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A Study on Smart Tourism Based on Face Recognition Using Smartphone

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Abstract

This study is a smart tourism research based on face recognition applied system that manages individual information of foreign tourists to smartphone. It is a way to authenticate by using face recognition, which is biometric information, as a technology applied to identification inquiry, immigration control, etc. and it is designed so that tourism companies can provide customized service to customers by applying algorism to smartphone. The smart tourism system based on face recognition is a system that prepares the reception service by sending the information to smartphone of tourist service company guide in real time after taking faces of foreign tourists who enter Korea for the first time with glasses attached to the camera. The smart tourism based on face recognition is personal information recognition technology, speech recognition technology, sensing technology, artificial intelligence personal information recognition technology, etc. Especially, artificial intelligence personal information recognition technology is a system that enables the tourism service company to implement the self-promotion function to commemorate the visit of foreign tourists and that enables tourists to participate in events and experience them directly. Since the application of smart tourism based on face recognition can utilize unique facial data and image features, it can be beneficially utilized for service companies that require accurate user authentication and service companies that prioritize security. However, in terms of sharing information by government organizations and private companies, preemptive measures such as the introduction of security systems should be taken.

Keywords: Face Recognition, User Authentication System, Information Management, Smart Phone

1. Introduction

Research works on human-behavior analysis from a variety of fields, which fit the respective characteristics in each of these fields, have been conducted. [1, 2] Among them, facial-recognition

technology is its mainstream and is one of the most active research fields. [3, 4] Facial recognition is a widely used security technology with a wide range of applications, including biometrics, which has been actively studied. [5] Facial recognition is the most natural form of personal identification method and does not constrain the action of its user. [6] Facial-recognition technology performs authentication using biometric data, and it is applied in various fields such as identity checks, access control, unmanned surveillance, and criminal-record search. Facial recognition does not demand a particular action or actions from the user to perform authentication, and the user does not need to be in contact with the subject. Therefore, it has the advantage of low user resistance, and higher safety is ensured based on the different characteristics of the user. [7]

In facial-recognition-based technology, as the performance of smartphones has advanced, interests in the field to perform certain services using smartphones have increased. Access control systems use a password for security, but when facial recognition is applied to smartphones, it is more secure, allows more flexible approaches, and no password is needed. [8, 9] With the popularization of smartphones and the tourism industry, this system represents an intangible aspect of the service industry that is undergoing a period of revolution. Tourists receive support for much of their tourist activities based on convenient mobility and network access. [10] A wide range of resources provided by smartphone applications provides tourists open access to necessary information anytime and anywhere, and the service provider can support them using the resources provided in the mobile device systems. [11] Mobile services provide services in various forms, such as area information, finding directions, finding friends, locating a child, Feng Shui, location-based advertising, etc. Services that use a map can provide search services such as a particular area, transportation, accommodation, restaurants, and other convenient facilities. [12] However, thus far, studies employing smartphones have focused on providing tourist information [13], ubiquitous environment [14], and location-based services technology [10, 15]. These studies focused on the convenience of the tourists. In addition, the use of customer information by tourism-related service providers for their customer welcoming reception mainly focuses on the customer service provided by existing associated companies and on customer-oriented services. However, the development of artificial intelligence (AI) technology is going to change these systems, which can provide personalized services to customers from service providers who leverage the information of foreign visitors. The most convenient method of personalized service is the use of facial-recognition information of foreign tourists who pass through the airport immigration office. A customer service method by applying facial recognition on a smartphone can be implemented. This paper is organized as follows. Section 2 describes the system configuration and model. Section 3 describes the environment for the implementation and the experimental results of the model. In Section 4, the conclusion is made, and future research directions are offered.

2. System Model

The development of a system applied to travel information that provides location-based services using smartphone apps is aimed at the convenience of the tourists. Facial-recognition systems based on a custom-tailored content system have sighted their goals on hospitality to customers and on convenience to the service provider. Figure 1 shows that the research presented in this paper is designed to focus on the dimensions of tourism-related service providers by providing a systematically tailored service to foreign tourists that visit a country.
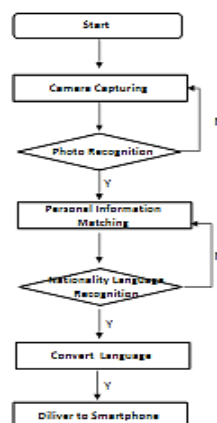
Figure 1. System Model

Figure 1 shows the system description. After the face-recognition process using a camera to capture image, the picture is matched with the image from the national immigration office. The personal information is obtained and delivered Information of the nationality and language is obtained, converted, and delivered to smartphones. AI is employed to search for the personal information and transfer this information to smartphones. Figure 2 shows the whole program configuration. Implementation environments are implemented on a Web Server and programmed using HTML5, CSS3, and JavaScript. The system is designed to use the Google Maps application programming interface (API) Version3.
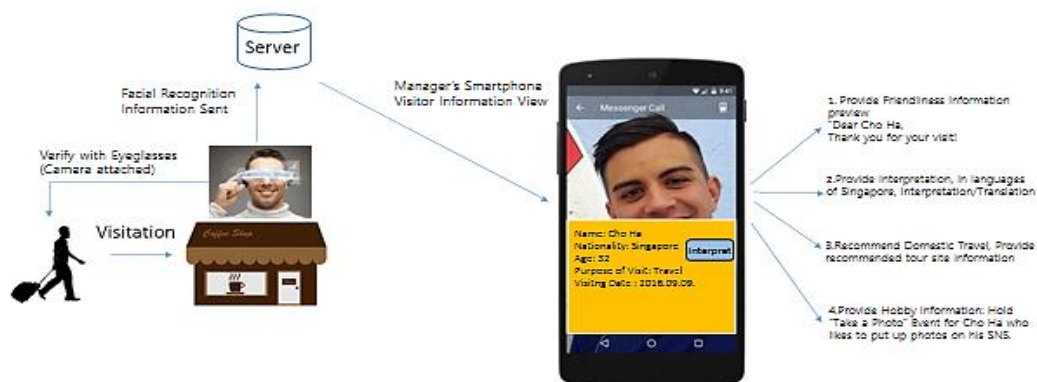

Figure 2. Program Screen

3. Research Result

In this study, we utilized speech-recognition, sensing, and AI personal information-identification technologies based on personal information-identification technology.

3.1 Personal Information Recognition Technology

Using a camera and the facial-recognition technology, we confirm the personal identification information such as name, purpose of travel, and hobbies of a first-time foreign tourist. Then, we recommend the tourists to participate in product sales and events through friendly conversation. The photograph, age, name, purpose of visit, entry date, and other basic personal information are obtained through the API(Application Programming Interface) of the immigration office public institution, which are downloaded from the server to the smartphones. More detailed information is introduced into the smartphones: first, by using facial-recognition and image-searching technologies based on the photograph and then through AI(Artificial Intelligence) technology, which searches online activities. Figure 3 shows the process of the personal information-recognition technology. Figure 4 shows the smartphone screen.
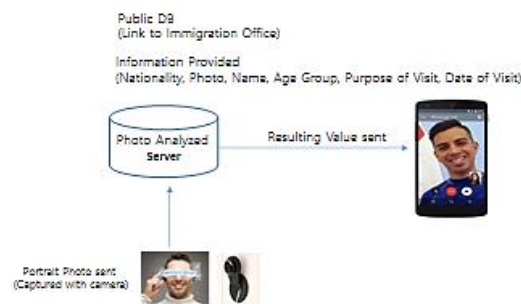
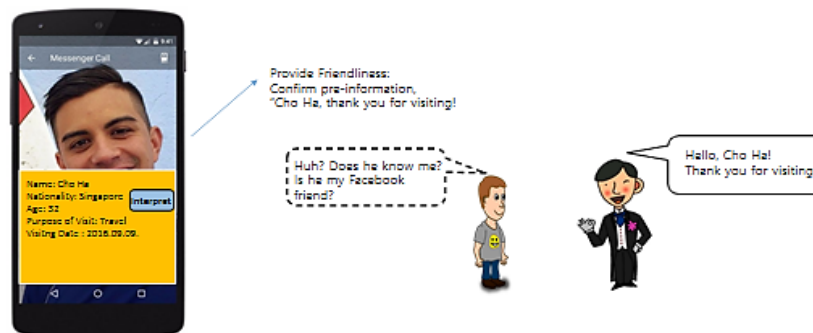**Figure 3. Personal Information Recognition Technology Process**

Figure 4. Program Screen

3.2 Speech Recognition Technology

The language of a foreign tourist who is visiting for the first time is first identified by the camera and facial recognition and then by the speech-recognition technology embedded in a smartphone, which serves as an interpreter. Through the microphone features of the smartphone, an audio file is transmitted by streaming to a server, and the speech is then translated into a mechanical language. In other words, this process

resembles a translation service method where the translated mechanical language downloaded from the server is then again converted to speech in the tourist language and delivered to the final receiver. Figure 3 shows the speech-recognition technology.
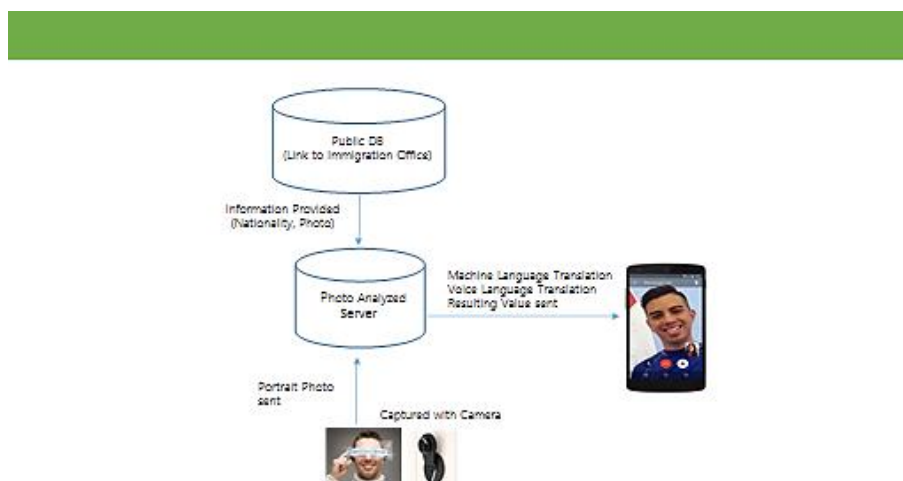

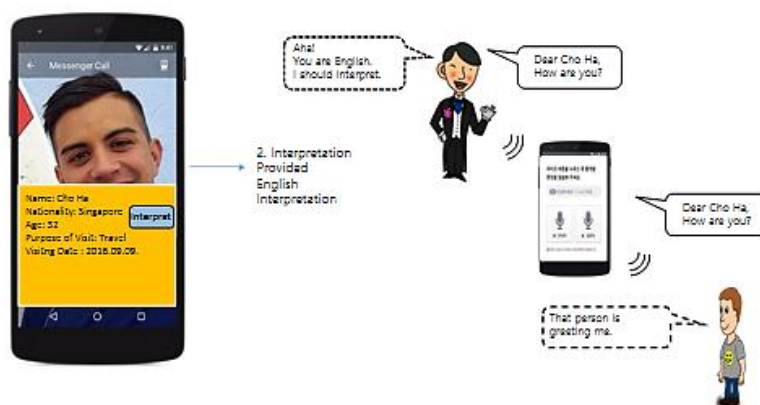**Figure 5. Speech Recognition Technology Process**

Figure 6. Program Screen

3.3 Application of Sensing Technology

Each business provides the travel information obtained using the sensing technology to guide the visitors to product sales by offering them personalized local area travel content. The technical scheme is to have the tour guide confirm the itinerary of foreign visitors and provide tour information that fits their itinerary and schedule. By utilizing an electronic tag, foreign tourists can confirm and experience the feeling of the tour site and utilize the information in the smartphone through 3D augmented reality, images, and videos.
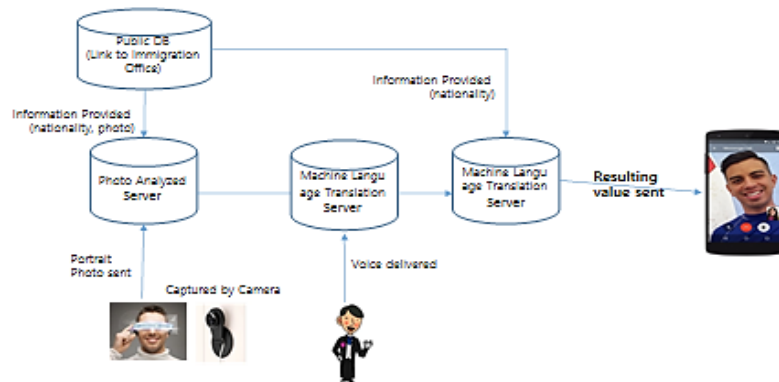
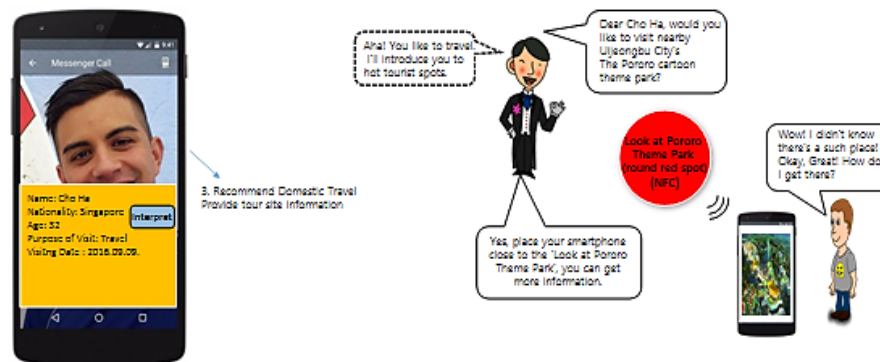**Figure 7. Tourism Information Applied with Sensing Technology**

Figure 8. Program Screen

3.4 AI Personal Information recognition technology

By taking advantage of the AI-provided personal information-recognition technology, each service provider proposes customized events in the areas of interest that foreign tourists could visit, which offers an opportunity for service providers to self-promote their business. After selecting online the sector where the tourists might be interested, the system gathers personal information using AI technology then offers the experience that the tourist themselves can enjoy. Thus, through the welcoming receptions, the service providers can self-promote their services.
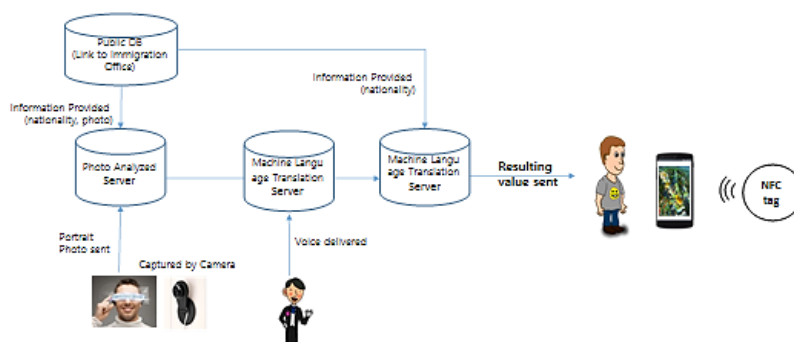
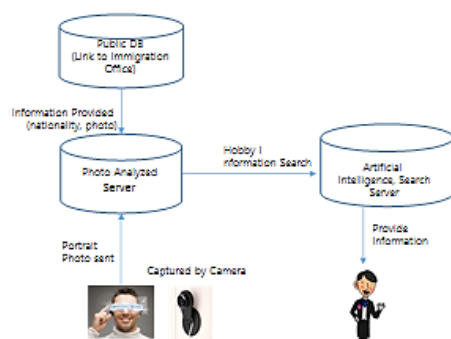**Figure 9. AI Personal Information Recognition Technology Process**

Figure 10. Program Screen

By applying personal information- and speech-recognition technologies, all service providers provide the information to the tourist in their smartphones. This program has been implemented, and the results show proper implementation on smartphones.

4. Conclusion

Tourism, which is an intangible, temporary, synchronous, and heterogeneous industry, can take advantage of I, and the benefit of companies providing tourism-related services for tourism can be doubled.

In this research for information utilization, an algorithm was developed and applied to smartphones. It was developed by applying a face-recognition-based tailored content system for the service industry to effectively provide a variety of services to foreign tourists.

Biometric information gathering such as facial-recognition technology should develop its system for information sharing not only with the immigration office but also with other service providers.

Facial-recognition technology is expected to respond to the diverse needs of foreign tourists and will provide the best service systems for tourists to enjoy new experience and improved interactive services. In the service industry that generates revenue through foreign tourists, increased variety of tailored services can be offered when welcoming customers by taking advantage of facial-recognition technology. This technology can offer friendly customer serviceby confirming the information of foreign tourists prior to their tour and provide interpretation services in their respective languages. In addition to providing information about location attractions, it can also recommend popular tourist routes that they can visit.

Because the facial-recognition technology proposed in this paper utilizes the characteristics of inherent face-image data, the service-provider industry, which require accurate user authentication for security as a specific priority, could utilized this system to their advantage. Nonetheless, this system suffers from the limitation in that it can only be made possible when the immigration office shares basic customer information to the service-provider in the tourism industry.

Acknowledgement

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