Definition, Detection and Generation of Iyashi Expressions*

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Abstract

This paper concerns the engineering analysis of "Iyashi", a peculiar concept to the Japanese, which affect person's heart and may change their expression and behavior. We have integrated the advocator's view of "Iyashi", analyzed the social background of "Iyashi" and have defined Iyashi and also the Iyashi expression. As the facial expression is the special and important stimulus for both observers and people who show expressions, we want to prove the existence of expressions that change the observer's emotion with Iyashi. We have developed the system to clarify the combination of facial features important for Iyashi through the psychological experiments and the analysis by Holographic Neural Networks (HNN). HNN analysis gave the structure of the Iyashi expression, that is the important combination of the physical facial parameters contributing to the high degree of Iyashi. Based on the structure of Iyashi we are able to generate the Iyashi expression appropriate for each person.

Key words: Iyashi, Iyashi Stimulus, Facial Expression, Psychological Evaluation, Holographic Neural Networks

1. Introduction

"Iyashi" is a popular buzzword on everyone's lips in Japan (we never use "Healing" and "Healed" instead of "Iyashi" and "Iyasareru" respectively, see Appendix for the details). "Iyashi" appeared to the mass media for the first time in 1988. Since 1990's the "Iyashi" boom which is a phenomenon peculiar to Japan has come. As the prolonged economic recession has added power to the boom, most of modern people require "Iyashi" to recovering from the physical and psychological stress of the workplace and of the daily life in general. At that time, many kinds of "Iyashi" goods had overflowed on the street.

However, the human have not discussed a clear definition of "Iyashi", never researched whether "Iyashi" is feeling or state or neither and had no common understandings of that. In this paper we would like to make "Iyashi" appear on the scientific stage and spread the reliable merits of "Iyashi" from Japan to abroad.

Ueda, a religious anthropologist who used the word "Iyashi" for the first time in Japan, explained the meaning in his book as follows [1]:

“When a conjure man prayed in Ceremony that repels satan in Sri Lanka, he was able to cure the person to whom the satan had clung. The recovery by the ceremony is called "Iyashi". So "Iyashi" (Healing) is a relief of the entire existence where an original appearance is regained.”
As Ueda noted, "Iyashi" was applied only by human beings. Today, "Iyashi" is a popular buzzword on everyone’s lips in Japan referring to anything that is physically or mentally soothing. Since "Iyashi" received the top award for Japanese neologisms and trend-setting words in 1999, there have been many "Iyashi" goods (toys, games, stationary, music, pictures, books, characters, incense & aromas, bath salts, plants, etc.) in Japan and they are all very popular commodities. The "Iyashi" boom has come. In these days, not only human relationships but also goods can be "Iyashi".

For instance, if you meet a person with severe expression by chance in town, how do you feel? It is sure that you become unpleasant and guess his character as cold and passionate. He looks like not having talked to and accepting you at all. You also do not talk to and approach him. But the next moment, if his expression becomes very mild, your emotion must change into the quite different one. He seems to accept you, and talk to as if the best friend. Of course, you similarly accept him and want to talk to him and guess his character as gentle and kind.

The facial expression which has been an object of psychological study is the special stimulus for both observers and people who show expressions. A person can guess unknown person’s age and character only from seeing the expression momentarily. As the change of one’s expression in the moment strongly restrains and controls the observer's behavior and emotion, the facial expression is very important in the personal relationship which is brought close and kept away between person to person. Each time, the role of observer and holder with facial expressions can change places easily.

The aim of this research is to prove the existence of expressions that change the observer's emotion with "Iyashi" and clarify the individual structures of "Iyashi" on the facial expression through the psychological experiments and the Holographic Neural Networks analysis[2,3]. We have made the HNN to learn the relations between inputs, i.e. the facial features and outputs, i.e. the psychological evaluation. Part of this work was reported elsewhere[4].

2. Definition of Iyashi

Generally, We want to call the loneliness, sense of alienation, incapable feeling and mental restrain a wound of the mind which requires “Iyashi”. In other words, in the society the essence of "Iyashi" is a process that looks for self-identity and improves the self and been admitted by others.

When is caused the wound which damaged the person? It is caused (1)when fundamental necessities for living are not satisfied, (2)when self-existence within relationships is denied, (3)when the admission and respect by others are denied and (4)when self-actualization is denied. The person who has a wound of the heart cannot mend, ease and liberate the wound for himself.

*We define the stimulus given to make the person’s heart with the wound to a more desirable or original state as Iyashi and the process where the state of heart becomes more desirable or original state as Iyasareru.*

For the wound of the heart, physical, social and mental factors are enumerated. There are various factors, however, why the wound occurs? The reason is because people’s mind demands many things regardless of consideration and unconsciousness but they can neither take nor give anything, so they are not filled with their mind. The wound is produced by the negation of survival and security, society relationships, self-identity, and self-realization.

There are also a lot of kinds of a Iyashi stimulus for the person and the Iyashi method is different depending on each person. Iyashi is divided into Iyashi of the psychology and Iyashi of the body. Concretely, Iyashi is included in art / music / games / toys / sports / sweetness / religion and words. As the above-mentioned, in these days, Iyashi stimulus can be both the interpersonal relationship and Iyashi goods. Though this phenomenon seems
that the meaning of Iyashi have been changed gradually, actually the essence has never changed. The persons have come to request Iyashi from both persons and goods to accept, admit and recognize themselves no solitude.

For example, in our definition, only distress recovery, refresh and a change of pace are not Iyashi. We want to distinguish those from Iyashi because they do not operate directly on the heart, we call them "relaxation". However if the person is fatigued physically and the fatigue damages his heart, the physical recovery by massage and bathing can raise his spirits. In this case, we consider the physical recovery the indirect Iyashi.

From the definition and preliminary psychological experiments, we define Iyashi expression. Though there is a person who is not your old friend, he has the expression that seems to accept you exactly now and to talk to you, and you want to reveal your own true emotion instinctively. The expression alone can be exactly the Iyashi stimulus. In short, the Iyashi expression is an expression that unconditionally can be accepted by a mind which is solitary and damaged. The definition is obviously different from the face of favor.

3. Outline of Facial Expression Detection/Generation System

For the experimental procedure, we prepared a sample of 20 facial expressions drawn on famous artworks as a masterpiece of Iyashi and these were used for the psychological evaluation of Iyashi. The physical values of face expression features were also measured from these images. Test subjects evaluated the degree of the Iyashi expression using the scale (0= no-Iyashi, 1= a little, 2= Iyashi). We made the HNN to learn the relations between inputs, ie; the facial expression features and outputs, ie; the psychological evaluation. We could know the important combination of the physical facial parameters contributing to the high degree of Iyashi from the analysis of the internal parameters of HNN \[^{1,4}\], and defined the combination as the structure of Iyashi of each subject.

We could change an arbitrary face image in an image with the Iyashi expression. That is, we could convert the evaluation of Iyashi from degree 0 into the expression of degree 2. We also could convert from the Iyashi degree 2 into 0. The outline of the facial expression detection/generation system is shown in Fig.1.
3.1 Psychological Evaluation of the famous Paintings of a face

We adopt 20 pieces of face images (see Fig. 2) from the picture collection by Shunsuke Kijima [6], a famous art critic in Japan, for the psychological experiment and also learning in the HNN. The picture collection includes a lot of famous art paintings with the expression of a famous Iyashi in the world [6]. In most technological researches on emotion, expressions based on recording actors, skilled or unskilled, were used for stimuli. There is a lot of advantages to use face art paintings instead of photos or other visual medias of actors. Artists paint and represent exquisitely, delicately and sometime exaggeratedly their instantaneous impression as they feel on canvas. From art paintings, therefore, observers will sense the same or stronger feeling or impressions as the painter felt. Concerning actor’s expression, it may be difficult, even for professionals, to show Iyashi expression in a natural way. As camera lens also produces a distortion, art paintings can revise them.

Fig. 2  Collection of twenty special paintings used in the evaluation of Iyashi and in the HNN analysis.

The subject watched a liquid crystal monitor screen of a personal computer. On the monitor, a face painting was presented. Then, the subject evaluated the degree of the Iyashi expression using the scale (0 = no-Iyashi, 1 = a little, 2 = Iyashi).

3.2 Detection of important parameters for Iyashi expressions by HNN analysis

At first, we extracted 63 characteristic points from each face such as eyebrow, eyes, nose, mouth and face outline (see Fig. 3). We normalized these face parameters and adopted 17 parameters. These physical parameters (Table 1) were based on the expression of the mental disease patient in "the criminaloid expression diagnosis container" [7]. Seventeen parameters (X1-X17) are used as input for holographic neural networks [3].
Fig. 3 Sixty-three characteristic points of a face to measure the normalized physical parameters of facial features.

Table 1. Normalized Face Parameters.

<table>
<thead>
<tr>
<th>X1 = p1/p5</th>
<th>X4 = p4/p5</th>
<th>X7 = p12/p9</th>
<th>X10 = p10/p8</th>
<th>X13 = p14/p8</th>
<th>X16 = p16/p8</th>
</tr>
</thead>
<tbody>
<tr>
<td>X2 = p2/p5</td>
<td>X5 = p6/p5</td>
<td>X8 = p15/p8</td>
<td>X11 = p11/p9</td>
<td>X14 = p19/p8</td>
<td>X17 = p17/p9</td>
</tr>
<tr>
<td>X3 = p3/p5</td>
<td>X6 = p7/p5</td>
<td>X9 = p18/p8</td>
<td>X12 = p13/p8</td>
<td>X15 = p20/p9</td>
<td></td>
</tr>
</tbody>
</table>

**Area parameters:** p1(right eye), p2(left eye), p3(nose), p4(mouth), p5(face), p6(right eyebrow), p7(left eyebrow).


The holographic method proceeds considerably beyond the neural paradigms. It could be also used to implement the above paradigms as well as to serve for fuzzy processing. In the holographic paradigm, an element of information is represented by a complex number or vector, operating with two degrees of freedom: that is, phase (e.g. $\theta, \phi$) and magnitude (e.g. $\lambda, \gamma$). Information content is assigned to the phase. The associated vector magnitude indicates a confidence level (0.0 to 1.0). Both stimulus [S] and response [R] data fields are represented by arrays of complex values:
where \( n \) and \( m \) are the number of elements in the stimulus and response pattern respectively and \( u \) is the pattern index. Learning several associations between stimulus \([S]\) and a desired response \([R]\) reduces to a non-iterative matrix operation.

\[
[X] = \left( [S]^H \cdot [S] \right)^{-1} \cdot [S]^H \cdot [R] 
\]  

(3)

where the symbol \( H \) denotes the conjugate transpose of matrix \([S]\). Note that all association must be enfolded onto the same matrix \([X]\) called holographic memory. The response \([R^q]\) to a new stimulus

\[
[S^q] = [\lambda_1^q e^{\theta_1^q}, \ldots, \lambda_n^q e^{\theta_n^q}] 
\]  

(4)

is computed through the matrix operation

\[
[R^q] = \frac{1}{c} [S^q] [X] 
\]  

(5)

where \( c \) is the normalization factor defined by:

\[
c = \sum_{k=1}^{n} \lambda_k^q 
\]  

(6)

If all elements in the query stimulus pattern \([S^q]\) match an existing stimulus pattern \([S^t]\), the retrieved response pattern \([R^q]\) will be close to the associated response pattern \([R^t]\). Here, closeness is computed in terms of the phase values and the magnitudes (confidence level) of each element. If the query stimulus pattern only partially matches an existing pattern, then the retrieved confidence level is expected to be lower than one. It would be very low if the query stimulus pattern does not match any existing pattern.
3.3 Generation of “Iyashi” expressions

Procrustes analysis was used for the generation of "Iyashi" expressions. The analysis determines a linear coordinates transformation (translation, reflection, orthogonal rotation, and scaling) of the feature points in the original image to best conform them to the feature points coordinates in the target image. The goodness-of-fit criterion is the sum of squared errors. The procrustes analysis also returns the minimized value of this dissimilarity measure and the transformed coordinates of the feature points from original image. The coordinates of the transformed images are used to compute the movement of the original feature points and to generate the requested expression. Compactly-Supported Radial Basis Functions (CSRBF) [5] are used to generate the “Iyashi” images moving the feature points in the original image to the transformed position of the features points in the target image.

4. Experimental Results

4.1 Psychological Results

Two subjects (Japanese woman and Cuban man) evaluated the face pictures shown in Fig.2 for the Iyashi degree. The condition of the subjects was quite different and the number of subjects were very few. However the expression pictures which they evaluated as 2 and 0 degrees were almost the same (see Table 2). For example the pictures No. 1, 5, 7, 9, 11, 16, 18 and 20 were evaluated as 2 by both. Two subjects had the same impression about facial features in those images.

Table 2. Evaluation of art paintings by two subjects.

<table>
<thead>
<tr>
<th>Picture No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject-1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
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<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Subject-2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
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<td>2</td>
</tr>
</tbody>
</table>

From the analysis of the subject’s impression, each subject was strongly impressed by the eyes and the mouth. The eyes with double eyelids instead of single eyelids look kindly. As for the mouth, the corner rises a little and lips are puffy. Also the cheek is not thin and the contour has egg shape. The expression in some pictures gave the impression as if the painted face was talking and listening to the observer. This is applicable to the definition of Iyashi which is defined in beginning exactly. Therefore, our definition of Iyashi expression would be reasonable and appropriate.

Conversely pictures No. 8, 12 and 13 were evaluated as 0 by both subjects and the impression of the two was also similar. The eyes in the pictures evaluated as 0 seemed to be angry and cold. They looked like not having trusted us at all. The mouth is pulled by side, the corner goes down and the lips are thin. The face contour is long and narrowed.

4.2 Analysis by the HNN

The HNN made the relationship between the physical features of facial paintings (measured by the normalized parameters, i.e. X1-X17) and the Iyashi degree evaluated by the subjects. Table 3 shows the sorting of parameters according to the importance provided by the magnitude stored in the holographic memory for both subjects. The parameters are ordered from highest (left) to lowest (right) importance in table 3.
Table 3. Importance of parameters (X1-X17) for two subjects provided by the magnitude of the holographic memory.

<table>
<thead>
<tr>
<th>Importance order</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject-1</td>
<td>3</td>
<td>14</td>
<td>4</td>
<td>13</td>
<td>7</td>
<td>10</td>
<td>12</td>
<td>8</td>
<td>6</td>
<td>1</td>
<td>17</td>
<td>15</td>
<td>16</td>
<td>9</td>
<td>11</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Subject-2</td>
<td>5</td>
<td>14</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>16</td>
<td>12</td>
<td>6</td>
<td>9</td>
<td>8</td>
<td>15</td>
<td>7</td>
<td>13</td>
<td>11</td>
<td>10</td>
<td>17</td>
<td>2</td>
</tr>
</tbody>
</table>

As it is expected, the importance of parameters is specific for each subject, however, some common parameters exist within the group of most important parameters. For example, parameter 14 (ratio between the thickness of the lips and the length of the face) and parameter 4 (ratio that mouth occupy in the whole face) are included within the five most important parameters for both subjects. Also parameters that consider the zone of the eyes and eyebrows are included within the most important group for both subjects (e.g. parameters 13 and 7 for subject-1 and parameters 5 and 1 for subject-2).

4.3 Generation of Iyashi expression

For the generation of Iyashi expression of faces, we used the results obtained from subject-1. From the minimized value of the dissimilarity measure provided by the procrustes analysis we selected two pictures (8 and 18). Picture-8 was evaluated as 0, no-Iyashi, and picture-18 as 2, Iyashi. The conversion of these images to the opposite class using the previously described methodology \(^{[3,8]}\) is shown in Fig. 4. Expression of picture-8(upper) has been changed considerably to an image with a gaze much more communicative.

![Original vs Transformed Images]

Fig. 4 Generation of expressions of Iyashi=2 from Iyashi=0 for the picture-8 (upper) and Iyashi=0 from Iyashi=2 for the picture-18 (lower).
5. Discussion

We compare subject’s impression with the results of the HNN analysis. The subject’s impression was described in the psychological results, however, its summary is shown in Table 4, with those from the HNN analysis.

Table 4. Summary of subject’s impression and engineering (HNN) analysis.

<table>
<thead>
<tr>
<th>Impression of</th>
<th>Impression of</th>
<th>Importance from HNN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iyashi expression</td>
<td>No-Iyashi expression</td>
<td>X1, X5, X7, X13, X4, X14</td>
</tr>
<tr>
<td>Eyes</td>
<td>double eyelid instead of single</td>
<td>angry and cold.</td>
</tr>
<tr>
<td>Mouth</td>
<td>Puffy risen corners a little</td>
<td>pulled by side, going down corners, and thin</td>
</tr>
<tr>
<td>Cheek</td>
<td>not thin</td>
<td>thin</td>
</tr>
<tr>
<td>Contour</td>
<td>egg shaped</td>
<td>narrowed</td>
</tr>
</tbody>
</table>

Subject’s impression has coincided with the results from the HNN analysis. However, the impression is subjective and qualitative. The HNN analysis is able to give the quantitative contribution of physical parameters to Iyashi expression. Furthermore, we are able to transform the original expression into the Iyashi expression by utilizing the quantitative contribution of facial parameters. The transformed picture into Iyashi=2 shown in the upper of Fig. 4 was judged to be sufficient for Iyashi expression by the subject-1. In lower case of Fig. 4, the transformed picture into No-Iyashi, was judged as No-Iyashi by the same subject.

We have defined Iyashi and Iyashi expressions for the first time. The Iyashi expression made from no-Iyashi face of upper case in Fig. 3 gave the impression as if the face was talking and listening to the observer. This is applicable to the definition of Iyashi which is defined in beginning exactly. Therefore, our definition of Iyashi expression would be reasonable and appropriate. Defined Iyashi and Iyashi expression would cover nearly the usage of "Iyashi" and "Iyashi" expression in society.

We could know the important combination of the physical facial parameters contributing to the high degree of Iyashi, and have called the combination the structure of Iyashi. Though the number of subjects were very few in this report, but if we could collect and analyze experimental data obtained from a lot of people, we will be able to know whether there would be a common structure of Iyashi to all the people or not.

6. Conclusion

Until now "Iyashi" has not been a topic for scientific research. However, we integrated the advocator’s view of "Iyashi" and how to use "Iyashi" in society with the psychological knowledge, we defined Iyashi. From the definition and the experimental results, we can define the Iyashi expression as those that gives the impression as if the holder is talking and listening to us. With psychological evaluation of facial expressions which recognize Iyashi (or no-Iyashi) and the analysis by HNN, we have had the method to built the Iyashi structure of each person. By using the method, we are able to generate facial expressions which could be Iyashi or No-Iyashi.

The proposed technique of psychological evaluation with the analysis by HNN could be used as a method to clarify the psychological structure of everybody concerning complex feelings (melancholy, sympathy) and blended expressions (except six basic expressions like happiness, anger, fear, disgust, sadness and surprise) which have not been proved yet.
Acknowledgements

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References


Appendix

"Iyashi" and "Iyasareru" are very often in this paper. We never use "healing" or "healed", because "healing" carries the main meaning of curing illness and injury, easing hunger, and alleviating pain, and it has the different essence from "Iyashi". We have decided that we use only Japanese language, "Iyashi" and "Iyasareru". "Iyashi" is the noun form of the verb "Iyasu". "Iyasu" is a transitive verb, so in the sentence which the subject is a person, "Iyasu" must be changed to the passive type of verb, "Iyasareru".

The term of "Iyashi" is enclosed by " when its usage is in the society, but the term of Iyashi is used without " for the meaning defined in this paper.