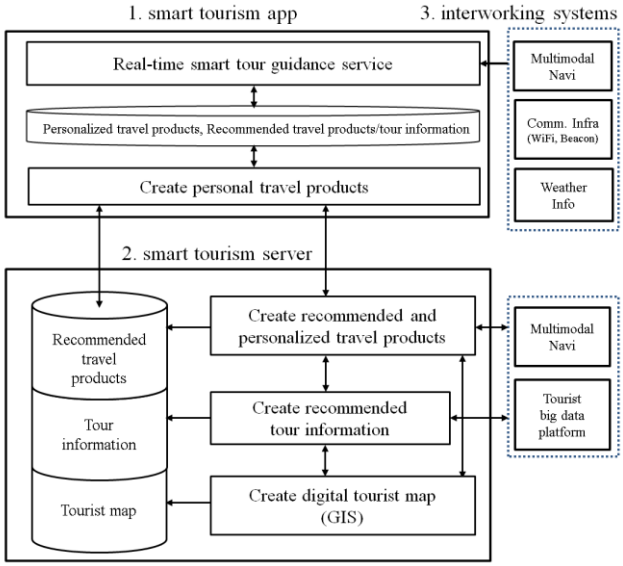
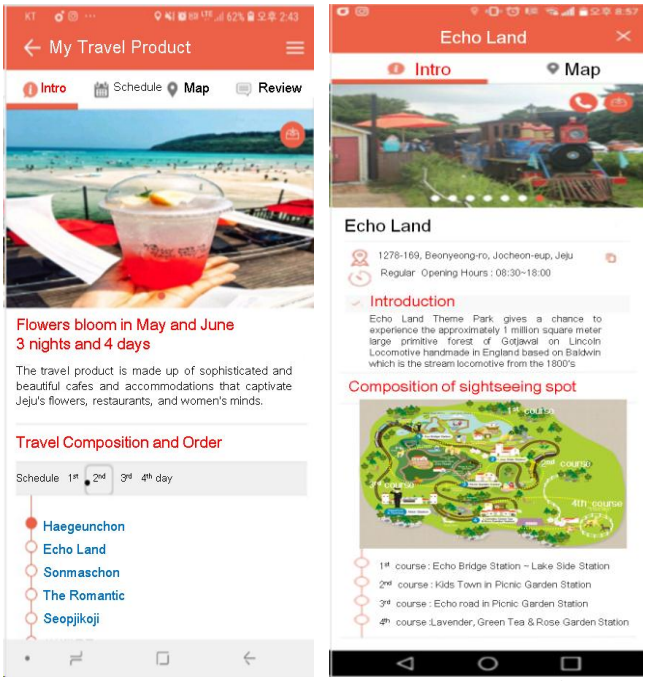


Fig. 1: The proposed smart tourism system consists of a smart tourism app and a smart tourism server

The recommended travel products can be developed local specialists as well as travel professionals to create new travel products utilizing differentiated local tourist contents. The recommended travel product includes the recommend tour information according to the tour schedule. The recommend tour information includes the recommended tourist attractions, lodgments, and restaurants. The tour information of the recommended tourist attraction includes geotagged tourist contents to provide smart tour guidance services during the trip. Figure 2 shows the UI/UX design of recommended travel product and tour information of tourist attractions using Adobe XD. Figure 2(a) shows a 3-night and 4-day recommended travel product for 20s or 30s during the summer vacation season in Jeju that is stored in my travel product. Figure 2(b) shows the recommended tour information of Echo Land theme park included in my travel product. The recommended tour information of the tourist attraction can be classified based on travel time, weather, tourist context information such as age and gender using the pedestrian networks on the GIS system.

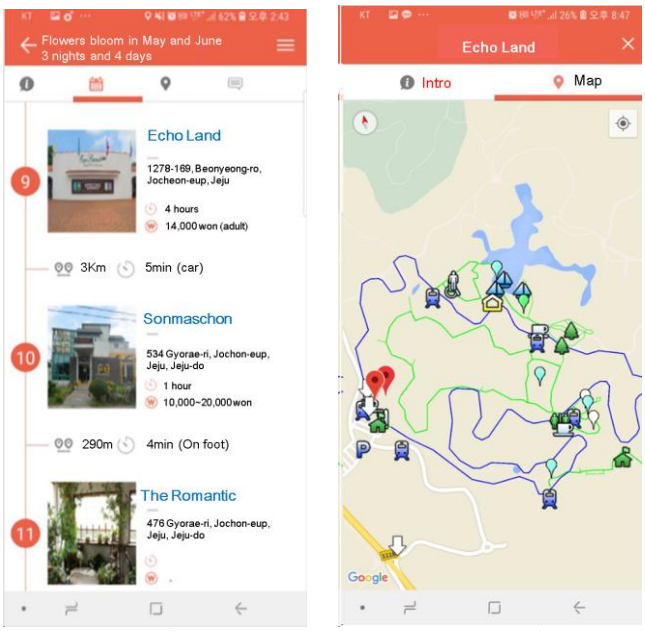


(**a**) Recommended travel product (**b**) Recommended tour information

Fig. 2: The UI/UX design of recommended travel product and tour information of tourist attractions using Adobe XD

The travel routes for pedestrians in the digital tourist map can be developed using the pedestrian networks on the GIS system. The tour information of the digital tourist map can be developed on the mobile maps such as Naver Maps, Kakao Map, and Google Maps. Figure 3 shows the digital tourist map of Echoland that is developed on Google Earth. The tour information of the digital tourist map is created by Keyhole Markup Language (KML) and displays it on mobile Google Maps. The tour information includes POI, point of story, point of risk, point of photo, etc. The train routes (blue) and pedestrian routes (green) are shown separately on the digital tourist map of Echo Land. The tour information of Echo Land can be classified to 4 courses according to travel time of pedestrian routes as shown in Fig. 2(b), Fig. 3, and Fig. 4(b).

Fig. 3: The digital tourist map of the tourist attractions on Google Earth



(**a**) Tour schedule of a travel product (**b**) Digital tourist map of Echo Land

Fig. 4: The UI/UX design of the tour schedule of a travel product and digital tourist map of Echo Land using Adobe XD

Figure 4 shows the UI/UX design of the tour schedule of travel product and digital tourist map of Echo Land using Adobe XD. Figure 4(a) shows the tour schedule of the recommended travel product as shown in Fig. 2(a). Figure 4(b) shows the digital tourist map of Echo Land created by KML on the GIS system and Google Earth.

2.2. Development of Personalized Travel Products Using the Recommended Travel Products

The smart tourism system provides the recommended travel products and tour information of tourist attractions. Tourists can select and modify recommended travel products and tour information of recommended tourist attractions to create the personalized travel products in the smart tourism system. Travelers can easily and conveniently create personalized travel products by deleting and/or inserting tourist information such as sightseeing spots, accommodation, restaurants from recommended travel products in the proposed smart tourism system. The modified travel product can be saved as my travel product in the user terminal.

Figure 5 shows the proposed development procedures of personalized travel products using the recommended travel products and tour information of tourist attractions: The tourists can creates the personalized travel products as follows:

(1) Select recommended travel products

Before or during the trip, tourists search on the smart tourism server and select recommended travel products and recommended tour information. The chosen travel products and tour information is stored in the user terminal. Tourist can also download the digital tourist map of the travel products and tour information. Tourist can check tour information on the digital tourist map.

(2) Make the personalized travel itinerary

Tourist can make the personalized travel itinerary by deleting and/or inserting tourist information from the stored travel products.

(3) Create the personalized travel product

Tourist requests the personalized travel product to the smart tourism server. The smart tourism server creates the personalized travel product interworking with the multi modal navi and the GIS platform. The smart tourism server modifies tourists' selected travel products according to his travel itinerary to create the personalized travel product. The smart tourism server calculates the tour distance and time and includes those in the personalized travel product.

(4) Create the digital tourist map

The smart tourism server creates the digital tourist map of the personalized travel information according to the chosen tour information of tourist attractions.

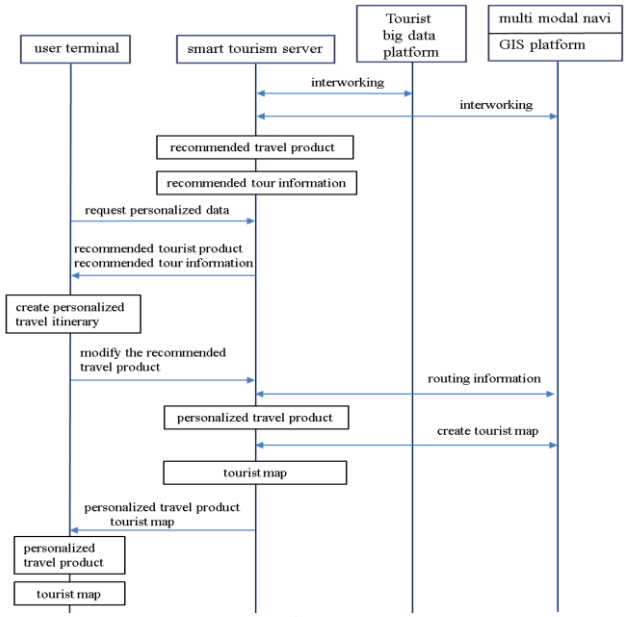
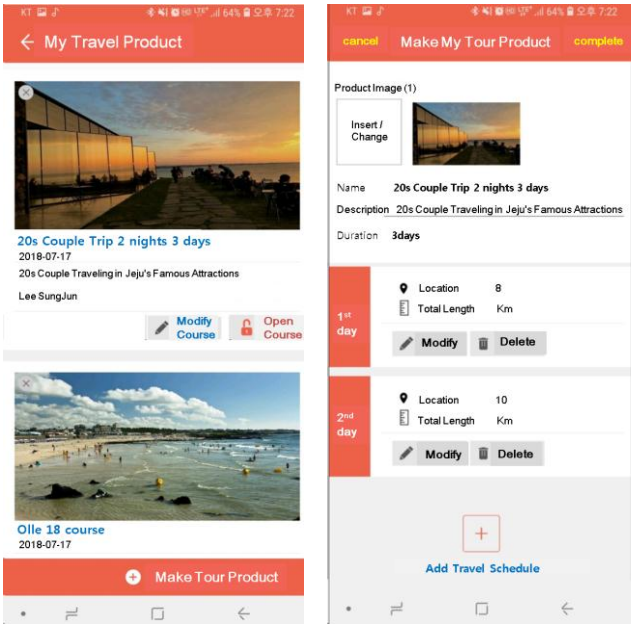


Fig. 5: Development procedures of personalized travel products using the recommended travel products and tour information of tourist attractions

(5) Download the personalized travel product and the map

The downloaded travel product is stored as my travel product. Tourist can use smart tour guidance services according the tour schedule of my travel product.

Figure 6 shows the UI/UX design of making the personalized travel itinerary using Adobe XD. Figure 6(a) shows the recommended travel products and tour information that is stored in the user terminal. In Fig 6(a), the course modify button is used to make the personalized travel itinerary. Tourists complete the travel itinerary by deleting and/or inserting tour information on a day-by-day basis from the recommended travel products as shown in Fig. 6(b). Tourists can also delete and/or add tour information from the selected date as shown in Fig. 7.



(**a**) Selected travel product (**b**) Make the personalized travel itinerary

Fig. 6: The UI/UX design of making the personalized travel itinerary using Adobe XD

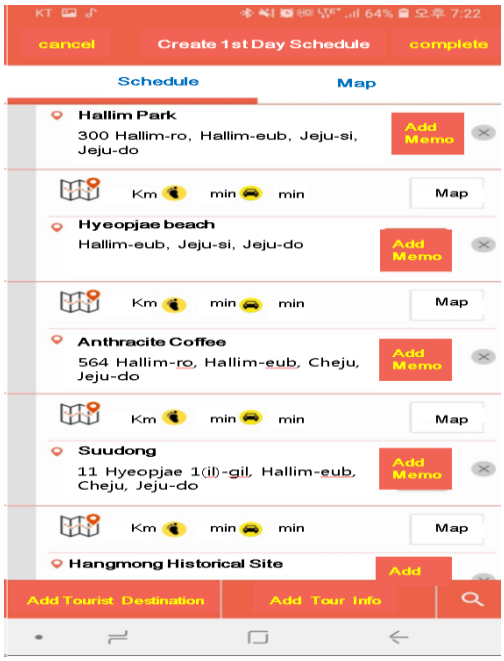


Fig. 7: The UI/UX design of creating the tour schedule of the travel product on the selected date using Adobe XD

3. Conclusion

In smart tourism, the smart tourism system interconnecting with the tourism big data platform should be developed to support tourist activities before, during, and after the trip. The objective of the study is to develop the smart tourism system. The developed smart tourism system consists of a smart tourism server and a smart tourism app interworking with a multimodal navi, a tourist big data platform, and communication infra. The developed smart tourism server provides the recommended travel products, tour information, and the digital tourist map on the mobile maps. The mart tourism app can create the personalized travel product interworking with the smart tourism server. The personalized travel product include tour information to provide smart audio tour guide services by the geotagged tourist contents such as storytelling, curation, guidance. The proposed smart tourism system can be further developed to provide MaaS based on the multimodal navi.

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