

## **Sasang Constitution Analysis and Wine Recommendation App suggestion through Mobile Face Recognition**

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### **Abstract**

*With the global COVID-19 pandemic, the tourism sector and all consumption have contracted with the untact era. Wine will also be sold and developed in various ways non-face-to-face in the future. Therefore, it is necessary to develop apps and web servers that focus on health in the era of single-person households and non-face-to-face. This study used facial recognition data based on photos of adult men and women in their 40s and 50s to analyze the Sasang constitution through a mobile app and web server, and suggested wine recommendations suitable for their constitution. First, the user's body information is entered. And through the facial recognition mobile app, recommend the right wine after analyzing the body type. if it's not like the first recommended wine, it is configured to receive another wine recommendation. In the future, the number of single-person households will increase further, and in the age of well-being, wine recommendations that fit my body will be useful. Wine recommendation suitable for Sasang constitution will be a useful mobile application to manage personal health*

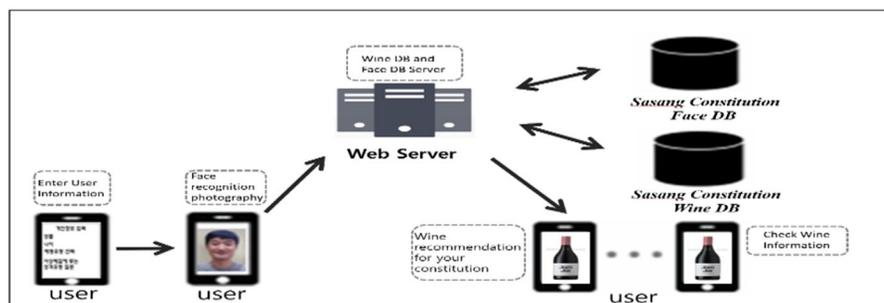
**Keywords:** *Sasang Constitution, Mobile, App, Face Recognition, Wine, Recommendation*

## **1. Introduction**

Sasang medicine of 'Ijema', founded in the late Joseon Dynasty, is traditional Korean medicine that prescribes according to the constitution, and the patient was seen with a scientific approach. Currently, it is possible to distinguish and analyze the constitution through DB according to the face shape of Koreans. Among the Sasang constitutions of Koreans in their 20s and 50s, Taeumin has a broad face, flat eyes and a wide and large nose, and is said to be half that of Koreans. Soeumin's face is narrow and slender, and the tail and nose are slightly drooping down. Conversely, soyangin often have raised eye tips, and wide foreheads up and down. Taeyangin has bright eyes, a strong impression, and a large head. Among the Sasang-in, grapes belong to the Taeyangin food, and alcohol belongs to the Taeumin food. Wine made from fermented grapes is an alcoholic

beverage, so it is a food suitable for Taeumin, but it also goes well with other constitutions. Wines with a variety of flavors and aromas are well suited for each constitution. Wine has a strong heat-generating part, such as soju, beer, and whiskey. Therefore, it is suitable for people with a cold body, and it is also a food suitable for Soeumin with weak digestive function as it has a strong power to increase appetite compared to other alcoholic beverages. In Taeyangin, the lung function is strong, but the liver function is weak. From the perspective of oriental medicine, eating a lot of sour among the five tastes (sweet, salty, sour, bitter, spicy) that protects the liver helps the weak liver function to the Taeyang people. Therefore, a good wine for the taeyangin is light (light body) and strong sour wine is good. Light white wines fit much better than heavy red wines. Sauvignon Blanc and Semillon varieties, which have a strong sour taste, are mainly applicable. White wines from Bordeaux, France, and wines from Riesling grapes from Germany, which are not sweet, also go well together. Red wines include Beaujolais Nouveau, a light French wine, and Chianti wine, which is light and sweet in Italy. Soyangin has strong digestive functions and weak kidneys. Since the body has a lot of heat, the bitter taste is helpful in reducing the heat of the heart. The bitter taste of wine is astringent and contains a lot of tannins. For wines with a lot of tannins, Barolo of Nebbiolo grapes from Piedmont, Italy, and red wines made with Barbaresco wine or Cabernet Sauvignon from Napa Valley, California, are suitable for Soyangin. Soeumin has a weak digestive function, so wine with a strong sweetness that helps digestion is well suited to the body. Wines with a strong sweetness include ice wine and Noble Rot wine. A sweet dessert wine eaten after a meal, or a white wine full of sweet aroma and tropical fruit grown in a hot region goes well. Red wines with strong sweetness grown in hot regions also fit the body well. Therefore, for Soeumin, sweet white wine and red wine go well together. Taeumin has a weak respiratory function in the lungs, so it is good to release the clogged energy through the spicy taste and release it. Therefore, Taeumin has a high body, high alcohol content, strong spicy taste, and goes well with wine with a strong taste. Wines made from Syran and Grenache grape varieties and fortified wines such as Sherry, Port, Marshalla, and Madeira go well together. Therefore, a red wine that is heavier and richer than a light-bodied white wine is suitable for Taeumin.

Figure1 is a suggested face recognition wine recommendation system using smartphones that are widely available to people. First, personal body information is entered, and then the user's face information is sent to the web server through the face recognition app. The sent face information is composed of the face Sasang constitution DB and Sasang constitution wine DB to recommend the wine that best suits the user. In addition, it is configured to establish a stable system by connecting to a web server rather than providing all information from the app.



**Figure1. Proposed face recognition wine recommendation system.**

A wine recommendation system suitable for the constitution is familiar to users who are new to wine and will be trusted as a well-being food. In addition, the recommendation of a scientific approach fused with IT will

lead to the growth and popularization of the wine industry. The structure of the thesis is as follows. Chapter 2 consists of previous thesis related to Sasang constitution classification, face recognition technology, and wine recommendation, and Chapter 3 consists of a proposal system and design implementation. Chapter 4 is composed of the advantages of the Sasang constitution wine recommendation system as a conclusion and the direction to be studied in the future.

## **2. Previous literature**

### **2.1 Sasang constitution and classification**

In the past, medicine considered human physiology and disease phenomena uniformly, regardless of the East and West. The physical characteristics of each person have not been recognized and ignored. In Sasang constitutional medicine, at the end of the 19th century, Dr. Jema wrote “Gyeokchigo” and “Donguisusebowon” to classify human constitutional types into Taeyangin, Taeumin, Soyangin, and Soeumin, and suggested a prescription for each constitution. It is an in-depth analysis of anthropology with the theory of human constitutional medicine [1]. Sasang medicine is a unique medicine that treats each constitution differently. The most important thing in these Sasang constitutions is the classification of Sasang constitutions. It is a very difficult task to accurately identify them [2]. In fact, public awareness of Sasang Medicine is very low. This shows objectivity to patients by showing quantitative and objective diagnostic results to patients through a diagnostic device system linked with engineering technology, except for general diagnosis in the case of Western medicine, which is currently well-recognized. On the other hand, Sasang Medicine is a very subjective diagnosis that relies on the intuition of the clinician in the method of diagnosis of the constitution, despite the fact that the most important thing is constitutional diagnosis. Therefore, it is true that it is difficult to popularize it compared to Western medicine. Therefore, it aims to implement a diagnostic device to improve accuracy and objectivity by systematizing the constitutional classification of Sasang Medicine. In particular, I would like to propose a methodology for engineering the Yongmosagi Theory, a method of diagnosing constitution through facial features, which has been the biggest problem of misdiagnosis for clinicians in the classification of Sasang constitution [3].

### **2.2 Face recognition technology**

Face recognition technology is a technology that determines what kind of person an input face image is, and is being applied to actual services such as immigration control, payment systems, and terminal unlocking. Face images collected in the real environment have a problem in that the face recognition performance deteriorates due to various expressions and lighting changes, long-distance shooting, resolution, and blur. These problems were solved by learning a large amount of data with deep learning technology. Deep learning-based face recognition technology has enabled high-performance face recognition in various data environments, and research beyond human recognition is also increasing [4]. It shows that facial recognition technology, which shares personal face information converted into digital format through a network and uses a computer program or skilled manpower to identify the owner of the face, has already penetrated deeply into our daily lives. For individuation to be effective, classification through database construction, especially some kind of social classification, must be carried out at the same time [5]. Various technologies are continuously being developed, such as detecting the face part by calculating the feature vector between these elements after extracting the position of the characteristic elements such as the eyes, nose, and mouth in advance, or extracting the face

region by using the face color or depth [6]. learning-based face recognition technology shows high performance on various datasets and is proven to be robust in any environment. For efficient face recognition in real environments, advanced video face recognition technology in a human moving situation will be required. Due to the rapid development of deep learning technology, various recognition technologies such as object recognition and face recognition are developing, and the basic performance is higher than the level desired by consumers. In particular, in the case of deep learning technology, the basic performance can dramatically increase as the number of databases used for learning increases. It is expected that the development and application of face recognition will become more common as the environment in which it is easier to collect face databases than in the past is coming. Accordingly, in the field of face recognition, it is developing from a simple face recognition method to an area of determining whether a family member or a relative exists only with a face image [7][8][9].

### 2.3 Wine recommendation system

In recent years, there has been an increasing number of environments where wines can be accessed widely from the 20s to the middle-aged. As wine shops, wine bars, and wine restaurants increase, preference for wine has diversified. Demand is also increasing, and there are various target groups, from enthusiasts with specialized wine knowledge to those who simply enjoy and like wine. With the craze of YouTubers' mukbang and TV restaurant-related programs, wine is the best alcoholic beverage that goes well with food [10]. There are various recommendation algorithms. In this paper, a recommendation system using an item-based similarity algorithm was studied. The degree of similarity between wines was measured by calculating the values of the wine selection properties that characterize each wine through the cosine similarity algorithm [11-14].

## 3. Implementation of proposal system and design

### 3-1 Face recognition implementation

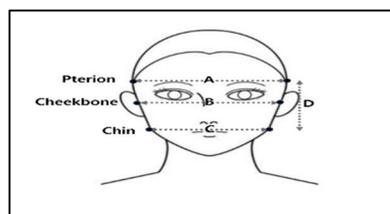
Since the shape of the face is diverse, it is difficult to extract accurate feature points. It was possible to accurately predict the Sasang constitution through the face ratio, and classify the Taeyangin, Taeumin, Soyangin, and Soeumin through the user's face ratio. Sasang constitution was analyzed when the measured value of the user's personal information input value and face ratio measurement value was over 70%. Therefore, after analyzing the user's Sasang constitution, the right wine is recommended.

Figure 2 shows, **A point, Pterion** : The point where the circumference of the head is the widest in the forehead is the point of measurement of the skull. It represents the length of the left and right broad points.

**B point, Cheekbone** : The left and right bone points refer to the cheekbones. Indicates the left and right lengths.

**C point, Chin** : It indicates the point of the jaw point and indicates the left and right length of the jaw point.

**D point** : The lengths from A to C are indicated.



**Figure 2. Sasang constitution dividing point that distinguishes facial proportions.**

Therefore,  $A=B=C$  ,  $B < D$  was expressed as the ratio of Taeumin,  $A < B > C$  ,  $B = D$  was expressed as the ratio of Soyangin,  $A < B < C$  ,  $B = D$  could be classified as Soeumin. The proportions of the face of Taeyangin do not come out precisely, so it is thought that more research is needed [15].

### 3-2 Design implementation

The user first enters personal information (1 question on body shape, 6 questions on personality, 8 questions on personal health) through the shortened Sasang constitution diagnosis questionnaire (ks-15) in the papers of Younghwa Baek and Eunsoo Jang. After face recognition through the mobile Sasang constitution face recognition app, information is sent to the web server. It analyzes the constitution of Sasang and recommends wine and transmits the information again. If you are satisfied, it leads to a decision, and if you want to choose another wine, you can be recommended a new wine.

Table 1 shows , for the taste that helps the weak liver function in Taeyangin, the sour taste is suitable among the five flavors. The white wine or red wine shown in Table1 has a strong acidity and a light body, and it is recommended as a wine that suits the constitution of Taeyangin.

List of wines that fit the constitution of Taeyangin			
	\$10~\$50	\$50~\$100	More than \$100
White wine	Oyster Bay	Green Water Grancotto	Ventolera Sauvignon Blanc
	Riverby Estate	Decoy California Cuvee Sparkling	Armand de Brignac Brut Gold
Red wine	Long Barn, Pinot Noir	Au Bon Climat, Pinot Noir	Domaine Comte Armand, Pommard 1er Cru
	Chateau, Pinot Noir Saint Guilhem	Field Recordings, Wonderwall Pinot	Colli Chianti

**Table 1. List of wines that fit the constitution of Taeyangin.**

Table 2 shows, Taeumin has weak respiratory function in the lungs, so it is good to radiate the clogged energy through the spicy taste. A high-body, high-alcohol, spicy wine goes well with this wine. Table2 shows a fortified wine and a full-bodied and spicy wine. Therefore, a wine suitable for the Taeumin was recommended.

List of wines that fit the constitution of Taeumin			
	\$10~\$50	\$50~\$100	More than \$100
Red wine	Frei Brothers, Zinfandel	Gerard Bertrand, Naturae Cabernet Sauvignon	The Vagabond Grenache 2015
	Dow's, Fine Tawny Port	Ramos Tawny Port	Dow's, 20 Year Old Tawny Port
	Mont Pere Shiraz 2014	Ktima Gerovassiliou	Redheads Studio, 1888 Barossa Valley Shiraz

**Table 2. List of wines that fit the constitution of Taeumin.**

Table 3 shows, Soyangin has a strong digestive function, weak kidneys, and a lot of heat in his body. In order to lower the heat of the heart, bitter among the five tastes is helpful. In Table 3, the bitter taste of wine can be expressed as astringency. The astringent taste of wine is changed to insoluble tannins as water-soluble tannins combine with alcohol. Therefore, people with a soyangin constitution can drink wines such as Cabernet Sauvignon, Nebbiolo, Sagrantino, and Thanat varieties that contain a lot of tannins, and it can be a wine that suits your constitution well. As shown in Figure 3-3, the recommended wine has a lot of tannins, so it goes well with Soyangin's constitution. Since tannins are contained only in red wine, white wine is not

recommended.

List of wines that fit the constitution of Soyangin			
	\$10~\$50	\$50~\$100	More than \$100
Red wine	Montes Alpha, Cabernet Sauvignon	Hecula Monastrell	Caymus Napa Valley Cabernet Sauvignon
	Montes Alpha Merlot	Montes Alpha Syrah	Beringer, Quantum Napa Valley
	Paxton, The Guesser Red	Idlewild, Flora Fauna Red	Ceretto, Barolo 'Brunate'

**Table 3. List of wines that fit the constitution of Soyangin.**

Table 4 shows, Soeumin has a weak digestive function, so wine with a strong sweetness that helps digestion is well suited to the body. Table 4 recommends sweet wine that improves digestion for Soeumin with weak digestion.

List of wines that fit the constitution of Soeumin			
	\$10~\$50	\$50~\$100	More than \$100
White wine	Jam Jar Sweet Moscato	Fior d'Arancio	Schimbock Riesling Trocken
	Sweet Astoria Lounge	Montinore Riesling Sweet Reserve	Château d'Yquem
Red wine	Jam Jar Sweet Shiraz	Krater Red Wine Sweet	Peace Pinot Noir Icewine
	Adoro Semi Sweet Wine	Yeopo's Dream Red Sweet Wine	Merlot Icewine

**Table 4. List of wines that fit the constitution Soeumin.**

The following is a wine recommendation design implementation suitable for the constitution type of Soeumin after the user enters personal information of the body and analyzes the Sasang constitution through face recognition.

Figure 3 shows, the user enters personal information (1 question on body shape, 6 questions on personality, 8 questions on personal health) based on the short-form diagnostic questionnaire (KS-15) of the thesis of Young-Hwa Baek and Eun-Soo Jang. A more accurate Sasang constitutional analysis was implemented through the shortened diagnostic questionnaire (KS-15). After a face is photographed using a face recognition app, it is sent to the web server, and the transmitted information is implemented after analyzing the constitution as a Soeumin through the DB from the web server.



**Figure 3. Realization of Sasang constitution analysis using face recognition App.**

Figure 4 shows, after analyzing the constitution of Sasang by face recognition deep learning, the recommended wine was implemented by receiving information from the web server on the wine suitable for

Soeumin. The first recommendation was implemented from cheap wines to high-quality wines by price, and if you want to get another wine recommendation, the second recommended wine list was implemented through Another Wine Recommendation.

Price Range	Red	White
\$10 ~ \$50	Jam jar Sweet shiraz	Jam jar Sweet muscat
\$50 ~ \$100	Krater Red Wine Sweet	Fior d'Arancio
\$100 ~ More than	Peace Pinot Noir Icewine	Schimbock Riesling Trocken

Price Range	Red	White
\$10 ~ \$50	Adoro Semi Sweet Wine	Sweet Astoria Lounge
\$50 ~ \$100	Yeopo's Dream Red Sweet Wine	Montinore Riesling Sweet Reserve
\$100 ~ More than	Merlot Icewine	Château d'Yquem

Figure 4. Implementation of wine recommendation list suitable for Soeumin.

#### 4. Conclusion

This study was designed and implemented to utilize the face recognition application system using the mobile phone app. If you are using an existing mobile phone, you can download and install the app to use the face recognition application system. Sasang constitution analysis through facial recognition is an IT technology in the well-being era by recommending wines that fit the user's constitution. As of 2021, the number of people going out in the Korean wine market has decreased, and the number of people consuming wine at home is increasing. Because wine is rich in polyphenols, it has been reported that it is beneficial to health such as anti-aging, anti-cancer effect, and prevention of arteriosclerosis through antioxidant action in the body. Therefore, wine recommendations that fit Sasang constitution can serve as a healthier beverage. In addition, a wine recommendation app that fits Sasang constitution will lead to the popularization of the wine market. This thesis is a system for recommending wine through facial recognition and Sasang constitution analysis using a smartphone app that is convenient to carry in real life. The advantages of the system are: First, when the user's face information is sent to the web server with the face recognition app, the wine that best suits the user is recommended with the face information and Sasang constitution DB and Sasang constitution wine DB. Second, we built a stable system because all the information from the app is connected to the web server instead of coming out. Third, the wine recommendation system suitable for the constitution allows users who are new to wine to trust wine as a well-being drink that suits their body. Finally, the scientific approach wine recommendation system fused with IT will lead to the growth and popularization of the wine market. . Non-face-to-face due to COVID-19 continues to be in contact with IT in real life and is growing. However, there are still many cases of inaccuracy in the field of face recognition technology, and it has not been established as an accurate system configuration. In particular, the proportion of Taeyangin is low compared to other constitutions, so a lot of data is needed, and research is needed. Therefore, along with the development of facial feature point extraction, the use of facial recognition will be diversified in the future and will be useful in the non-face-to-face era.

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