Abstract

**Purpose:** The purpose of this study is to develop a system for the cosmetic surgery procedures to help improve the work efficiency for those who specialize in the cosmetic surgery, and increase their satisfaction with procedures and surgical results for their customers. For instance, when a customer's eyes are illuminated on a mobile screen, the physiognomy characteristics can be automatically recognized, which can help determine a procedure for the eye surgery or operation. And since the distance between the eyes can be automatically recognized, it is possible to predict the scope and method of cosmetic surgery focused on the eyes, thereby increasing the satisfaction of the customers who desire a good physiognomy and appearance.

**Method:** First, each part (front of the eye, tail of the eye, upper line, and underline) forming the shape of the eye, the top and bottom of the face, the left and right sides of the pupil, and the points characterizing the endpoints of the cheekbones are designated as the points on the coordinate plane as the feature point.

Second, after defining the physiognomy related elements and the cosmetic surgery elements with a mathematical formula, the coordinate values for the feature points are automatically obtained by the facial recognition technology, and the cosmetic surgery image according to the physiognomy is calculated according to the calculation result entered in the formula, thereby setting the standards for determination.

Third, since the shape of the eye can be distinguished when the condition given by the equation is satisfied with respect to the feature points input as coordinates, the method for outputting physiognomy and cosmetic surgery determinations can be presented.

**Results:** As it was determined that the eye shape and the distance between the eyes have a large effect on physiognomy, the method for determining the procedure and standard for cosmetic surgery as an automatic facial recognition system was proposed.

**Conclusion:** The experts of the service industry for the cosmetic surgery identify the eye shape of the customers who desire to change the shape of the eye, and are thinking about whether the shape according to the needs can harmonize with the image on the entire face, and solve it accordingly, and as a method, make reference to the physiognomy. At which time, the backed-up physiognomy knowledge of the app program based on this system is automatically searched, and efficient results can be expected. Hence, this paper will be used as a basis for establishing a system that suggests the procedures or surgical directions such as makeup, plastic surgery, and tattoos.

**Keywords:** Physiognomy, Cosmetic Surgery, Eye, App, Procedure

1. Introduction

In the modern society, appearance is recognized among the factors which may acquire social competitiveness beyond an individual's physical characteristics. Accordingly, many modern people have increased their interest in their impressions and images to a large extent and consult
their physiognomy related needs online, as well as grooming their appearance and showing off their various personalities[1], and as such, the concept of appearance management is changed to an even larger meaning, replaced by the concept of beauty [2]. Furthermore, the industrial effect related to beauty is expanding, and given this influence, numerous companies exist both offline and online for the physiognomy information services and related sites[3]. However, most sites provide services as a database of numerous people, but there is no facial analysis system utilizing the features of facial features.

However, until now, an automatic face avatar generation system that may automatically generate the face most similar to a customer has been established [4]. This system detects and recognizes a face image using a mobile screen, classifies features, and creates an avatar with the same image as the user’s face [5][6]. The accurate detection of feature points according to the facial features such as eyes, nose, and mouth is very important for the face recognition, physiognomy, beauty, and the facial expression analysis [7]. The methods for face recognition include the statistical-based methods [8], neural network-based methods [9], connection structure methods [10] and hidden Markov models [11], and the methods using geometric information [12], etc., while the method of making it corresponds to the method using geometric information.

In this study, the facial feature points were set and displayed as coordinates by the method using such geometric information, and the physiognomy related information according to the shape of the user’s eyes can be provided as a mathematical formula, and information on coordinates around the eyes protection is possible.

Given that physiognomy is a synchronic phenomenon that appears universally in all civilizations [13], nobody would say that physiognomy is unscientific. Physiognomy not only refers to the study of predicting personality and fate through partial characteristics or overall harmony of the face [14], but reading the information on the face with physiognomy is also a means of enhancing communication with others and understanding the other person. Hence, it may be said that physiognomy analysis for a good impression is an essential process when performing makeup, plastic surgery, and eyebrow tattoo procedures [15]. However, notwithstanding the fact that the procedure operators try to analyze the shape of each part of the face to satisfy the needs of the customer, they have difficulties in responding to the customer due to the misunderstanding and shallow knowledge of physiognomy. Hence, it is considered that a system providing assistance is necessary.

In the system presented in this study, when the customer’s face is projected on the mobile screen, the position of the feature point that constructs the eyes can be automatically recorded by coordinates. (At which time, the setting of the characteristic point was consulted by 5 relevant experts.) The length or area between the coordinates is calculated according to the formula presented by this researcher, and is also automatically analyzed according to the conditions of the formula, and the customer’s personality, appearance, and the past as well as the future can be predicted, and hence, it will be helpful in the procedure to create a better image.

From a physiognomy related point of view, an individual’s image has the persuasive power that it can be formed in the environment surrounding him rather than himself [16]. Hence, the relationship between the beauty industry and physiognomy seems to be progressing actively, and it is considered that they are inevitably interconnected as an integral part of the standards and principles of plastic surgery. In particular, the eyes carry importance in terms of being able to examine all the functions and health of the organs and organs through the length and width of the eyes.
Furthermore, since it is the part where the functions of the brain are most exposed to the outside, it is called the window of the mind to see the soul, spirit, and wisdom [17]. Since 90% of the human mind is expressed through the eyes, the surgery and procedures related to the shape of the eye occupy the largest proportion among cosmetic surgery, and many people undergo their eye surgery due to the recent development of new surgical methods [18]. Hence, it is intended to automatically analyze the overall face shape by defining facial feature points in order to measure the length and height according to the shape of the eye and the size of the pupil among many parts of the face.

The service quality of the cosmetic surgery industry is playing a public role in enhancing customer preference and emotional bonding, providing satisfaction, and realizing changes in various consumer markets [19]. Accordingly in order to provide high-quality services, it is necessary to expand and specialize efforts from the viewpoint of emphasizing the differentiation of the service industry for cosmetic surgery [20]. Hence, the facial analysis system presented in this paper will play an important role in improving the service quality of the cosmetic surgery industry related to the physiognomy and plastic surgery according to the shape of the eye.

2. Name and Coordinates of the Shape

2.1. Name and location of each point

When there is a photo of rectangular face, the tip of the forehead located on the hairline of the face is called the top point, the coordinate value is \((ax, ay) = (0, 100)\), and the point located at the tip of the chin is called the bottom point, while the coordinate values on the coordinate plane is \((qx, qy) = (0.0)\). Since the human physiognomy is not an absolute measurement of the size of each part forming the face, but is rather related to the size ratio between the parts, the total length of the human face is set to 100 and the length ratio of each part is calculated. Hence, the upper and lower points are fixed with a length of 100, the names of the feature points for each part are determined, and their positions are measured for each person. That is, as illustrated in <Figure 2>, a name is assigned for each point that designates a specific position of the eye shape, a coordinate name is set, Coordinate is obtained with the length ratio between the bottom point and the top end point which it measures by using ruler. Such coordinate values can be automatically obtained by facial recognition technology.
2.2. Coordinate values of each point

When the shape of the eye is input on the screen, such devices as a scanner are operated to obtain the coordinates of each point. Naturally, there are research results showing that there is a difference between the left and right eye width in terms of exact numerical value[21]. However, considering that the face is symmetrical with the nose as the center, the flow will not be largely affected even if the other side is not recorded. Hence, in this study, the name of each point was assigned only for the shape of the eye located on the right side of the face. When the coordinates of each point are input and a numerical value is obtained according to the formula, the physiognomy characteristics are automatically output depending on whether the numerical value meets the standard.

The names and coordinate values of each coordinate in <Figure 1> are as in <Table 1>.

Table 1. Coordinate name and coordinate value.

<table>
<thead>
<tr>
<th>Name of point</th>
<th>Location</th>
<th>x-coordinate</th>
<th>y-coordinate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Top point</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>F</td>
<td>Hair in front of eye</td>
<td>10.5</td>
<td>53.4</td>
</tr>
<tr>
<td>R</td>
<td>Above eye line</td>
<td>20.2</td>
<td>61.2</td>
</tr>
<tr>
<td>S</td>
<td>Eye underline</td>
<td>20.2</td>
<td>56.4</td>
</tr>
<tr>
<td>H</td>
<td>Eyebrows</td>
<td>29.8</td>
<td>57.2</td>
</tr>
<tr>
<td>T</td>
<td>Right eyeball</td>
<td>22.7</td>
<td>60.9</td>
</tr>
<tr>
<td>W</td>
<td>Left eyeball</td>
<td>17.7</td>
<td>60.9</td>
</tr>
<tr>
<td>I</td>
<td>Cheekbone endpoint</td>
<td>31.2</td>
<td>54.3</td>
</tr>
<tr>
<td>Q</td>
<td>Bottom point</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
When the conditions are satisfied by substituting the data of the points illustrated in the table into the pre-entered formula, the result of physiognomy is output.

3. Physiognomy by the Eye Shape

3.1. Eye's shape

In certain cases, the concept of an excellent face in terms of physiognomy and the concept of an excellent face in terms of plasticity are different. For example, the eye in terms of physiognomy is good for the upper and lower eyelids to meet naturally at the corner of the eye,[22] and if the eyes are long and low rather than wide, leadership and respect are easy to arise, and it is good to see them as an advantage by doing great things, yet on the other hand, in terms of plastic surgery, people with large, round eyes are viewed as images of a beautiful woman.

The shape of the eye is basically divided into shape and size, specifically, the width of the brow, the presence or absence of double eyelids, the angle of the corners of the eyes, and the protrusion of the eyelids[23]. In this chapter, it is intended to examine the characteristics of the eyes according to physiognomy except for the protrusion of the eyelids, which is difficult to present with the frontal photographic data.

3.1.1. Phoenix eye

The phoenix eye is the most evaluated eye in terms of the physiognomy of the eye. It is contrary to the aesthetic elements of modern society, but in terms of physiognomy, the thinner, longer and more detailed, the better, and the best is the phoenix eye. In particular, they are both very dark and precious eyes to the extent that the pupil is indistinguishable[24].

The phoenix eye refers to an eye with a long rim and tail, and when determining whether it is a match using facial recognition technology, the ratio of the length and height of the eyes to the total length of the face should be considered.

Now, in order for an eye to become the phoenix eye, the following two conditions must be satisfied. The numerical standards were set with normal photos, yet better objective standards will require adjustment by experts, and eventually the figures will be converged.

Figure 3. Phoenix eye.

Note: https://www.google.com/search.

Conditions of the phoenix eye

A) It must be a small eye with \((rx-sx)/(hx-fx) < 18\%\) (objective criterion)

B) It must be a long eye with \((hx-fx)/ix > 70\%\) (objective criterion)
Among the above conditional expression, A) means that the height of the eyes should not be high, and B) means that the length of the eyes should be long. When specific points around the eyes are input by the facial recognition technology, the authenticity of the phoenix eyes will be immediately revealed by this equation.

Among the celebrities, Jiseob Soh and Seungho Yoo are the representative figures with the phoenix eye.

Figure 4. Jiseob Soh.

3.1.2. Dragon eye

The dragon eyes are long torn and large, and they are not as good as the phoenix eyes, but they are good enough to become the king of a country. The dragon eyes are larger than phoenix eyes, yet are smaller and longer than the cow eyes, with clear black and white eyes.

Figure 5. Dragon eye.

The condition to become the dragon eyes is that the eyes are relatively small and the eyes are long.

A) \(18\% < \frac{rx-sx}{hx-fx} < 25\%\) should be larger than phoenix eyes but relatively small (objective criteria)

B) \(\frac{hx-fx}{ix} > 70\%\) must be a long torn eye (objective criterion)

Yuna Kim is a representative figure of the dragon eyes.
3.1.3. Tiger eye

While the eyes are large, the pupils are rather small, and hence, the whites of the eyes can be seen a lot, and they are also called auspicious. Overall, it refers to the eyes with bulging eyes at both ends, and there are many types who are respected by the people around them because of their upright personality and overflowing sense of justice. This may lead to wealth and fame, but in the later years of life, there may be no blessing for the children.

To become the tiger eyes, the pupils must be small and the eyes are large, and hence, the following two conditions must be satisfied at the same time.

A) \( \frac{(tx-wx)}{(hx-fx)} < 40\% \), the pupil should be small (objective standard)

B) Must have large eyes with \( \frac{(rx-sx)}{(hx-fx)} > 30\% \) (objective criterion)

Dongwon Kang is a representative figure of the tiger eyes.
3.1.4. Lion eye

The lion eye refers to the shape of large eyes, double eyelids, and raised eye tails. The eyes with raised eyebrows belong to a sheep's temperament, and have a strong personality [25], have excellent conviction, execution ability, intelligence, and senses, and have a fast brain [26]. In the physiognomy studies, the lion eyes are the eyes of a leader with a wise and ferocious personality, and it is considered that they have good potential to succeed in bureaucracy and rise above the ranks early. Be careful of the extreme temperament and the excessive greed.

A) It must have large eyes with \((rx-sx)/(hx-fx) > 30\%\). (objective criteria)

B) \(Hy > (ry-sy)/2\), the corner of the eye should rise. (objective criteria)

Actors Soo Koh and Donggeon Jang are representative figures of the lion eye.
3.1.5. Cow eye

Cow eye refer to the eyes with large, round eyes and many eyelashes. The right eye is a large, round eye with many eyelashes. It has been said that he is a physiognomy who is diligent, earnest like the image of a cow, and has a lot of patience, and hence, he or she would become wealthy as much as he or she works hard.

Cow eyes are large and round eyes. The following two conditions must be satisfied simultaneously.

A) It must have large eyes with \( \frac{rx-sx}{hx-fx} > 30\% \) (objective criterion)
B) \( \frac{hx-fx}{ix} < 60\% \) must be round eyes (objective criterion)

Actor Boyoung Park's eyes correspond to these eyes.
4. Conclusion

Since there has not been a numerical concept yet in the criteria for judging physiognomy or images and determining the status of cosmetic surgery, most of the experts and ordinary people have tended to judge by guessing eyes[27]. The consumers verbally express the purpose of cosmetic surgery they desire, and the surgeon listens to them and, if necessary, subjectively determines the patient’s condition through examination and performs the procedure[28][29]. However, while such subjective determination as this is important, if the objective data are presented together, the reliability will be much higher. Hence, standardization of data is considered to be a necessary process to improve service quality for each medical customer.

The number of foreigners visiting Korea, known to be a powerhouse for the cosmetic surgery related medical technology, is expected to continue to rise in the future, and the Korean Wave is also expected to continue to rise in the future, and the Korean Wave is also expected to have a significant impact on the cosmetic surgery market in Korea[30]. It is believed that standardization of numerical values is essential in order to utilize the value of an IT powerhouse and demonstrate cutting-edge technology in the cosmetic surgery field[31]. Towards this end, cooperation with the animation development field will be required[32][33].

In this paper, when the eyes are exposed to the screen using the modern devices, the positions of the dots are automatically input, and the results of cosmetic surgery of the eye area based on physiognomy are presented. Since it will be possible to quantify not only the shape of the eyes but also other parts of the face, it is considered that the future task will be to create formulas and figures for cosmetic surgery standards along with the physiognomy related analysis of the feature points that form all faces.

5. References

5.1. Journal article


5.2. Thesis degree

5.3. Books

5.4. Additional references

6. Appendix
6.1. Author’s contribution

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>- Design ☑</td>
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<td>- Getting results ☑</td>
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<td>- Analysis ☑</td>
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<td>- Make a significant contribution to collection ☑</td>
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