

The Development of the Conceptual Model Visualization Program

개념모델 가시화 프로그램의 개발

Hong-Seok Choi*† · Akira Okazaki*

최홍석*† · 오카자키 아키라*

Department of Design, Takushoku University*

타쿠쇼쿠대학교 디자인학과*

Abstract

The earlier *KANSEI*¹⁾ evaluation had to choose not to overlap the opposite meaning of the words, had to choose that some figures are shown step by step and had to choose be prepared things in advance. However, The Study shows a method which visualizes the imprecise evaluations of human without choosing evaluation items which are not prepared figures.

The program is used the way which is entered by hand-drawing that the subjects use the way to enter their subjective feelings about the evaluations presented by using the mouse or the graphics tablet. It is possible to express imprecise things about evaluations and the method of drawing is free. The program provides that we can express our thinking by drawing and there are a few limits and the prescribed standard.

The area ratio of each circle is expressed as a pie chart and the area of circle what is drawn which is counted automatically at the same time. These things are possible not only to modify a transparency, a thickness of a line, a color and the area of circle what is drawn, but also to adjust the area of circle. The conceptual model is visualized that expresses something by hand-drawing such as a circle. The conceptual model has wide range of applications such as a personnel evaluation, a suffering evaluation and product evaluation.

The program currently has been testing the effective of the program's possibilities which is used with the personnel appraisal tool of the nurses themselves who work in nurse support department where the St. Marianna University School of Medicine Hospital is. And also the program is proceeding with development to visualize the conceptual model by dynamic interfaces effectively and the program is applied such as KJ method and a program is used to express the kind of the patient's pain and its level.

Keywords : Conceptual model, Visualization, *KANSEI* evaluation

요약

기존의 감성평가방법은 대립하는 뜻의 단어를 중복되지 않게 선택하거나, 단계별로 제시된 수치를 선택해야 하는 등, 미리 준비된 것 중에서 골라야만 했다. 하지만, 본 연구에서는 평가대상항목에 대해 미리 준비된 수치에서 고르지 않고, 인간의 애매한 평가를 시각화하는 방법을 개발했다.

본 프로그램은, 제시된 평가항목에 대한 주관적인 느낌을 피험자가 마우스나 펜타블렛을 이용해 손으로 그

1) 'KANSEI' is a Japanese word covering a very broad range of meanings and connotations, such as delicacy in sensitivity, fine sensibility, sensitiveness, sensitivity etc. Ikko Sakamoto(2010).

† 교신저자 : 최홍석 (타쿠쇼쿠대학교 디자인학과)

E-mail : bleusonnet@gmail.com

TEL : +81-42-665-0526

려서 입력하는 방식이다. 그리는 방법이 자유롭고, 평가에 대한 애매한 표현이 가능하다. 정해진 기준이나 제한이 적고, 생각대로 그려서 표현한다. 연이어 그려진 원은 면적이 자동으로 계산됨과 동시에 각 원의 면적비율이 원 그래프로 표시된다. 그려진 원은 크기, 색, 선의 굵기, 투명도 등의 수정이 가능하고, 평가 후에는 원의 비교, 조정이 가능하도록 되어 있다. 개념모델을 손으로 그린 원으로 표현하여 시각화 하는 것으로 인사평가, 고통평가, 제품평가 등의 응용범위가 넓다.

성 마리안나 이과대학병원 간호지원센터 직원들에 의해 그 가능성을 평가 받아, 현재 간호사자신의 인사평가 툴로써의 효과를 검증 중에 있다. 이와 함께 환자의 고통의 종류와 그 레벨을 표현하는 프로그램과 KJ법을 응용하여 다이내믹한 인터페이스로 개념모델을 효과적으로 시각화할 수 있도록 개발을 진행하고 있다.

주제어 : 개념모델, 가시화, 감성평가

1. Introduction

The *KANSEI* evaluation is the way to express not only design fields, but also the subjective and imprecise *KANSEI* of the human quantitatively.

The earlier *KANSEI* evaluation had to choose not to overlap the opposite meaning of the words, had to choose that some figures are shown step by step and had to choose be prepared things in advance. These are the reason why the subjects are forced to limited value without freedom of choice. These things make the subjects be forced to subjective choice freely. On the one hand, there are several possible ways to rate straight such as the eye mark camera and the movement analysis. However, a complex process of evaluation is needed which is used with other evaluation methods because there is no verbalize to extract data related to *KANSEI*. Therefore, the study shows a method which visualizes the imprecise evaluations of human without choosing evaluation items which are not prepared figures.

2. Character of the Program

The program is used the way which is entered by hand-drawing that the subjects use the way to enter their subjective feelings about the evaluations presented by using the mouse or the graphics tablet. It is possible to express imprecise things about evaluations and the method of drawing is free. The program provides that we can express our thinking by drawing and there are a few limits and the prescribed standard.

The area ratio of each circle is expressed as a pie chart and the area of circle what is drawn which is counted automatically at the same time. These things are possible not only to modify a transparency, a thickness of a line, a color and the area of circle what is drawn, but also to adjust the area of circle. The conceptual model is visualized that expresses something by hand-drawing such as a circle. The conceptual model has wide range of applications such as a personnel evaluation, a suffering evaluation and product evaluation.

3. Development Environment

“rami” is made using the AIR of Adobe Systems[®]. The program is the execution environment of the desktop application to develop using web technology such as Flash and JavaScript. The Air application program has two major advantages of using the desktop application and the Web application. The program is possible to express a variety of interface which is based on Adobe Flash. The program depends on only a few things such as OS or Web browser and it is run on multi platform.

The program also has a clear characteristic that it is possible to do interface design and to utilize the local resource because the program is desktop application which can be used the web techniques.

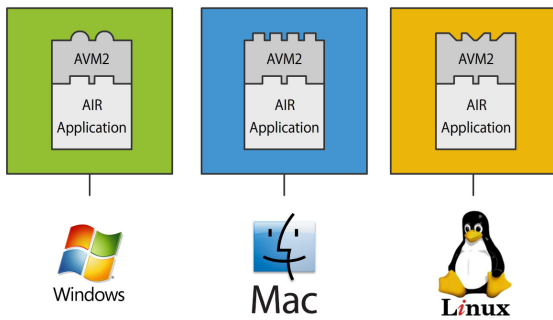


Fig. 1. Support Multi Platform by ActionScript Virtual Machine 2

4. Screen Layout

There is the start-up screen of the program. The subjects enter their name and an object's name what they want to visualize and structuralize of the conceptual model. If the evaluation items are arranged, the subjects can enter the items on this screen. The subjects can move to the main screen by pressing a start button.

The main screen is divided the three sections. The subjects can draw something by hand in the widest white section. This is the section where the subjects can visualize the conceptual model. The subjects can express the relationship between up and down of a circle and mark a crossover rate automatically.

The evaluation rate of a circle about each item is expressed as a pie chart where is the top of the left section on the main screen. The name of each item is expressed with a percentage where is the bottom of the left section.

The subjects can change over to the three-dimensional mode by pressing a 3D button. And also the subjects can observe the circles like looking down from the top and rotating them which are expressed in three dimensions by operating the slider what is marked newly.

In the 3D screen, the subjects can not only to change the height of the circle, but also to mark the figures data about the relation between each circle. This is the function for visualizing the relation of data including from a circle by setting the evaluation axis newly.

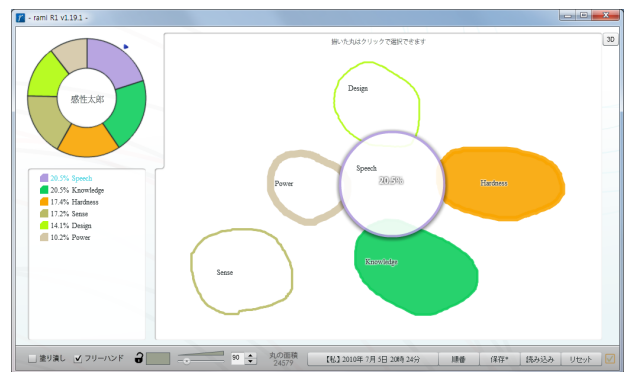


Fig. 2. "rami" Start-up Screen and Main Screen

5. Function of the Program

5.1. Eidetic drawing

The basic function of the program expresses a user input without making any adjustments by accepting as it is. So, this program is applied the way that psychological quantity is visualized by drawing circles without inputting numbers or choosing something what are presented. Using the equation of curve has too much time to calculate the area of a circle. So, the way is adopted that the pixels of a circle are counted.

There are often the cases what a start point of drawing a circle is not connected with its end point because the way of drawing a circle is depended on individual personality. Therefore, this way is applied to treat like a complete circle by connecting the two points.

After drawing a circle, this method can expresses a circle more similar to a conceptual model by changing Table 1 The components of a circle.

The data of the length of a line, the date and time of drawing, and the time required of drawing are saved

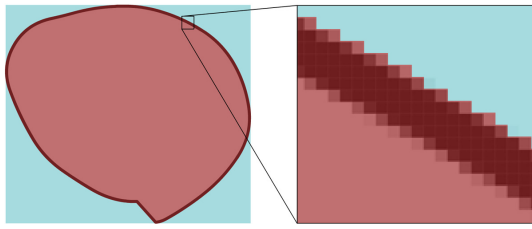


Fig. 3. Area of the circle

immediately after finishing drawing a circle.

The length of a line means the overall length of a line which is used to draw a circle. It is the necessary function because the length of a line is changed according to the way of drawing a circle even though the area of some circles is the same. Because a state of mind can be grasped that do not know just by area ratio.

Similarly, there is also the sorting function according to the time required of drawing. It can grasp psychological changes according to the time required whether they think about something or not, even if the

Table 1. The components of a circle

Component	Type	Expression
Area	Number	
Fill	Boolean	
Color	Number	
Width of Line	Number	
Hand Drawing	Boolean	
Transparency	Number	
Location	Number	
Title	Text	
Height	Number	

area of some circles is the same. And it also can sort in order of the date and time of drawing.

The function can give the hint what is considered very important apart from an area ratio according to what a subject draws something at first when a subject only is given an assessment item and then do not be given order.

5.2. Graph & List

The graph located on the top left of the program's screen shows the name of the center of each conceptual model to structuralize and visualize. And being drawn the area of circles on the stage are totalized up and then the ratios are shown the type of each circle's color and pie graph.

The pie graph has the function that when the pie of the pie graph is drag-and-drop on the stage, the circle is copied exactly the same circle on the spot. It is possible to convert into the sort of area ratio and in order of the date and time of being drawn by sort button.

The list located on the below left of the program shows all circles' area ratio and title which was drawn on the stage. It is also can convert into the sort of area ratio and in order of the date and time of being drawn.

The list not only can modify already inputted titles, but also choose a circle which is based on the crossover rate.

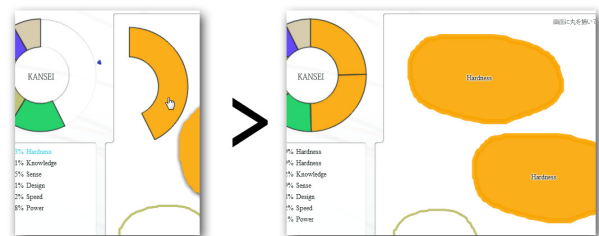


Fig. 4. Copy Function

5.3. Crossover rate graph

Being drawn the relationship between top and bottom of circles can be expressed by operating mouse pointer over the circles after moving the circles to overlap each

other. It is possible to visualize the crossover rate, in case the overlapping part of areas has a meaning besides the relationships between top and bottom.

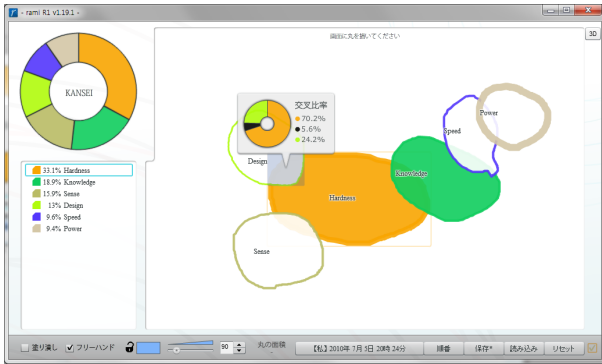


Fig. 5. Crossover rate graph

It is the crossover rate graph that the correlation of two circles is shown with a ratio by the overlapping areas of circles. More than two circles are needed to use this function, and when choosing a based circle and then move mouse pointer over overlapped another circle, the crossover rate graph is shown.

5.4. 3D Mode

It is changed into 3D mode when 3D button located on the top right of the program is clicked.

When it is changed into 3D mode, all drawn circles are shown in location of height 0(center). A circle can be observed as look down from above by operating new shown slider. In other words, the mode is changed each circle's height to add height with z-axis.

It is the function to show new evaluation by using a high and low difference. For example, choose the assessment items of a product such as color, shape, weight, and size and then make its evaluation being appeared as area ratio, and then it can be expressed as the height about the good and bad of operating function by new evaluation-axis by changing into 3D mode.

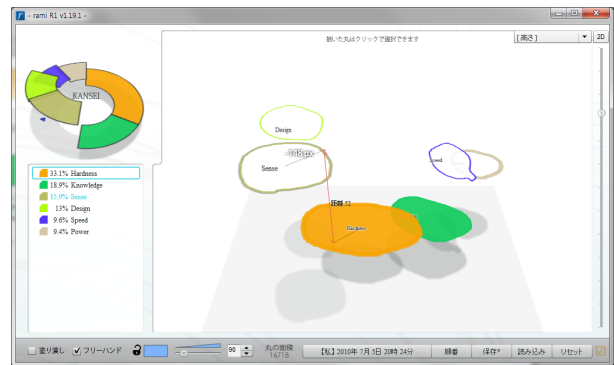


Fig. 6. 3D Mode

3D mode has five options of height, area, the time required of drawing, the length of line, and the date and time of drawing. For instance, when selects the area option, from among the drawn circles are located the biggest circle at first upper direction, the smallest circle at first lower direction, and the rest circles are located the height which is set to area ratio. The rest of functions are the same.

5.5. The rest of functions

5.5.1. Temporary storage

The program has the convenient temporary storage function that when saving some circles from among the drawn circles for a moment or using the same circle many times. When a drawn circle puts in the pie graph, it is saved in stack to save temporarily.

Being saved several circles is excluded from the percentage calculation of the pie graph. It is possible that being temporarily saved circles are restored by dragging them on the stage or clicking them.

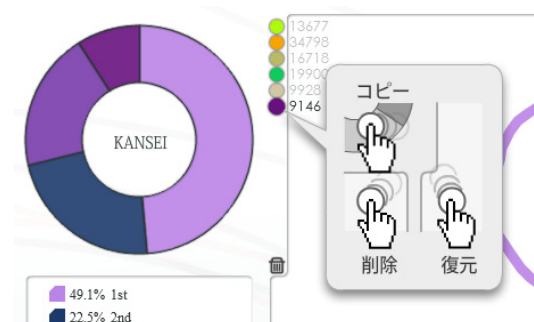


Fig. 7. Temporary storage and Balloon Help

5.5.2. The file management

The whole program or a circle be saved by the own file format after evaluating by program. In the case of saving the whole data, a current operated screen is saved as image file together. When a circle was drawn, it does not be initialized but being shown together if the saved file is read.

It also has the function that files are managed by the simple mouse operation without using the save of menu and the load button. When pressing the shift key and dragging it out of the stage by clicking the left mouse button on the stage which is drawn circles, the whole data is saved and also a circle can be saved in the same way. Conversely, when a stored file is dragged in the program, the file can be read.



Fig. 8. left: Program Icon, center: Save File Icon, right: Single Save File Icon

5.5.3. Help

The program shows the message related operations which is the help function located on the top middle of the screen and then indicates what mouse pointer points the explanation of the functions Typical function is that when mouse pointer stays more than for a certain time, balloon help appears for explaining function.

5.5.4. Update

The program has automatic update function through the Internet.

The function is possible to support several things such as the feedback on operation errors, bugs' modification, and the addition of new functions and customize.

6. Application of the program

It is possible new evaluation by clarifying about the difference and application from existing evaluation methods.

6.1. Difference from SD method

SD method is the way to clarify emotional impressions how human feels about stimulation. The program has three features about this below.

- 1) The expression of psychological quantity is possible that is not to input step from one to seven, but to draw an area or the length of a line without step.
- 2) In case of evaluating by SD method, it is not easy to modify already inputted figures. On the contrary, this program can be modified easily by comparing with each item because a whole circle inputted is recognized at a glance.
- 3) SD method is ranking limit from minimum one to maximum seven, but this program is possible to express beyond the limit because after already drawn a minimum or maximum circle, it can be changed its scale larger or smaller than before.

6.2. Difference from ME method

ME method is the way to rate the psychological quantity of human about physical quantity of stimulation. This method expresses numerically by comparing a standard stimulation with other stimulation, the psychological quantity about stimulation sets to one or hundred.

For example, when standard stimulation be set for hundred, a circle is expressed corresponding to the figure by inputting one hundred fifty about other stimulation and then if the circle's size is different from the stimulation what user felt, the size can be modified and other stimulation can be expressed with drawing a circle by comparing the circle of standard stimulation without numbers. Therefore, users can visualize a more similar feeling like psychological quantity about the stimulation

what they are feeling on their own.

6.3. Application of the KJ method

KJ method is devised a way to organize data. This program is possible to apply as follows.

- 1) After drawing a figure which becomes a card, copy it by copy function and then enter data which is based on a theme.
- 2) Group the similar cards by batching. Decide a keyword in this group.
- 3) Draw a figure with a shape and a color by hand which are symbolized a group and then input a keyword.
- 4) The card is included in the group by moving in the group. The shape of the group becomes large in proportion to the number of the included cards.
- 5) Until becoming the group of a proper number, repeat from 2) to 4)
- 6) These are able to show the card and the group included in a group through the preview or to review and exchange opinions by indicating a whole by hierarchy.

6.4. Assessment of pain

Pain has special double-sidedness which is different from other senses. One thing is the perceptual aspect that is involved in the nerves mechanism sending stimulus causing pain, and another thing is the emotional and sentimental aspect that is involved in feeling pain such as the fear of pain, and the hope for disappearing pain.

There are the several earlier ways to evaluate or measure pain such as MPQ (McGill Pain Questionnaire) is a questionnaire classified as a lot of words related to pains, VAS (Visual Analogue Scale) is to measure the length of a point pointed by hand on a line 100 mm long after setting which the end of the left is painless and the end of the right is the maximum pain which had ever experienced, FPS (Face Pain Scale) is a way to choose what close to facial expression enduring pain, NRS (Numeric Rating Scale) is to express the score of

pain that is feeling now by verbalizing after dividing the intensity of pain into eleven stages from zero to ten, FLACC is to measure five elements about face, leg, behavior, cry, and tranquilization through the chart by totaling the scores, Pain Vision is to measure the figure that is increased the voltage to stimulation that is pain as a patient feels after attaching the electrode pad on the skin of a patient and then electrifying the feeble electricity.

This program can be visualized the following the four evaluations by applying the evaluation of pain.

- 1) Part: indicate the part of pain on the human body picture.
- 2) Intensity: indicate the intensity of pain by the size of drawing a figure, the length of a line, and the time required of drawing.
- 3) Feature: evaluate by the shape and color of drawing a figure, the thickness of a line, and the drawing animation and then users indicate by inputting in person or choose the words related to prepared pain.
- 4) Persistence: indicate by drawing the graph about the change condition of pain or express the degree of acute or chronicity by the thickness of a figure which is drawn or the height of a shadow.

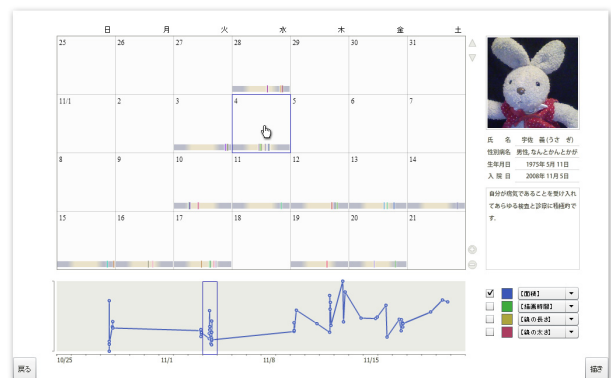


Fig. 9. Pain Assessment Program
Calendar view with Pain Graph

It is possible to evaluate more closely as pain as a patient feels by these applications.

6.5. Evaluation of own oneself

There is the short version framework which is the study to conceptualize the body knowledge of nurses that is developed by Ms. Yasuko Jinda

When a veteran nurse talks with other nurse who cannot lead to the nursing view of oneself yet, the nursing view is clarified by using it. However, according to the experience or knowledge of a veteran nurse, the contents will be able to be induced.

So, when the framework is replaced with this program, it is easier for nurses to grasp more their condition and it helps for nurses to find suitable the nursing view, by visualizing the size or the relationships between top and bottom of each sheet close to the nurse's conceptual model.

After visualizing a circle which is drawn about current the strong point or feature of oneself by using self-evaluation, change it into 3D mode and then it can be shown clearly about the difference between oneself and the third person's evaluations when the third person's evaluation be evaluated with z axial.

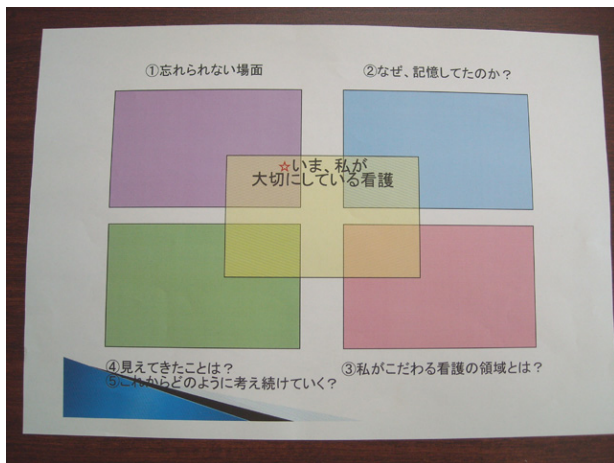


Fig. 10. framework to look back again the patients who have not been forgotten of the past

7. Conclusions

I think there is a high possibility that the program is useful in several uses because It is possible to visualize the conceptual model using drawn a circle freely. The

program currently has been testing the effective of the program's possibilities which is used with the personnel appraisal tool of the nurses themselves who work in nurse support department where the St. Marianna University School of Medicine Hospital is. And also the program is proceeding with development to visualize the conceptual model by dynamic interfaces effectively and the program is applied such as KJ method and a program is used to express the kind of the patient's pain and its level.

References

- Aitken, RCV. (1969). Measurement of feelings using visual analogue scales. *Proc R Soc Med*, 62:989 - 993.
- Akio, Y. (1998). *Pain and Stress*. Sofia Scitec, No.9, Apr.
- Kiyoko, F. (2010). *Assesment of The Pain*. TOTU Care Network(www.totucare.com).
- Kujira, H. (2008). *Adobe AIR Professional Guide*. Mainichi Communications.
- Natsu, K. (2010). *The Foundation Knowledge of Pain and Contraction*. Gijutsu Hyoujun Publish Company.
- Merkel, S. (1997). A behavioral scale for scoring postoperative pain in young children. *Pediatric Nurse* 23(3), 293-297.
- Tadahiko, F. (2004). *Human Engineering Guide*. Scientist Publishing Company.
- Yasuko, J. (2009). Specific Process of the medical Field Study, *Clinical Nursing, Jan. vol. 35, No.1*, 15-19, Herusu Press.

원고접수 : 10.07.29

수정접수 : 10.08.18

게재확정 : 10.08.20