International Journal of Advanced Culture Technology Vol.8 No.4 255-262 (2020)
DOI https://doi.org/10.17703/IJACT.2020.8.4.255

IJACT 20-12-34

A Study on Tourist Destinations Recommendation App by Medical Tourism Type Using User-Based Collaborative Filtering

Jin Cai*, Gihwan Ryu**
** Kwangwoon University, Department of Immersive Content Convergence, Graduated, Seoul, Korea*
***Kwangwoon University, Graduate School of Smart Convergence, Institute of Tourism Industry, Professor , Seoul, Korea*
E-mail : {jincai**,** allryu}@kw.ac.kr

Abstract

Recently, medical tourism is recognized as a high value-added industry because of its longer period of stay and higher expenditure than general tourism. In particular, although the number of medical tourists visiting Korea is increasing, the perception of Korean medical services is low. The purpose of this paper is to develop the app which, based on medical tourism type, recommends tourism destinations. Additionally, this proposed app can expand general tourism as well. It can provide tourists with medical information easily by sorting types tourists. Besides, as medical tourists normally stay long, we can take the advantage of post-treatment time. This app collects medical information data and tourist destination data, and categorizes the types of medical tourists into four categories: disease medical tourism, traditional medical tourism, cosmetic medical tourism, and recreational medical tourism. It provides medical information according to each type and recommends customized tourist destinations. User-based collaborative filtering is applied for tourist destination recommendations.

Keywords: *Medical tourism, Collaborative filtering, Types of medical tourists, Tourist destinations*

1. Introduction

Recently, gamification has been widely used in fields such as education, healthcare, corporate marketing, Medical tourism is defined in various terms such as medical travel, health tourism, and global healthcare[1]. Compared to general tourism, medical tourism is recognized as a high value-added industry due to the high cost of tourist destinations and the long stay period. Also, compared to general tourism, medical tourism is showing rapid growth worldwide[2,3]. Along with the widening of the application scope about medical tourism, the development of ICT (Information and Communications Technologies) have caused the various changes in medical tour industry[4]. Since Korea's medical tourism have been allowed to attract foreign patients in 2009, the actual patient basis reached 380,000 in 2018, and accumulated 2.26 million patients. From December 2018, 1,958 medical institutions attracting foreign patients accounted for 2.9% of the total medical institutions, and the ratio of lost medical institutions among the registered medical institutions was about 72%. By type of treatment, outpatients accounted for 93% [5]. Korea's international medical tourism is mainly concentrated in the cosmetic industry, and especially attracts medical tourists from neighboring countries such as Southeast Asia, Japan, and China. Through applications related to plastic surgery and various promotional activities, the recognition of Korean cosmetic beauty tourism has already been achieved at the world level[6]. As the number of foreign patients gradually increases in medical tourism, it is necessary to provide services for medical tourists. It is necessary to recommend tourist destinations that can expand from medical tourism to pure tourism

Manuscript received: October 30, 2020 / revised: November 19, 2020/ accepted: November 25, 2020
Corresponding Author: allryu@kw.ac.kr
Tel:+82-01-2785-8300, Fax:+82-2-940-5443
Author's affiliation: Propessor, Graduate School of Smart Convergence, Kwangwoon Univ., Korea

by utilizing the characteristics of medical tourism that the period of stay is long. In this paper, we propose an app for recommending tourist destinations by medical tourism type of using user-based collaborative filtering. This app proposal makes to use of the characteristics of medical tourism that the period of stay is long, allowing medical tourists to do personalized tours for the remaining period. This proposed method categorizes medical tourists into 4 types of disease medical tourism, traditional medical tourism, cosmetic medical tourism, and recreational medical tourism based on medical information and tourist information data[7]. Medical tourists divided by the type which are provided with tourist recommendations for each type through user-based collaborative filtering, an artificial intelligence technique. User-based collaborative filtering receives medical and tourist destination data, predicts tourist destination data, and divides it by medical tourism type. Tourist destinations are recommended based on how similar medical tourists by type using the tourist destination recommendation app preferred similar tourist destinations. The data that provided for collaborative filtering is collected by extracting only necessary data by importing medical tourism information data and tourist destination data through data crawling. Through this configuration, medical tourists can lead from medical tourism to general tourism. Based on this, tourism recommendations are not simply listed as famous tourist destinations, and medical tourists can receive recommendations based on which tourist destinations similar types of tourists prefer them. This service function allows medical tourists to be divided by type to obtain desired information more quickly, and to recommend tourist destinations suitable for individuals.

In this paper, Chapter 2 describes the concept of medical tourism, domestic and foreign medical tourism platforms, and type research on medical tourism. Chapter 3 addresses the proposed system outline and components, system operation process, and collaborative filter technique as a recommending method, and Chapter 4 implements the interface configuration and process with a mobile web screen. Finally, Chapter 5 describes the conclusion and future research.

2. Related Work

Medical tourism can be thought of as a simple combination of 'medical' and 'tourism', but the classification of medical tourism varies greatly depending on how the scope of medical tourism is determined, and terms related to medical tourism are also very diverse. Research is being conducted in a wide range of perspectives. Goodrich & Goodrich (1987) medical tourism is defined as providing medical services along with tourism activities as provided to those with the purpose of health promotion and treatment. Medlik (1996) medical tourism is defined as visiting or traveling to other places for the purpose of treatment. Laws (1996) medical tourism is defined as an activity for relieving psychological and physical stress, and broadly defined it as a part of leisure activities to improve one's health status by leaving one's residence. In Korea, Hae Jae Cho (2006), Hyuna Hong et al. (2007) medical tourism is defined as as the provision of medical services as well as tourism activities to patients for the purpose of health promotion and treatment, In Beomjong Lim et al. (2009), medical tourism is defined as the pursuit of medical and tourism services at the same time as a patient's treatment, recreation, and tourism activities. In addition, Hall & Weiler (1992) and Bong-gyu Park (2008) introduced the concept of SIT (Special Interest Tourism), which means tourism is conducted for a special purpose rather than pure tourism. It was also defined. In other words, medical tourism is defined as one of the SITs as it refers to tourism conducted with a special purpose of providing health-related medical services such as medical services and treatment or treatment, not for the purpose of pure tourism. In the end, medical tourism is defined as tourism for the prevention and treatment of diseases and for promoting mental, psychological, and physical health care and activities related to the prevention and treatment of diseases, leaving one's residence[8]. The main information and functions provided by Visit Medical Korea are divided into six categories. The first is information centering on medical services such as types and prices of medical services, medical institutions, etc. The second is information on 25 wellness tours, and the third is information on medical tour packages and medical tour programs, The fourth is the medical tourism information center, information on medical tourism support such as online consultation, the fifth is general information such as announcements, events, and reviews of medical tour experiencers, and the sixth is Seoul, Busan, Incheon, Daegu, Daejeon, and Gyeonggi-do. , Gangwon-do, Chungcheongbuk-do, Jeollabuk-do, Gyeongsangbuk-do, etc. It provides information on

regional medical tourism[9]. "Treatment in Spain" specializes in providing end-user and B2B information, and is a leading medical tourism platform that covers various sectors of the health and medical market. 'Treatment in Spain' categorizes into four areas: 'Doctors in Spain,' 'Dentists in Spain,' 'Hospitals and Clinics,' 'Enquire about treatment,' and provides medical tourism related services. This platform is characterized by providing detailed information on medical institutions and costs by dividing medical services into general medical services and dental medical services. In other words, this platform can be viewed as a comprehensive medical tourism service platform designed to highlight the advantages of the service by subdividing it into comprehensive health check-up and disease treatment, dental treatment service, healthcare and health promotion service, and Spanish tourism service. The 'Thai Medical Vacation' platform consists of' Why TMV(Thai Medical Vacation),"Why Thailand,' 'Treatment,' and 'Medical Blog,'. The characteristic of the Thai medical tourism platform is that there are medical tourism offices in each country to promote the professionalism and reliability of Thai medical institutions to the world, so service support is available to increase the use of the online platform for overseas medical tourists. In addition, "Thai Medical Vacation" is characterized by providing various services such as Thailand's medical level, services, tourism, and visa issuance, and supports promoting Thai medical tourism through blogs or social media channels[10]. A typical types of medical tourism is summarized in table 1.

<Table 1> Types of Medical Tourism [7]

Type of medical tourism	Division	Contents
Disease medical tourism	Concept	In emergency situations that are directly related to the conservation of life, such as heart surgery, organ transplantation, and bone marrow transplant, the type of surgery cannot be performed in the home country but in another country.
	Important factor	Legal permit Infrastructure to receive medical treatment
	Representative country	Germany, Jordan
Traditional medical tourism	Concept	Medical tourism in the form of experiencing traditional medicine and enjoying hot springs and spas to treat chronic diseases and allergies and maintain health.
	Representative country	Ayurveda in India, herbal treatment in Korea
Beauty medical tourism	Concept	Medical tourism products favored by women as a type of medical tourism for cosmetic surgery, beauty, massage, hot spring, spa, and skin massage.
	Important factor	Excellent medical technology price competitiveness
	Representative country	Mexico, Argentina, Thailand, Malaysia, South Africa, etc.
Recreation medical tourism	Concept	Visit and stay in a place equipped with a natural environment suitable for a vacation spot and an infrastructure for health care
	Important factor	Secure tourists with economical and time-saving

		Facilities necessary for health, medical care, and recreation in the vacation spot
	Representative country	Most countries

3. Proposal System

3.1 System Overview

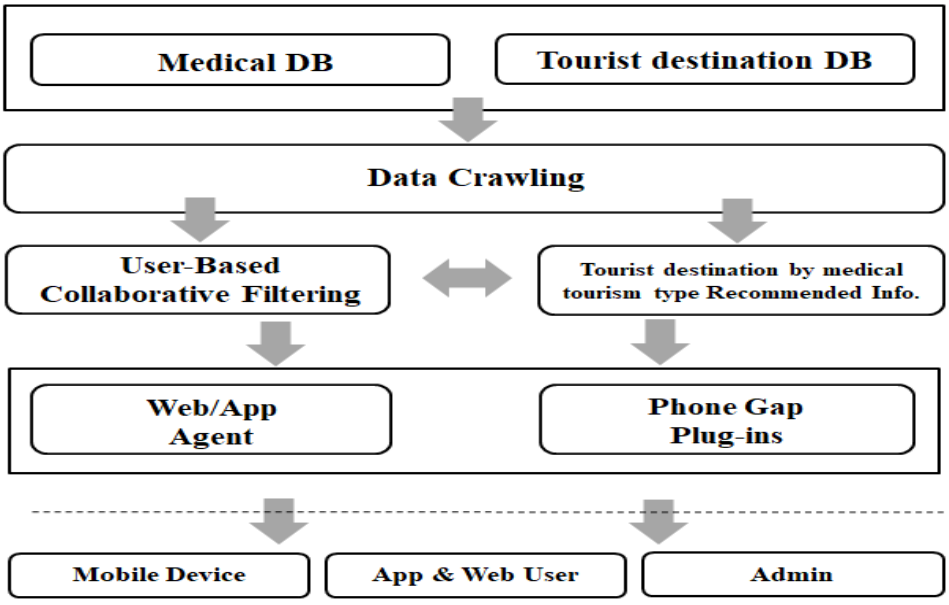

Figure 1. Tourist Destination Recommendation System

In this section, medical tourists are divided by the 4 types of medical tourism, traditional medical tourism, cosmetic medical tourism, and recreational medical tourism based on existing medical information. It proposes an app that recommends customized tourist destinations for medical tourists by combining medical information and tourist destination information. Figure 1 is an outline of the composition proposed in this paper, it consists of Medical DB, Tourist destination DB, Data Crawling, User-based Collaborative Filtering, Tourist destination by medical tourism type recommended Info., Web/App Agent, Phone Gap Plug-ins and the following is a description of the components of each hierarchy.

- Data Crawling : Data Crawling collects data by receiving medical tourism information data and tourist destination data. The execution method of this agent is a task that collects medical tourism information Contents existing on the Web and is automated by programming. It is a technique to retrieve HTML pages, parse HTML/CSS, etc., and extract only necessary data. By calling Open API to a service that provides Open API (Rest API), we applied a method of extracting only necessary data from received data. Also, by programming a browser such as Selenium, only necessary data was extracted. In this agent, a function that extracts only necessary medical information data was used by parsing HTML tags from a web page with medical information using the BeautifulSoup library. In other words, bs4 was installed using the pip command, which was referred to the BeautifulSoup 4 API guidelines.

```
from bs4 import BeautifulSoup

# 1) reqeusts Request medical tourism information web page using library
# 1-1) res Medical tourism information HTML data is stored in the object, and medical tourism
information data can be extracted as res.content
.res = requests.get(www.visitmedicalkorea.com)
….
c_list = crawling_list(res)
for i in range(len(c_list)):
        v = c_list[i]
        print(c_list.content)
….
# 2) HTML Parsing the page BeautifulSoup(HTML Medical tourism information data, parsing method)
# 2-1) BeautifulSoup Parsing method
soup = BeautifulSoup(res.content, 'html.parser')

# 3) Search for necessary medical tourism information data
title = soup.find('title')

# 4) Extract necessary medical tourism information data
print(title.get_text())
….
```

- User-based Collaborative Filtering : User-based Collaborative Filtering receives medical and tourist destination data, predicts tourist destination data, divides medical tourism by type and makes recommendations based on users. The degree of similarity in user-based collaborative filtering is based on how similar items (medical tourism information) were preferred by two users. In the user base, scores of medical tourism information evaluated by a user can be expressed as vectors. In general, the similarity between users can be defined as the similarity between vectors. Various methods can be used to obtain the similarity between vectors, and cosine similarity and Pearson similarity are used. The cosine similarity is defined as "similarity = $\cos(\theta) = \frac{\boldsymbol{A}\cdot\boldsymbol{B}}{||\boldsymbol{A}||\,||\boldsymbol{B}||} = \frac{\sum_{i=1}^{n} A_i B_i}{\sqrt{\sum_{i=1}^{n} A_i^2}\sqrt{\sum_{i=1}^{n} B_i^2}}$", where A_i and B_i are components of vector A and B respectively. This similarity equation is applied to the proposed app.
- Tourist destination recommended Info. : Tourist destination recommended Info. receives data collected and analyzed by Data Crawling and delivers medical and tourist data to User-based Collaborative Filtering.

- Web/App Agent, Phone Gap Plug-ins : Web/App Agent, Phone Gap Plug-ins display and display information on recommended tourist destination to various users. As shown in Figure 2, the execution method of this agent is an asynchronous processing model (Asynchronous processing model or Non-Blocking processing model), which executes tasks in parallel. In other words, even if the task has not been completed, the next task is executed without waiting. For example, when

performing the task of fetching data from the recommendation server and displaying it on the screen, after requesting the data from the recommendation server, the next task is immediately executed without waiting for data response from the recommendation server (Non-Blocking). After that, when data is answered from the recommendation server, an event occurs and the event handler continues to perform the task to be performed with the data. Most of JavaScript's DOM event handlers, Timer functions (setTimeout, setInterval), and Ajax requests operate in an asynchronous processing model.

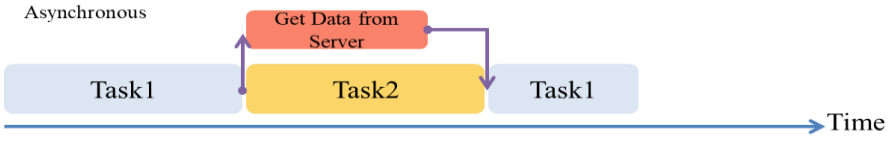

Figure 2. Asynchronous Processing Model

The following is system operation process of the medical and tourist site recommendation app.

3.2 System Operation Process

The operation process of this proposed system is explained as follows. Figure 3 is showing the operational process.

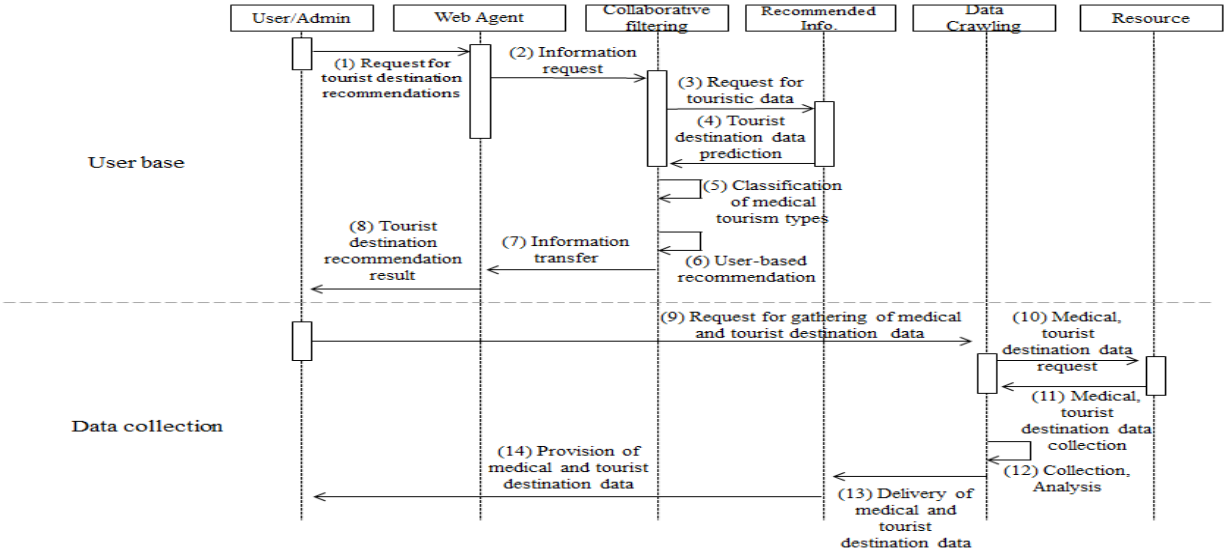

Figure 3. System Flow-Chart

(1) The user requests a tourist destination recommendation.
(2) The agent requests information on recommending tourist destinations through collaborative filtering for information requested by the user.
(3) Collaborative filtering requests tourist destination data in Recommended Info.
(4) Recommended Info. predicts the requested tourist destination data and delivers it to collaborative filtering.
(5) Collaborative filtering is classified by medical tourism type through the data received.
(6) Based on the classification of medical tourism types, tourist destinations are recommended through user-based collaborative filtering.
(7) Deliver information of recommended tourist destination to Agent.
(8) Shows the result of recommended tourist destination to the user.

(9) Admin requests gathering of medical information and tourist destination data.
(10) Data Crawling requests medical, tourist destination data from the resource for the requested data.
(11) Medical and tourist destination data collected from resources are delivered to Data Crawling.
(12) Data Crawling collects and analyzes the data received.
(13) Recommended Info. receives the analyzed medical and tourist data.
(14) Provides medical and tourist destination data to the Admin.

4. Application example

In this paper, we applied it as a suggestion system to recommend tourist destinations to medical tourists using collaborative filtering. This application example shows the process of running an app based on collaborative filtering.

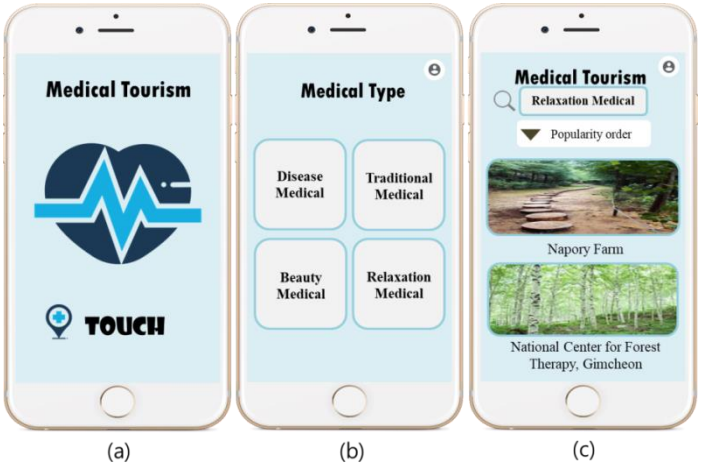

Figure 5. Mobile Apply Example

Figure 5 is made with basic main screen, medical tour type, and tourist destination recommendation. (a) is the start screen of the app. (b) First, the medical tourist selects his or her medical tour type. (c) shows various tourist destinations in addition to Naples Farm and Gimcheon National Healing Forest in order of highest score to users according to the evaluation scores of tourists of the same type in relation to the selected recreational medical tourism type.

5. Conclusion

In this paper, we analyzed domestic and foreign medical tourism platforms and medical tourism types, and proposed a customized tourist destination recommendation system for each type. Since this proposed system is divided to medical tourism by type, it is possible to efficiently and quickly obtain medical information suitable for each tourists, and to provide users with higher quality medical tourism information . In addition, by recommending better tour destination information that is appropriated to tourists than that of existing system, this system will expose more local culture and additional medical services or treatments to travelers during the tour and increase the need for revisits.

The services provided by the system proposed in this paper are as follows. First, it classifies medical tourism types. It categorizes the types of medical tourism to help tourists find customer-oriented and specific medical information quickly and easily according to types. Secondly, tourists can receive recommendations of customized tourist destinations which are inferred from user-based collaborative filtering rather than that of famous tourist destinations which get easily. Future research on medical tourism should be developed using other types of artificial intelligence techniques to provide a variety of medical tourism services.

6. Reference

[1] An, Hye-Gyung · Park, Dae-Hwan · Jang, Byeong-Ju (2001). An Exploratory Study on the Curriculum Development for Medical Tourism Experts, Northeast Asia Tourism Research, 11/30/2011, Vo l. 7, Issue 4, p. 169-185, Tourism Institute of Northeast Asia

[2] Park Jong Deok, "An Study on the Establishment of a Korean Style Medical Tourism Business Model," The Journal of Humanities and Social Sciences 21. Vol. 8 No. 5 (2017) pg. 483, 18 p.

[3] Ji, Yeon. Shin, Sae-Young, "Activation strategies for Beauty Industry through Korean Medical Tourism," Journal of Tourism Management Research 30. 3 (2015): 289-303, Korea Academic Society Of Tourism Management, 2015.

[4] Cho, Sung-Shik,"A Research on Medical Tourism Activation Plans in Creative Economy Ages," Journal of Tourism and Leisure Research 27(3), 2015.03, 253-272(20 pages)

[5] https://www.ekjm.org/journal/view.php?number=25666

[6] LIU YIN "The Effect of Chinese Medical Tourists on the Intention of Revisiting According to the Selection Factors of Korean Medical Tourism Destination - Focusing on comparison of individual and group tourists –"

[7] Suk, Soo Sun "Design Strategy for the Attraction of Patients of the Medical Tourism Industry in Korea - Emphasis on the Muslim Patient Medical Services -" Journal of Digital Design 16(1), 2016.3, 1-10(10 pages)

[8] Young Ju Kim, Jooheon Kim "Effects of Expected Medical Service and Country Image on Medical Tourism Intention" INTERNATIONAL BUSINESS REVIEW 22(3), 2018.9, 187-214(28 pages)

[9] http://english.visitmedicalkorea.com/eng/medicalTreatments/medicalTreatments01_1.jsp

[10] Wonjong Kim, Gwijeong Park, Jaesin Oh "A Study for Establishing Business Model of Korean Medical Tourism Cloud PlatformFocusing Expert Group in Depth Interview" The Journal of Internet Electronic Commerce Resarch 19(1), 2019.2, 331-352(22 pages)