A TENTATIVE MODEL FOR KANSEI PROCESSING
PROJECTION MODEL OF KANSEI EXPERIENCE -

Masaak KUROSU

The Open University of Japan, JAPAN

ABSTRACT

Based on the distinction between the Kansei quality and the Kansei experience, a tentative scheme on the relationship between the quality characteristics and the human experience is considered. Then the CEP (Cognitive-Emotional Processing) model is proposed where the emotional process is superposed to the cognitive processing model. This model lead to the consideration that there are no perceptual correlates to the Kansei quality and that the Kansei quality might be a virtual image quality. Thus, a projection model of Kansei quality is proposed where Kansei quality is regarded as a projected image of Kansei experience to the artifact.

Keywords: cognition, emotion, CEP model, projection model

1. INTRODUCTION

Although there are various definitions for the term "Kansei", it seems to be generally accepted that Kansei is related to both of the cognitive process and the emotional process. This presentation proposes a tentative model for Kansei processing as a projection model based on the combination of the cognitive process and the emotional process.

Regarding the cognitive process, there have been proposed various models since late 1950's when the information processing approach was introduced to psychology. Since then, there are famous models by Broadbent (1958), Atkinson and Shiffrin (1968), Haber and Hershenson (1973), Baddeley (1974), Treisman (1980), Card, Moran and Newell (1983), Norman (1990), Kieras, Meyer, Mueller and Seymour (1999), and May (2006). Common features of these models include: (1) the human being is regarded as the information processor, (2) there are the data flow and the control flow, (3) the model starts from the sensory input and ends with the verbal/motor output, (4) the initial step is the sensory receptor including the eye, the ear and other sensory input channel, (5) the next step is the

sensory information storage that is sometime called VIS (Visual Information Storage) or AIS (Auditory Information Storage), (6) the next step is called the STM (Short Term Memory) and is sometimes called as the WM (Working Memory) with the visual information loop and auditory information loop that retain the information depicted from VIS and AIS and interact with the LTM (Long Term Memory) that stores the information in the real context (the episodic memory) and the abstract form (the semantic memory), (7) there is an information control process that is similar to the CPU of the computer and controls the data flow among VIS, AIS, STM (WM) and LTM, (8) finally the output information is conveyed through the STM to the output buffer, then to the output motor system including the mouth and the finger.

Regarding the emotional process, the traditional models concerned about the structure of emotion such as the one proposed by Wundt (1902), Schlosberg (1952), Plutchik (1962) and Russel (1980). But the information processing model of cognition influenced to formulate the emotional processing model such as the ones proposed by Roseman (1984), LeDoux (1986), Kaiho (1991), Forgas (1995), Ohira (1997), Takemura (1997), Power and Dalgleish (1997), Kovecses (2002), Kitamura (2003), and Mogg and Bradley (2005). Compared to the information processing model of cognition, the models of emotion differ very much from one to another.

2. S-R DIFFERENTIATION IN TERMS OF KANSEI

2.1. Kansei Quality and Kansei Experience

Sometimes the use of the term "Kansei" is confusing and unclear whether it means the trait of the artifact or the mental process. In this article, a simple dichotomy of S-R psychology is adopted and the Kansei quality on the side of the artifact and the Kansei experience on the side of the human being are differentiated (Figure 1).
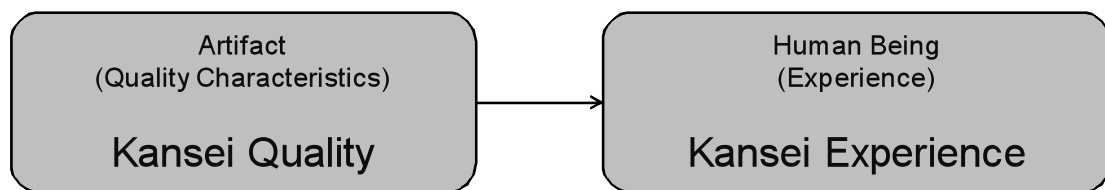

Figure 1: Kansei Quality and Kansei Experience

If the Kansei quality can be regarded as one of the quality characteristics including usability, reliability, safety etc. and the Kansei experience, in other words satisfaction/dissatisfaction, can be thought of consisting of a series of processes including attractiveness/unattractiveness, good-looking/bad-looking, and attachment/hatred, Figure 1 can be re-described in detail as Figure 2. In this figure, quality characteristics that were perceived and recognized by a person will give rise to corresponding subjective impressions such as ease/difficulty of operation, relief/anxiety, and other Kansei impressions such as attractiveness/unattractiveness as a result of the information processing and the emotional processing. Such impressions will be summarized as the satisfaction/dissatisfaction which is regarded as the same with the Kansei in this article and the satisfaction/dissatisfaction will

finally influence the user experience (UX). If we base our consideration on the relationships described in Figure 2, it would be suitable to consider the combination of the information processing system and the emotional processing system.
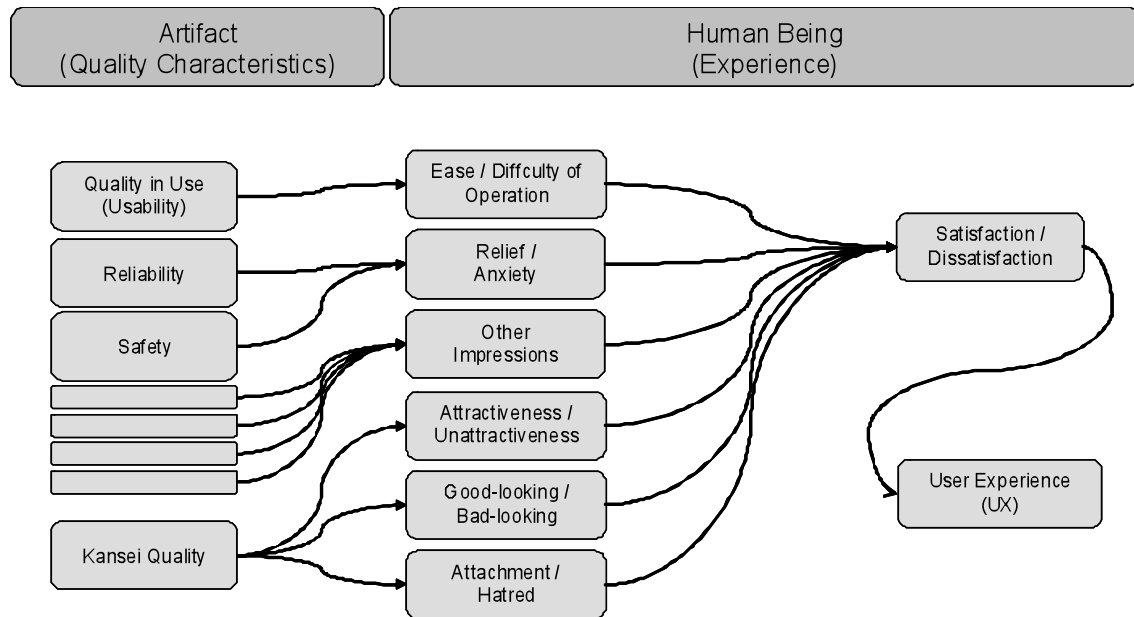

Figure 2: Kansei Quality and Kansei Experience (Satisfaction)

3. A MODEL OF COGNITION AND EMOTION

3.1. CEP (Cognitive-Emotional Processing) Model

As stated in the introduction, the psychological model of cognitive process has reached a consensus to a certain extent in the field of cognitive psychology. It could be described as in Figure 3 where sensory systems, sensory registers, retention loops, STM (WM), LTM, information control process, output buffers and output systems are included.

To this model, the emotional process is overlaid thus composing the CEP (Cognitive-Emotional Processing) Model (Kurosu 2009-1,2). This model is a superposition of the emotional processing model over the cognitive processing model because the emotional process is closely linked to the cognitive process. There are two types of emotional process one is the extrinsic emotional process that reacts to the sensory input or the cognitive image retrieved from memory and another is the intrinsic emotional process that emerges without any stimulus. The former is related to the cognitive process so that the cognitive processing model is used as a basis for the whole model.

The cognitive processing model starts at the sensory input including visual, auditory and other sensory inputs. There are sensory memories corresponding to each sense modality. Sometimes they are called VIS (visual information storage) and AIS (auditory information storage) specifically. Information stored in such sensory buffers is fragile and apt to be erased.

For keeping the sensory information to a certain amount of time, the WM (working memory) or the STM (short term memory) works as the temporary storage. There are the retention loops for the information depicted from the sensory memory.

The WM is located between the sensory memory and the LTM (long term memory). The LTM is a database of past experience, hence a new coming information will be matched with the information stored in the LTM and that information will be added in the complex network in the LTM. There are two types of information stored in the LTM; one is the episodic memory that retains the situational information of the event and another is the semantic memory that is the result of the abstraction and the generalization of the episodic memory.

These information processing is controlled by the information control process just like the CPU of the computer where the WM works as a main memory of the computer.

When some decision is made intentionally or unintentionally (or consciously or unconsciously), the signal to the motor process is created and is transmitted to the output buffer, then to the output system such as the mouth or the hand. There must be a feedback loop from such output system to the sensory register to make sure if the action was done properly.

This is the outline of the cognitive information processing. Most of the emotional processing in this model is not the data flow but basically the control flow in contrast to the cognitive processing includes the data flow.

The key concept for the emotional processing is the valence or the emotional value attached to the information (Lerner and Keltner 2000). The valence can take a positive value or a negative value that corresponds to the pleasure or the displeasure. For the incoming information, the emotional process adds the valence and the information will be stored in the LTM with the valence. In the episodic memory, the information about the event with the valence will be stored and in the semantic memory, the itemized information with the valence will be stored in the complex network of the LTM. And when some incoming information is processed at the WM, the pair of information and valence will be retrieved and be used there.

When people experience some event, or more in detail, perceive something, the incoming information in the STM will be searched in the LTM based on the similarity of information. The control of this processing is conducted by the information control process. If some information can be found in the LTM, it will be sent back to the STM accompanied by the specific valence. The level of valence triggers the emotional process in a positive way or a negative way, thus brings about the emotional experience. Furthermore, this new pair of information and valence will be added to the LTM for possible retrievals in the future.
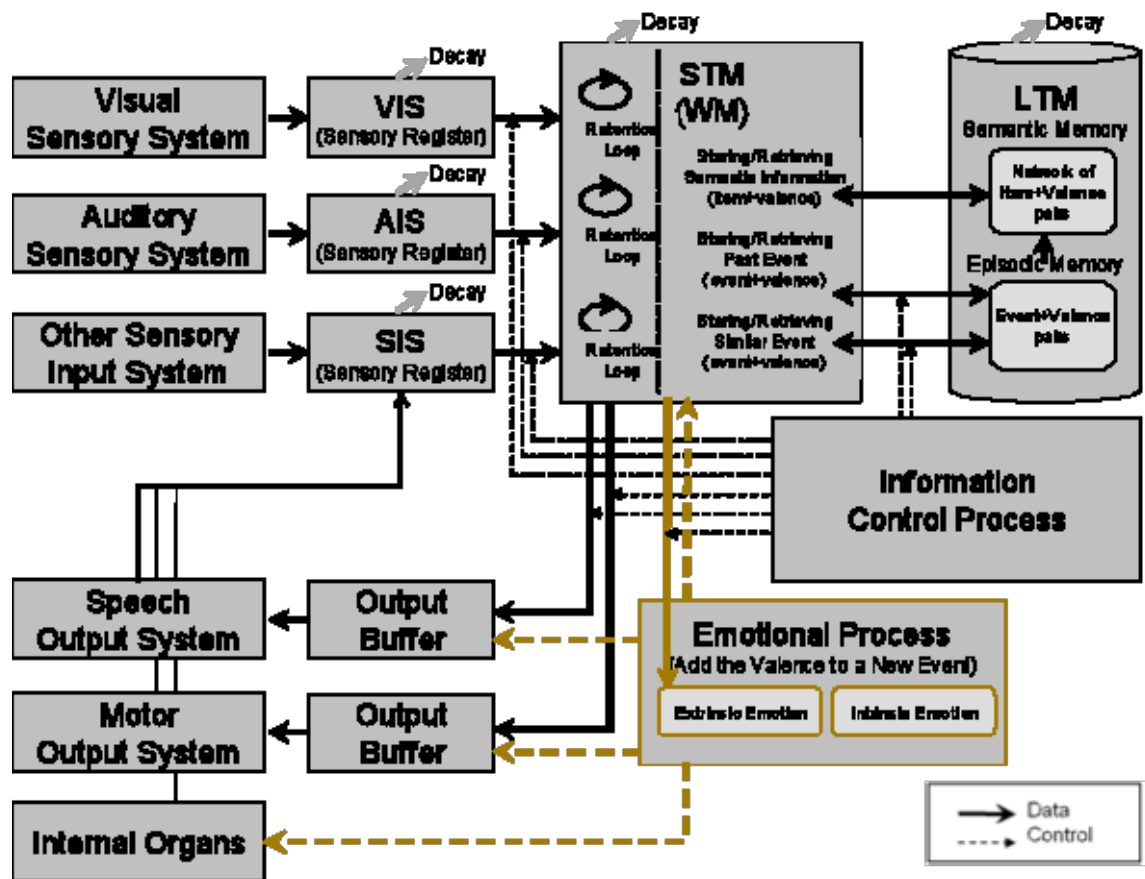
Figure 3: CEP (Cognitive-Emotional Processing) Model

4. A PROJECTION MODEL OF KANSEI

4.1. How Can Kansei Experience Be Achieved?

Based on the CEP in Figure 3, the relationship between the Kansei quality and such human experiences as attractiveness/unattractiveness, good-looking/bad-looking, and attachment/hatred as is shown in Figure 2 can not be such a direct one. Something must be perceived and recognized before such impressions will be formed. In Figure 4, a revised version of Figure 2 is shown. In this figure, quality characteristics and physical characteristics that can be the basis for the quality characteristic are shown on the left hand side and human experience including perception, cognition, emotion, Kansei and experience are shown on the right hand side.

It should be noted that there is no Kansei quality on the left hand side. In this figure, such impressions as attractiveness/unattractiveness, good-lookin/bad-looking and attachment/hatred are described to be formed based on the perception of form, color and texture that corresponds to the physical characteristics of the artifacts such as the appearance including form, color and size and the material on the left hand side of the figure. It is the same with Figure 2 that the Kansei experience, i.e. the satisfaction/dissatisfaction, will be formed of ease/difficulty of operation, relief/anxiety, attractiveness/unattractiveness, good-looking/bad-looking, attachment/hatred and other impressions.
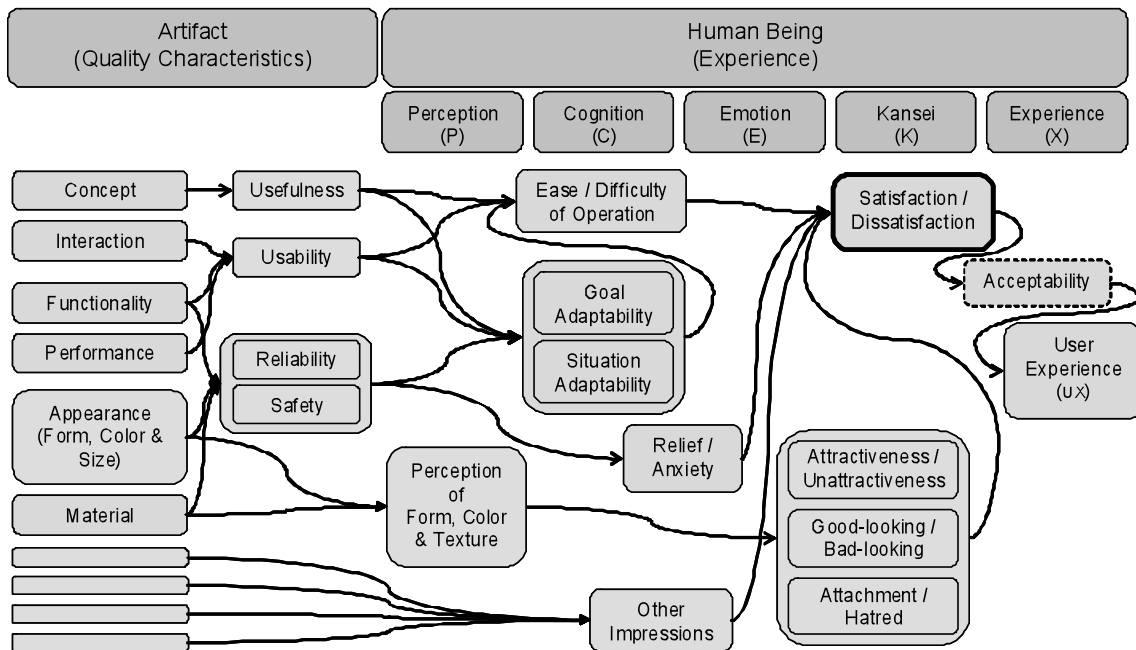
Figure 4: Kansei Quality and Kansei Experience (Satisfaction) – Revised

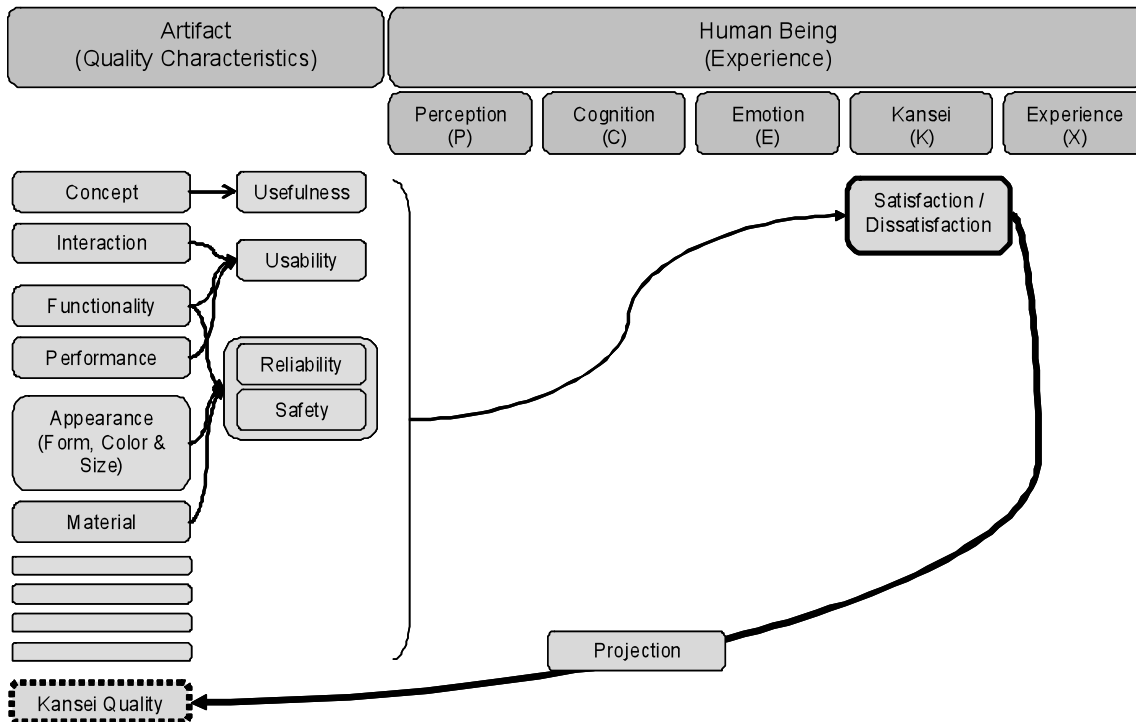## 4.2. A Projection Model of Kansei Quality

Figure 5: Projection Model of Kansei Quality

A question must arise where the Kansei quality went as looking in Figure 4. Because the Kansei quality cannot be directly perceived, it is presumed that it is a virtual quality characteristic and will be "perceived" based on the projection mechanism. The projection, sometimes called the apperception, is a famous mental mechanism that makes the projection methods such as TAT and Rorschach test for diagnosing the personality possible. As in the

case of projection methods, Kansei experience (satisfaction/dissatisfaction) will let the cognition system to project the mental image of Kansei toward the artifact. In other words, Kansei quality could be thought of the virtual image quality. This possible mechanism is shown in Figure 5.

5. CONCLUSION

In this article, a projection model of Kansei quality is proposed that is based on the consideration that there should be some perceptual correlates to the Kansei quality before it forms impressions such as attractiveness/unattractiveness, good-looking/bad-looking and attachment/hatred that finally forms the Kansei experience (satisfaction/dissatisfaction). This idea comes from the Cognitive-Emotional Processing model where the Kansei experience is regarded as the result of the combination of both processing. Although the locus of the Kansei experience is not clearly specified in CEP model, it could be thought as occurring in both of the STM and the Emotional Process.

Kansei quality is thought to be a virtual image quality that is formed as a result of the projection mechanism of which the STM or the WM is playing a key role. This mechanism may be adopting the information obtained from the quality characteristics other than the Kansei quality.

Because the model proposed here is still a tentative and hypothetical one, a series of empirical research should be conducted to clarify the mechanism described in this article in the near future.

REFERENCES

Broadbent, D.E. *Perception and Communication* Pergamon Press, 1958

Atkinson, R.C. and Shiffrin, R.M. *Human Memory* in Spence, K.W. and Spence, J.T. (eds.) *The Psychology of Learning and Motivation, Vol.2* Academic Press, p. 89-195, 1968

Haber, R.N. and Hershenson, M. *The Psychology of Visual Perception* Holt, Rinehart and Winston, 1973

Baddeley, A.D. *Human Memory* Psychology Press, p.44, 52, 1997 (Baddeley, A.D. and Hitch, G.J. *Working Memory*, 1974 in Bower, H. (ed.) *The Psychology of Learning and Motivation* Vol. 8, Academic Press, 1974)

Card, S.K., Moran, T.P. and Newell, A. *The Psychology of Human-Computer Interaction* LEA, p.26, 1983

Kieras, D.E., Meyer, D.E., Mueller, S. and Seymour, T. *Insights into Working Memory from the Perspective of the EPIC Architecture for Modeling Skilled Perceptual-Motor and Cognitive Human Performance* 1999, in Miyake, A. and Shah, P. (eds.) *Models of Working Memory* Cambridge U.P. 1999 (adapted from Meyer and Kieras *A Computational Theory of Executive Cognitive Processes and Multiple-task Performance, Part 1. Basic Mechanisms.* Ps. Rev. 104, 3-65, 1997)

May, J. *Specifying the Central Executive May Require Complexity* in Andrade, J. (ed.) *Working Memory in Perspective* Psychology Press, 2006

Lange, C.G. and James, W. *The Emotions V1,* Kessinger Publishing (Reprint 2008) 1922

Cannon, W.B. *The James-Lange Theory of emotions: A Critical Examination and an Alternative Theory* University of Illinois Press 1927

Wundt, W. *Ethics: An Investigation of the Facts and Laws of the Moral Life Vol.1* Second Ed. University of Michigan, 1902

Bridges, K.M.B. *Emotional Development in Early Infancy* Child Development, 3(4), pp.324-341, 1932

Woodworth, R.S. and Schlosberg, H. *Experimental Psychology*, Methuen 1972

Plutchik, R. *A General Psychorevolutionary Theory* 1962 in Scherer, K.R. and Ekman, P. (eds.) *Approaches to Emotion* Erlbaum, (adapted from Cornelius, R.R. *The Science of Emotion* Prentice-Hall 1996)

Russel, J.A. *A Circumplex Model of Affect* J. Personality and Social Psychol. 39(6) P.1164, 1980

Zajonc, R. *Feeling and Thinking: Preferences Need no Inferences* American Psychologist, 35, 151-175, 1980 (adapted from Cornelius, R.R. *The Science of Emotion* Prentice-Hall, 1996)

Bower, G.H. *Mood and Memory* American Psychologist, 36, pp. 129-148, 1981

Norman, D.A. *Learning and Memory* Freeman and Co., 1982

Roseman, I. *Cognitive Determinants of Emotion* in Shaver, P. (ed.) *Review of Personality and Social Psychology* Vol.5, Sage 1984, (adapted from Cornelius, R.R. *The Science of Emotion* Prentice-Hall, 1996)

LeDoux, J.E. *The Neurobiology of Emotion* 1986 in LeDoux, J.E. and Hirst, W. (eds.) *Mind and Brain* Cambridge UP p.329, 1986 (adapted from Cornelius, R.R. *The Science of Emotion* Prentice-Hall, 1996)

Kaiho, H., Harada, E. and Kurosu, M. Cognitive Interface, (in Japanese) Shinyo-sha 1991

Forgas, J.P. *MOOD AND Judgement: The Affect Infusion Model (AIM)* Psychological Bulletin, 117, pp.39-66, 1995

Ohira, H. *A Mechanism of Fusion Phenomenon of Cognition and Emotion*, in Kaiho, H. (ed.) *Psychology of Warm Cognition* (in Japanese), Kaneko Shobo, 1997

Takemura, K. *Thought, Judgement and Emotion*, in Kaiho, H. (ed.) *Psychology of Warm Cognition* (in Japanese), Kaneko shobo, 1997

Power, M. and Dalgleish, T. *Cognition and Emotion: From Order to Disorder*, Psychology Press, 1997

Kovesces, Z. *Emotion Concepts: Social Constructionism and Congnitive Linguistics* in Russell, S.R. (ed.) *The Verbal Communication of Emotions: Interdisciplinary Perspectives* Lawrence Erlbaum Associates, Pp. 109-124, 2002

Kitamura, H. *Cognition and Emotion* (in Japanese), Nakanishiya Pub. Co. 2003

Mogg, K. and Bradley, B.P. *Attentional Bias in Generalized Anxiety Disorder Versus Depressive Disorder* Therapy and Research 29, 29-45, 2005 in Baddeley, A. *Working Memory, Thought, and Action* Oxford U.P., 2007

Kurosu, M. *The Mechanism of Satisfaction*, WWCS2009 Workshop 7, 2009-1

Kurosu, M. *Kansei Quality and Kansei Experience – from the Scope of Human-Centered Design* (in Japanese), Human Interface Symposium Workshop, 2009-2

Lerner, J.S. and Keltner, D. *Beyond Valence: Toward a Model of Emotion-Specific Influences on Judgement and Choice*, Cognition an Emotion 14(4), p.473-493, 2000