

# Factor of Feeling “Hannari” from Kimono Images

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**Abstract.** A separation from the kimono in Japanese society has an effect which has serious implications not only for the clothing industry, but for the continuation of traditional Japanese culture. However, for clothing, the lure of the kimono’s beauty only remains in a modern age as “attire for special occasions.” This paper attempts to define and classify one part of the kimono’s appeal, the Japanese expression, “hannari-kan,” or “feelings of elegance.” Considering online shopping, we used a display device to show many kimonos for consideration and ratings, to collect data and quantify “hannari”. We also assessed brightness and color in relation to “hannari” ratings.

**Keywords:** Kimono · Obi · Aesthetics · Brightness · Color

## 1 Introduction

As the kimono stopped being used for daily activities during the Showa era, its functionality, social context, and the economic activity generated by kimono manufacturers also declined. Now, the kimono is rarely worn, except for weddings, graduations, or other ceremonies, on special occasions if the wearer so chooses. The kimono industry follows a course of decline. The kimono industry has been decreasing even in Nishigin, the seat of kimono production, where looms, businesses, and staff peaked in 1975. The purchase expense rate for kimono and obi against the entire apparel purchase expense has fallen to 20 % of 1975 levels in 2011. Kimono consumption has dropped from 1 every 3 years in 1975 to 1 every 40 years in 2011. Obi consumption has fallen from 1 every 5 years in 1975 to 1 every 56 years [1]. These statistics show a separation from the kimono in Japanese society, an effect which has serious implications not only for the clothing industry, but for the continuation of traditional Japanese culture. However, for clothing, the lure of the kimono’s beauty only remains in a modern age as “attire for special occasions.” This paper attempts to define and classify one part of the kimono’s appeal, the Japanese expression, “hannari-kan,” or “feelings of elegance.”

The word “Hannari” has a long history, with the first recorded usage in the *Gyokujinsho* in 1563 [2]. “Hannari” originated in the Kyoto geisha district, but has since spread throughout Japan. When it originated, “hannari” was an adjective meaning “chic” or “sophisticated,” but the meaning has changed with time and the spread of the word. It now gives a different impression whether the speaker is referring to a person or an object. It is difficult to properly assess “hannari” without properly clarifying what

makes something “hannari.” There are few examples of research about “hannari” which do not first attempt to clarify the possible sources of “hannari” to quantify it and draw conclusions. This study attempts to do the same, applying “hannari” strictly to kimono. Considering online shopping, we used a display to show many kimonos for consideration and ratings, to collect data and quantify “hannari”. We also assessed brightness and color in relation to “hannari” ratings.

## 2 Experimental Methods and Conditions

### 2.1 Psychological Quantity

Our research assistants were shown images of 20 kimonos and asked to rate them on a 5-tiered scale using 20 sets of adjectives expressing “hannari” selected by specialists. The kimono specialists were 7 members of the Kyoto Institute of Technology Textile Society, who selected a total of 114 images of kimonos from the Kyo-yuzen Silk Cooperative Association. In each set of five, researchers were told to rate two kimonos as “strongly hannari,” two as “not hannari,” and one as “in-between,” as in Fig. 1 and Table 1. We also compiled a list of 100 sets of adjectives related to “hannari,” based on words found in writings related to kimono and silk fabrics. These included such scales as “soft or firm” and “feminine or masculine”. We then asked the kimono specialists to choose 20 pairs of words from that list that best matched the feeling of “hannari.”

Our research members were 58 men and women, aged in their 10’s to 89, with no symptoms of color blindness (37 men, 21 women). This sample included 7 members of the Textile Collection Museum & Archives Research Committee, students, working adults, and housewives. All members of the study had heard the term “hannari” used



Fig. 1. Images of kimono selected by kimono specialists

Table 1. Sample ranking of kimono in sense of hannari

Rating	Choice	
Strong Sense of “Hannari”	1	5
Weak / No Sense of “Hannari”	2	4
Neither Strong Nor Weak	3	

before. Research took place in a dark room, without natural lighting. Images of kimono were displayed on a  $2560 \times 1440$  pixel Apple Thunderbolt Display. Participants were asked to maintain a distance of 50 cm from the screen (Fig. 2).

## 2.2 Physical Quantity

### 2.2.1 Measuring Brightness

In order to evaluate the relationship between image brightness and sense of “hannari,” we measured the brightness of each image. We divided each image into 10,000 parts ( $100 \times 100$ ), and measured the brightness of each part. Figure 3 shows an example of the division of an image.

To restrict the influence of external factors, we measured the brightness in a dark room. The camera used was a Nikon D7000. The lens used was an AF-DX NIKKOR 18–200mf/3.5–5.6G ED VR II. The software used was RISSA-DCJ/ONE. Shutter speed was set to 1/10th of a second.



Fig. 2. Ranking kimono in sets of 5 in a dark room

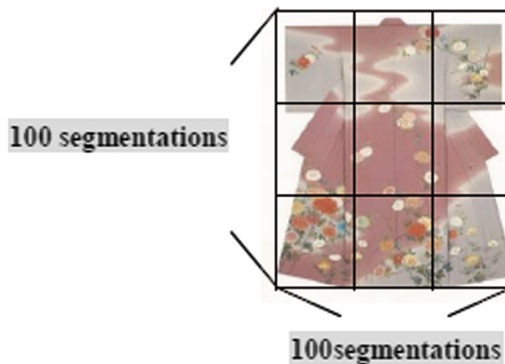


Fig. 3. Illustration of dividing an image into 10,000 parts

### 2.2.2 Color Measurement

To measure the effect of color on sense of “hannari,” we measured the color of each kimono image. The color measurement was conducted at the same time of brightness measurements according to the methods described in 2–2–1. We divided each of the kimono images into 100 parts, translating the X and Y color values into  $u'$  and  $v'$  values, with  $u'$  on the horizontal axis and  $v'$  on the vertical axis. We used the CIE1976UCS color space to plot our results.

## 3 Results

### 3.1 Psychological Quantity

In order to better view participants’ responses about the strength of “hannari” of a given image, we took the average values and plotted them on a scale as shown in Fig. 4. In the graph, we can see that the kimonos shown are ranked 5–1–3–4–2 in terms of “hannari”. As kimonos 5 and 1 were chosen as the “most hannari” examples, and kimonos 4 and 2 were “least hannari,” we can see that our results match the specialists’ opinions.

When using SPSS to analyze the data we obtained, we performed a factor analysis. In order to evaluate what impact each factor had on the sense of “hannari,” we performed a multiple regression analysis on the scores of each factor. Table 2 shows the factor loadings of each factor after a Promax rotation. This figure allows us to extract 3 factors. The first factor we were able to discern using this method is “fluffiness.” The second factor is “gorgeousness,” and the third factor is “chic”. These 3 factors allow us to get a regression formula of what represents “hannari”.

$$y = 0.579x_1 + 0.269x_2 - 0.012x_3 - 0.094$$

- $x_1$  = Fluffiness
- $x_2$  = Floweriness
- $x_3$  = Luxuriousness

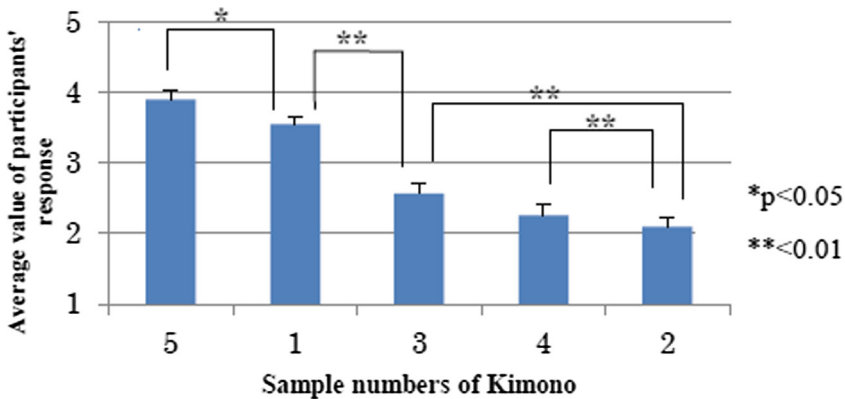


Fig. 4. Averaged sense of “hannari”

**Table 2.** Factor loadings

Antonym of Adjective			Factor		
			1	2	3
Fluffy	—	Rugged	<b>.860</b>	.477	.466
Soft	—	Hard	<b>.819</b>	.444	.468
Feminine	—	Masculine	<b>.775</b>	.757	.468
Pale	—	Strong	<b>.742</b>	.290	.317
Warm	—	Cold	<b>.702</b>	.419	.423
Relaxing	—	Stressful	<b>.670</b>	.066	.372
Rounded	—	Straight	<b>.578</b>	.155	.192
Gorgeous	—	Un-gorgeous	.500	<b>.932</b>	.496
Flashy	—	Conservative	.332	<b>.886</b>	.459
Glamorous	—	Unglamorous	.447	<b>.832</b>	.537
Pretty	—	Cool	.718	<b>.751</b>	.438
Graceful	—	Ungraceful	.459	<b>.686</b>	.617
Calm	—	Chaotic	.094	<b>-.582</b>	-.010
Elegant	—	Inelegant	.503	.430	<b>.778</b>
Sophisticated	—	Barbaric	.298	.328	<b>.776</b>
High Quality	—	Poor Quality	.497	.642	<b>.721</b>
Refined	—	Coarse	.605	.409	<b>.698</b>
Trendy	—	Untrendy	.341	.523	<b>.581</b>
Traditional	—	Untraditional	.133	.045	.184
Japanese Style	—	Not Japanese	.081	.012	.153

The selection method of factors based on “Maximum likelihood estimations”  
 Rotation rules: Promax method with normalization of kaiser

## 3.2 Physical Quantity Results

### 3.2.1 Results of Brightness Analysis

Figure 5 shows the relationship between average brightness and sense of “hannari”. Brightness is tracked on the horizontal axis, and average “hannari” is tracked on the vertical axis. The sense of “hannari” gets stronger as it approaches 4. The most “hannari” kimonos, 5 and 1, both had high average brightness values. The least “hannari” kimonos, 2 and 4, had comparatively low values. The data yields a correlation coefficient of 0.93, which strongly suggests that kimonos with higher average brightness evoke a stronger sense of “hannari.”

Next, we used the standard deviation in brightness across the entire kimono to help us judge contrast. The standard deviations, plotted against “hannari,” are shown in Fig. 6. This yields a correlation coefficient of  $-0.67$ , showing a negative correlation.

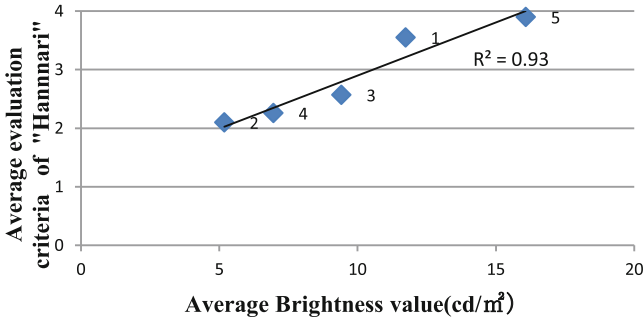


Fig. 5. Average brightness vs. sense of hannari

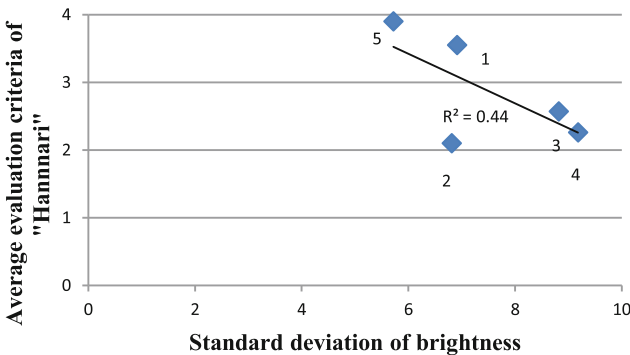


Fig. 6. Standard deviations of brightness vs. sense of hannari

The more “hannari” kimonos, 5 and 1, had smaller standard deviations than the least “hannari” kimonos, 2 and 4. This data suggests that kimonos with lower contrast, or less scattered brightness, are more likely to be considered “hannari.”

To investigate the relationship between “hannari” and the frequency distribution of brightness, we plotted the frequency distribution in Fig. 7. The image segmentation domains are on the vertical axis, and the horizontal axis shows the data divided into parts of 2 candela/m2. The most “hannari” kimonos, 5 and 1, have lower peaks in their distributions, while both ends of the distribution are flared. Also, the least “hannari” kimonos, 2 and 4, have higher peaks and one-sided distributions. When examining the relationship between sense of “hannari” and the peakedness and degree of distortion in the frequency distributions, we can see that the degree of distortion and “hannari” have a correlation of  $-0.79$ , indicating that the smaller the degree of distortion in the distribution, the more likely the kimono will have a strong sense of “hannari” (Fig. 8).

### 3.2.2 Color Measurement Results

Measurements were taken at the same time as brightness measurements. Kimono images 1–5 were divided into 10,000 regions, labeled with X and Y values, and assigned  $u'$  and  $v'$  values as below.

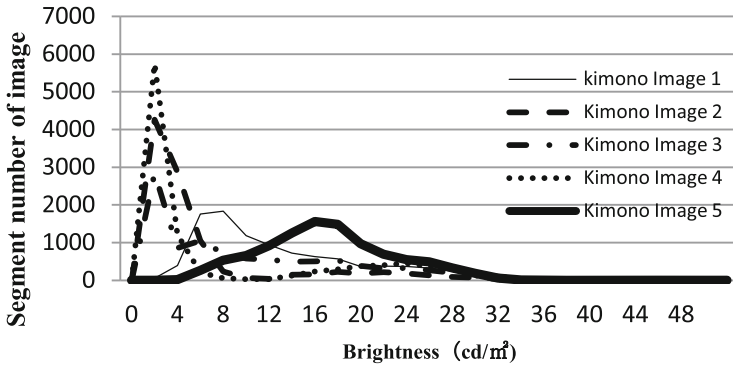


Fig. 7. Brightness frequency distribution vs. hannari

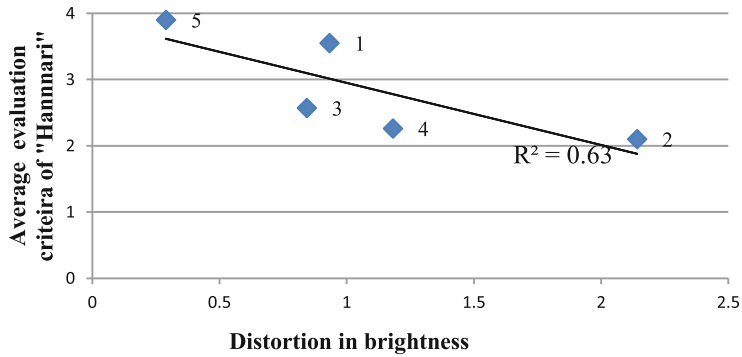
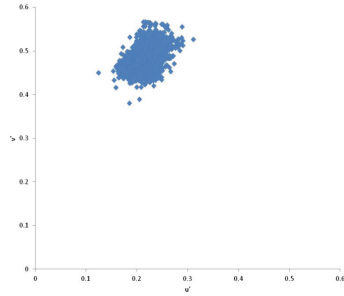


Fig. 8. Distortion in the frequency distribution & hannari

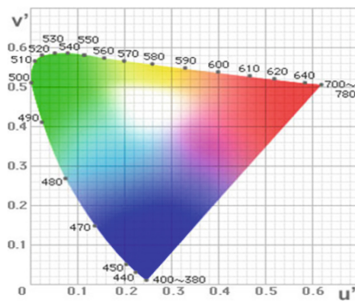
$$u' = \frac{4x}{4x + 15y + 3z} = \frac{4x}{-2x + 12y + 3} \quad v' = \frac{9y}{x + 15y + 3z} = \frac{9y}{-2x + 12y + 3}$$

These values were plotted in terms of the CIE1976 UCS color space, as in Figs. 9 and 10. In order to evaluate the relationships between  $u'/v'$  values, and “hannari,” we calculated the average  $u'/v'$  values, the standard deviations, the median, maximum, and minimum. Of these, the average values and standard deviations had the strongest relationship to sense of “hannari.”

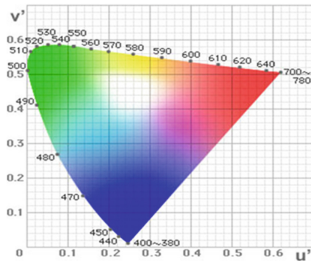
The distribution range of the color plots included in all the kimono images used in this research are shown as the color space in the Fig. 11. The correlation coefficient between the sense of “hannari” and the average value of  $u'$  was 0.50, revealing a slight correlation. As the average value of  $u'$  became more, the sense of “hannari” was likely to increase (Fig. 12). As seen in the color space in Fig. 11, it suggested that a cream color contributed more to the sense of “hannari” than light-green.



**Fig. 9.** Kimono image 1 color plot



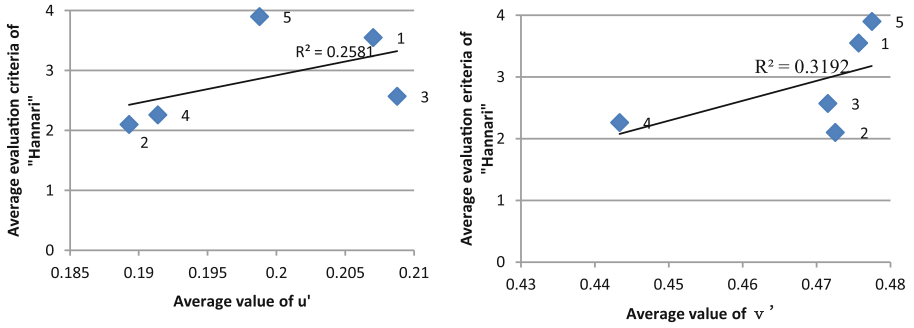
**Fig. 10.** CIE1976UCS color space



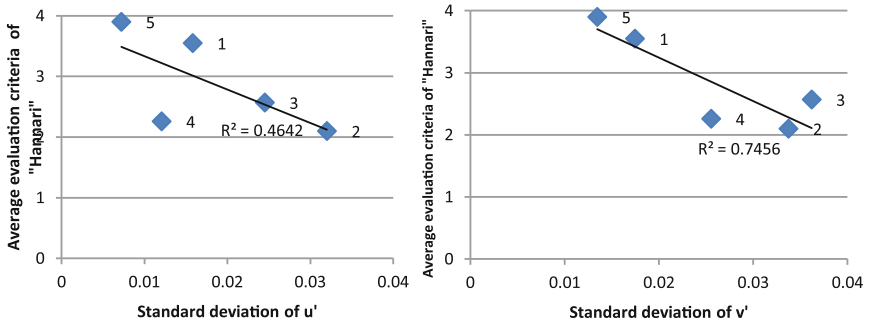
**Fig. 11.** The rectangular zone of the data of kimono images 1–5 (Color figure online)

The correlation coefficient between the average value of  $v'$  and the sense of “hannari” was 0.56 (Fig. 12). It suggested that a cream color contributed more “hannari” than blue. The correlation coefficient between the standard deviation  $u'$  and the “hannari” was  $-0.68$ , and the standard deviation of  $v'$  was  $-0.86$ . This suggested that the kimono images with less color variations showed a stronger sense of “hannari” (Fig. 13).





**Fig. 12.** Correlation between the average  $u'$  and  $v'$  value and sense of “hannari” (Color figure online)



**Fig. 13.** Correlation between the standard deviation  $u'$  and  $v'$  value and sense of “hannari” (Color figure online)

### 4 Discussion

We conducted a factor analysis to find the factors that comprised the sense of “hannari” from the perspective of psychological quantity. The results show that three factors constitute the “hannari”; the first factor is “fluffiness”, the second factor is “gorgeousness” and the third factor is “chic”. These 3 factors allow us to get a regression formula of what represents a sense of “hannari”. The coefficient value of the first factor, “fluffiness”, was almost twice that of the second factor, “gorgeousness”. This suggested that the sense of “fluffiness” strongly affected the “hannari”. With quantification results of the “hannari” having been achieved, “hannari” is expected to be utilized in product developments.

Moreover, in order to clarify the correlation between the sense of “hannari” and substance quantity, we examined the relationship between the brightness of kimono images and the sense of “hannari”. The results showed that the higher the degree of distribution in the brightness, the more likely the kimono will have a strong sense of “hannari”. Investigating the relationship between the “hannari” and the frequency distribution of brightness showed that the most “hannari” kimonos, 5 and 1, have lower

peaks in their distributions, while both ends of the distribution are flared. Also, the least “hannari” kimonos, 2 and 4, have higher peaks and one-sided distributions. When examining the relationship between the sense of “hannari” and the degree of distortion in the frequency distributions, a correlation of  $-0.79$  was found. This suggested that the smaller the degree of distortion in the distribution, the more likely the kimono will have a strong sense of “hannari”.

In order to evaluate the relationships between  $u'$  and  $v'$  values, and “hannari,” we calculated the average  $u'v'$  values, the standard deviations, the median, maximum, and minimum. The results showed the average values of  $u'$  and  $v'$ , and the standard deviation of  $v'$  were related to the sense of “hannari.” The correlation coefficient between  $u'$  and the sense of “hannari” was  $0.50$ . From the distribution range of divided color regions of the kimono images in the Fig. 11, we can assume that cream colored kimonos contribute more to the sense of “hannari” rather than light green ones. The coefficient between  $v'$  value and the sense of “hannari” was  $0.56$ . Figure 11 suggested that the cream color contributed more to the sense of “hannari” than blue. The correlation coefficient between value  $u'v'$  and the sense of “hannari” was  $-0.68$  to  $-0.86$ , which showed a strong negative correlation. This suggested that the kimono images with less colors contributed to the sense of “hannari”. These results showed a correlation between the substance quantity and the sense of “hannari”.

## References

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