

Implementation of Self-expression Tool with Interactive Hangeul

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Abstract

Modern people communicate in a digital space without being limited by physical space and time. On the internet, people's desire for self-expression is getting bigger, and the most common self-expression tool is characters. Characters are visual materials to express human thoughts and desires. This study is a method to positively express the viewer's self in an interactive Hangeul system. The proposed system produces new formative shapes and meanings of Hangeul through the process of deconstructing and reconstructing the characters. Immediate character transformations that are synchronized with the motion of the viewer act as a tool of self-expression by inducing the viewer's active interaction repeatedly. Therefore, the proposed interactive Hangeul is more than enough to be used as a new graphic tool beyond the text to be read, and it is highly likely to develop into cultural contents using it.

Keywords: *Interactive Hangeul, Character deconstruction, Self-expression, dynamic communication*

1. Introduction

In the age of new media, characters expand the scope of expression as an effective element that visually embodies social, cultural, and political routines, as well as the underlying functions of delivering messages. The introduction of video media and the spread of the internet added the concept of time and space to static characters. Characters that move according to the gaze or motion of the viewer who reads them are increasingly being imaged. Therefore, the good and interactive characters for communication are becoming a huge artistic trend that creates a culture. Characters are visual materials to express human thoughts and desires. In other words, characters are the most perfect symbols and pictures that express certain meanings. But when we separate the relationship between characters and meanings, people break the stereotypes of the characters and create associations. Therefore, in this study, we intentionally try to betray the characters and change their meanings.

This study is a method for actively expressing the viewer's self in an interactive Hangeul system. The purpose of this system is to use digital technology as a reminder of a new perspective on characters in two ways. One is to find the morphology and visibility like the picture hidden in characters, and the other is to induce the viewer's active self-expression through the visual transformation using the deconstruction of

Hangeul. The proposed system deconstructs the characters and recognizes the deconstructed components as a unit of character image. The deconstruction of these character symbols and the new combination method is a discovery of a new form, not a distortion of characters. Therefore, the characters have enough value as a formative form with a different visual form, beyond the function of language delivery. Hangeul, with its intention and emotion, is completed by the motion of the viewer and creates new visual transformations. Immediate character transformations that are synchronized with the motion of the viewer act as a tool of self-expression by inducing the viewer's active interaction repeatedly. This means that the characters have infinite possibilities to reflect the environment and spirit of the present age. Therefore, the proposed interactive Hangeul is more than enough to be used as a new graphic tool beyond the text to be read, and it is highly likely to develop into cultural contents using it.

2. Self-expression with interactive Hangeul

2.1 Interaction model for self-expression

The development of the Internet and computers has enabled people to communicate without physical space and time constraints. There is criticism that the development of digital brings about confusion of human alienation and value. But another network of people using digital space is being formed. The modern people of the internet are actively presenting their self-expression around the internet as their self-expression desire increases. The self-expression desire includes the intention of people to reveal themselves to others, and it is the process of controlling and managing to convey certain their images to others [1].

On the Internet, an avatar replaces a person's image. The basic attributes of avatars are self-expression, and people identify themselves with avatars. So people try to dress up their avatars and make them into their own images. Interaction is the tool that enabled such self-expression desire in an online environment. As shown in Figure 1 shows the interaction model for self-expression proposed in this study. In this model, interactive Hangeul is regarded as a kind of avatar synchronized with the viewer's motion. Viewers choose the character, fonts, colors, and other properties to decorate, just as they would decorate an avatar's appearance. And the viewer regards Hangeul which contains his intention as his avatar, controls it, and expresses his emotions and self. This means that the Internet space where a person transmits emotion through avatars is the same virtual space that enables self-expression using interactive Hangeul.

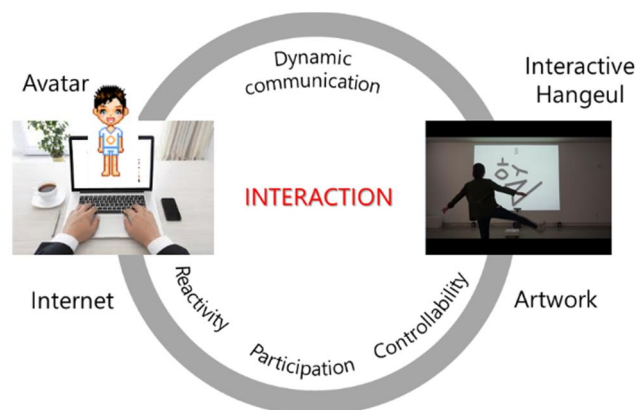


Figure 1. Interaction model for self-expression

Modern people use a lot of time to find pleasure and prefer to be able to rely on emotion and react quickly. This is consistent with the intent of interactive Hangeul to pursue immediate interactions. Therefore, the character to be interacted with in the viewer not only conveys the meanings of characters but also transmits emotional information indicating the atmosphere and the situation.

2.2 Extended concepts of interactive Hangeul

Interactive Hangeul delivers a new visual pleasure and powerful message about Hangeul characters through interaction. It can be used as the most appropriate communication method for the information receiving method of our brain by giving originality and playfulness to static Hangeul. Figure 2 shows the characteristics of the interactive Hangeul of the concept extended from static Hangeul. First, Interactive Hangeul reveals its output with a predictable shape. It has a pictorial characteristic for enhancing information transmission, which enhances the accuracy and attractiveness of the meaning to be conveyed. Second, Interactive Hangeul attracted a tool called Interaction to be a living artwork with emotions. The viewer identifies the results that respond to his body motion, engages in emotions, and engages in play. Finally, Interactive Hangeul has a characteristic that it continuously generates new meanings dynamically according to the relationship between characters and images through real-time interaction with the viewer.

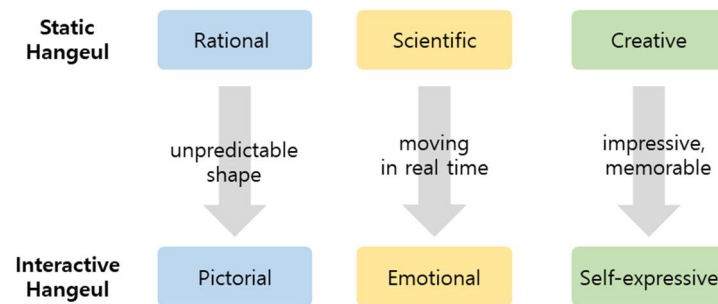


Figure 2. Extended concept of interactive Hangeul

3. Dynamic communication on interactive Hangeul

3.1 Deconstructive characteristics of Hangeul

For the study of interactive Hangeul, understanding of Hangeul structure should be preceded. Hangeul has a more complicated structure and is able to deconstructable characters, so it has better application of expression. Hangeul collects consonants and vowels to form a complete character. It is a very organized character composed of 14 consonants and 10 vowels. It is a highly organized featural character consisting of 14 consonants and 10 vowels. Featural characters have the characteristic that when a stroke is added to a character, a new character with a different meaning is created. Unlike the roman alphabet, Hangeul is a three-dimensional structure composed of 2~4 consonants and vowels, which are combined into one character. Depending on how the consonant and the vowel are gathered, they are classified into three categories as horizontal, vertical and mixed gathering [2].

3.2 Least readable deconstruction

In this study, we propose a method to visualize the completely deconstructed Hangeul movement using user's interaction as the main element of the artwork based on the formative principle of Hangeul. When deconstructing Hangeul without considering the structure of the characters, it is highly possible that the readability of the characters is lowered. Especially, Hangeul can be read as a character that has a completely

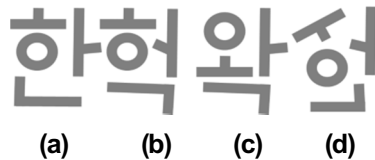


Figure 3. Various meanings generated with deconstruction

different meaning when the frame forming the character is deconstructed. Figure 3 shows that when Hangeul '한' is deconstructed, it may represent several different meanings.

Therefore, deconstruction method considering the readability of the viewer as well as the formability of Hangeul is needed. In order to faithfully carry out the role as a character, it is necessary to maintain a certain degree of formality within a range that does not deviate from the gathering structure, and the deconstruction should be carried out. In this study, we use a method to limit the moving area of characters. The lines that make up the characters are deconstructed on the basis of the intersection or inflection point, but the disassembled lines cannot go beyond the predefined area of the components according to the gathering type of the characters. (See Figure 4)



Figure 4. Moving areas of each component for the readability of the viewer

3.3 Methods of dynamic communication

3.3.1 Basic algorithm

In order for the deconstructed Hangeul to react immediately to the viewer's movements, it is necessary to synchronize the viewer's motion information with the Hangeul image information. In this study, MS's Kinect was used to acquire motion information of the viewer. The interactive Hangeul starts to be activated from the moment when the viewer recognizes the skeleton information.

After some image processing, the inflection points of the lines constituting Hangeul are extracted and the connection information between them is stored in the array list. This connection information is called an interaction point in this study. The interaction points, which are elements of Hangeul, are matched with the skeleton points of the viewer and show dynamic movements. Figure 5 shows the approximate procedure of Hangeul drawing on the basis of matching points.

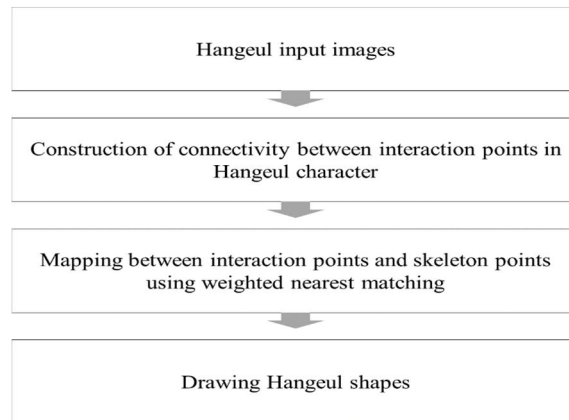


Figure 5. Procedure of Hangeul drawing by Weighted nearest matching

All the skeleton points extracted from the viewer and the interaction points of Hangeul are matched in the order of the closest distance (by Euclidean distance [3]) and the area of the movement is analyzed. From the results, we can see that the movement of specific interaction points is activated. It is related to the nature of movement of the human body. As shown in Figure 6, a person moves his arms and legs a lot more than his her body when moving. Therefore, the nearest matching between the nearest skeleton point of viewer and the interaction point of Hangeul shows that there is a phenomenon that human movement is concentrated in a specific skeletons. If more interaction points are matched to active skeleton points, it is possible to express more dynamic Hangeul. Thus, in this study, we propose a method to maximize the dynamic interaction effect by assigning high weight to the dynamic skeleton such as the most active arms and legs of the human body and preferentially matching the interaction points.

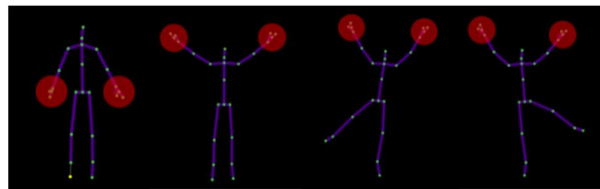


Figure 6. Change of skeleton point according to user's motion

3.3.2 Weighted nearest matching

In order to calculate the weights automatically, we measured movement information for 10 subjects. Assuming that the subjects moved in a fixed position, the cumulative amount of movement of all the skeleton points of each subject was calculated. Subjects were allowed to move for about 5 seconds, and the moving distance was measured every 500ms. The measured distance is equalized to the range of [0, 1] and used to calculate the weight in the following equation.

$$w_i = \alpha + \frac{-(m_i - m_{min})}{w_{max} - w_{min}}$$

To determine the constant α in the above equation, we change the value of α from the range [0,1] in 0.1 units and analyze the matching of the skeleton points and the interaction points. This analysis showed that when the value of α is 0.5, the movement of the viewer is natural and most active. The determined weights are used to calculate the distance to determine the matching between the skeleton point, $S_i = (S_x, S_y)$ and the interaction point, $I_i = (I_x, I_y)$ as shown in the following equation [4].

$$\text{dist}(I_i, S_i) = w_i \times \sqrt{(I_x - S_x)^2 + (I_y - S_y)^2}$$

We let 5 users experience the interaction with 22 Hangeul characters and then calculate the matching ratio between the skeleton points and the interaction points. The following table compares matching rates of the weighted nearest matching and nearest matching. From Table 1, we can see that the proposed method is effective for realizing dynamic interaction.

Table 1. Part of matching rate comparison for 22 Hangeul characters

Character	Nearest matching	Weighted nearest matching
‘대’	37.45%	67.73%
‘학’	40.00%	73.01%
‘교’	41.90%	75.89%
‘구’	57.02%	96.05%
‘글’	60.12%	96.43%
‘애’	33.57%	68.70%
‘네’	45.27%	70.95%
‘버’	51.27%	70.05%
⋮	⋮	⋮
Average	38.40	70.66

4. Implementation of interactive Hangeul

In general, people feel realistic when they access stereoscopic content, not flat content. There are many ways in which a person can feel the depth and space of an object. We chose the line as an element to visualize interactive Hangeul. Dots can be gathered to express lines in 2D space and lines can be gathered to express 3D space. The interactive Hangeul, proposed in this study, was implemented using a method of superimposing two-dimensional lines, which provided the viewer with a 3D stereoscopic effect of Hangeul.

At present, the standard that can objectively compare the performance of the interactive Hangeul proposed in this study is not properly set at home and abroad. In particular, interactive Hangeul includes not only a visualization for object recognition and drawing task, but also an interaction with the user, so there are few comparative studies. Two evaluations methods are performed to demonstrate the performance of the proposed system. One is an objective assessment that measures the dynamic level of viewer interaction, as shown in Table 1 above. The other is a subjective assessment it surveys of interaction satisfaction are performed. The subjective evaluation of the proposed system consists of a questionnaire survey of 20 participants participated in this system. Participants entered less than three Hangeul characters in our system,

interacted with the resulting images, and participated in the survey to determine satisfaction. The participant showed about 86% satisfaction with our interactive Hangeul. It is expected that the high level of satisfaction of the participants is due to the effect that the components of Hangeul character moves separately according to their gestures. Therefore, we can see that the proposed interactive Hangeul is not a simple text transmission tool but a self-expression tool of the viewer that reveals the meaning contained in Hangeul characters.

5. Conclusion

Interactive Hangeul is an approach to a more efficient multimedia environment as a means of self-expression mixed with time, space, speed, and technology. In this study, design and implementation method of an interactive Hangeul system that responds to viewer's gesture in real time is proposed. In order to provide a more dynamic movement of Hangeul synchronized with the viewer's motion. Hangeul characters were deconstructed using its formative features. Interactive Hangeul, in which consonants and vowels move separately rather than in a lump, gives a feeling of alive. This system is especially dynamic and effective in Hangeul, Chinese, and Japanese, which can decompose text. And the output of the proposed system is represented by arranging the lines in 3D space so that viewers can feel the space sense. As a result of testing the developed interactive Hangeul, viewers showed immersion and satisfaction in moving typography like their avatar. This proposed system also acted as a means for the viewer to actively express themselves through interaction. Interactive Hangeul expresses visual effects and artistic sense intensively with contents that match the digital environment with sound and video. In addition, through the process of communication through the interaction, the viewer's self-expression is maximized and positive feelings are brought out. Therefore, it will also stimulate the attention of the world and spread Korea's cultural contents.

References

- [1] N. Ellison, R. Heino, and J. Gibbs, "Managing impressions online: Self-presentation processes in the online dating environment," *Journal of Computer-Mediated Communication*, Vol. 11, No. 2, pp. 415-441, 2006.
DOI: <https://doi.org/10.1111/j.1083-6101.2006.00020.x>
- [2] S. Y. Lim, "Design of Kinetic Typography Interaction based on the Structural Characteristics of Hangul," *International Journal of Contents* Vol. 12, No. 3, pp. 42-46, 2016.
DOI: <http://dx.doi.org/10.5392/IJoC.2016.12.3.042>
- [3] R. Fabbri, L. Da F. Costa, J. C. Torelli, and O. M. Bruno, "2D Euclidean distance transform algorithms: A comparative survey," *ACM Computing Surveys (CSUR)*, Vol. 40, Issue. 1, No. 2, 2008.
DOI: <http://dx.doi.org/10.1145/1322432.1322434>
- [4] S. Y. Lim, *3D Interactive Typography with Character Deconstruction on Visual Dynamics Model*, Ph.D. Thesis, Kyungpook National University, Daegu, Republic of Korea, 2018.