An Action Decision Model for Emotions based on Transactional Analysis

H. FUJITA, N. SAWAI, J. HAKURA, M. KUREMATSU

Abstract— Human computer Interaction based on emotional modeling has been investigated and reported in this paper. Human personality has been analyzed based on ego-gram analysis and accordingly human "SELF" emotional model has been created. We have created as one part a computerized model which reflects a human user (in this paper Miyzawa Kenji model) impeded as a computer model and through it, an emotional interaction between that model and the real human user is established. The interaction scenarios and reasoning are based on transactional analysis. We have implemented the system and empirically, examined it, as experiment in public space for revision and evaluation.

Keywords—emotional reasoning, human user interaction, intelligent interface, facial analysis, ego gram.

I. INTRODUCTION

THIS paper contributes to present part of our experimental work on building a virtual system based on Miyzawa Kenji art work observed on by his writing. Miyazawa Kenji born in Iwate, Japan on 1896
http://www.kenji-world.net/english/who/who.html
The interaction he portrays is never nonsensical, but always animated with an authenticity that rings true to the reader. Such rhythm represents or reflects certain cognitive behavior inside the stories through which the user may interact and feel the emotional or living part that he/she may interact. The conceptual way of thinking of Miyzawa Kenji can be reflected through Leibniz. Kenji analysis on space and time reflected through his Milky way scripts, mind and case based analysis, and many phenomena based physics based analysis reflected through science based structure novels. I will come to this issues latter part of this paper.
The paper is showing the state of art in making a system that can interact with human user based on a personality cloning. The cloning is based on analysis on the art work(manuscripts) of passed away person. The analysis is projected using art work of that person (namely Miyzawa Kenji). In previous work we have reported on this experiment [1]. Briefly, we have requested scientists specialized in the literatures that are aware of the scientific background of Kenji's art work. The analysis is been reflected from; his literature analysis view, physiological view on Kenji personality, and the physiological view on his thinking.

The objective of the system is to have hollow gram that can interact with the user based on the mental cloning of the subject person in the hollow gram (Miyazawa Kenji), and according to it we have the human user interacts with the system through facial based analysis (using universal Ekmann facial analysis). The whole system is shown in Fig.3. The user through a touch panel enter his gender type and age class type, the system measure/collect the user personality based on a concept we called it a universal templates, that is used to estimate the user profile based on the collected data. This would be explained in this paper in Sec.3. This paper ir organized as in the following. Sec. 2 presents the frame work of physiological framework based on transactional analysis. Sec. 3, the action decision model based on emotional reasoning, and it shows how we use the transactional analysis to create mental cloning based interaction between human and computer. Sec. 4, presents the system interaction namely Virtual Miyzawa Kenji, showing how transactional analysis is been utilized. Sec. 5 represents simply the forth coming phase related to the evaluation.. Sec. 6 is the conclusion.

II. HUMAN COMPUTER INTERACTION BASED ON PSYCHOLOGICAL STUDIES

We spent much time with computers for handle our information. However, we do all our best to adapt our self to computer more than having the computer to adapt itself to us. We think that there is importance to have computer systems (machine) understand our emotion and interact with us based on internal psychological reasoning and type of information.
The mind can be viewed as community of selves; Horowitz [5] proposed the *concept of a state of mind.* A state of mind is a relatively coherent pattern a composite of diverse forms of experience and expression that appear almost simultaneously. These states of mind are accompanied by characteristic expressive behaviors, tone of voice, facial expression).

Understanding the "self" of a human is not easy process by any machine. We have psychologically cloned the user main "self", based on the user physiological analysis, and modeling. The synchronic view (high degree of emotional representation to the environment) of self is also presented. The example of the mental user cloning we used was for Miyazawa Kenji whose manuscripts and writing been condensed by literature scientists and experimental analysis based on questionnaires. This introjection is to specify the physiological view of art work of this passed away person.

II.1 TRANSACTIONAL ANALYSIS BASED MODELS

Transactional analysis is a development approach of self perception and its impact. The theory discovered first by Eric Berne [7] and it stated that much can be discovered about an individual by analyzing the type of interactions (transactions) engaged in. As stated by Thomas Harris the type of transaction of a human is relation to other people is a consequences life position of that person at a particular moment. Life positions are real types of perception of self and others. TA (Transactional Analysis) suggested that we each had an *Inner Parent*, an *Inner Child*, and an *Inner Adult* personality parts that collectively determined our feelings, beliefs, and behavior. Berne [7] made it clear that analysis of transactions between ego states is the fundamental activity of a transactional analyst. He focused on ego states and transactions because they are eminently observable. Ego states and their representation as three stacked circles are the icons of transactional analysis.

The Transactional analysis life position is a function of the performance of a person and the attention received from other party (Kenji System). The assumption is that all people want attention preferably positive (praise, encouragement). But if positive attention is not given, negative attention is selected. The worst possible consequence would be to receive no attention at all from a transaction (engagement).

Self perception is an essential issue specifying attributes related to behavior. Acceptance of self, ability to accept and relate to others in positive prospective is a desirable outcome. It is essential to foster a positive view of self for each user.

Studies in PET(Positron Emission Tomography scan) discloses that normal brains operate like a network of interdependent minicomputers – (i.e. different specialized neural regions interact concurrently with each other and our organs to produce our conscious perceptions, thoughts, and physical and emotional feelings. These regions may correspond to what are called "subselves" in this presentation.

Subselves can be introjected. For example there may be an Audience (other people).

Kenji self observes, coordinate and execute decisions and promote basic harmony among the subselves.

Berne[7] postulated three basic ego states-Parent, Adult, and Child-each with an important function. Dusay [8] narrowed the large number of potential ego states to five: Nurturing Parent, Critical Parent, Adult, Adapted Child, and Natural Child. TA conceptualizes personality in terms of five functional ego states: Critical Parent (CP), Nurturing Parent (NP), Adult (A), Free Child (FC), and Adapted Child (AC). These five ego states have been widely researched with varying degrees of scientific rigor. A number of researchers have attempted to demonstrate reliability and construct validity for these ego states. The Tokyo University Egogram is reportedly very much in use in Japan. Egogram is a sort of psychological scales theoretically based on Transactional Analysis. Tokyo University Egogram (TEG) published in 1984 was a questionnaire with high reliability and validity. Since then, it has been widely used in various fields such as medical care, education, and industry. The second edition of TEG was published in 1993 after three years of basic studies. In this study, we investigated the use of TEG 2.0 for its personality application to predict the self of Kenji and the user for best interaction based on the finding of the self through experimental analysis of the egogram using TEG2.0.

The TA has been studied [9][10][11] for personality analysis, reflected in the TEG system for studying human personality. As specified by Berne and modified by Dusay [7] the five ego states are as below:

1. A nurturing parent subself: supports care, attention, and positive reinforcement.
2. An evaluative parent subself; critic, pusher, it reflects the norms and values of the society and set up standards and measures.
3. A central organizing subself, who is the self that often works with the observer and act as the leader.
4. A good socialized adapted child subself. This is obedient, conforming child who tries to please authorities, and it lacks creativity.

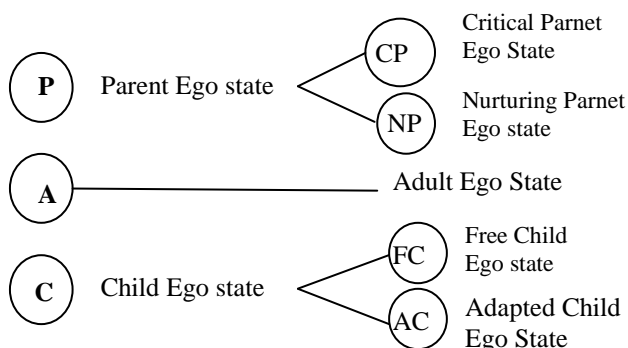A natural child sub self, creative, nonconforming, spontaneous and playful. (As shown in Fig.1.)

Fig. 1: The five ego states

II.2 EGO GRAM MEASUREMENT MODEL

The mind can be viewed as community of selves, (Horowitz [5] proposed the concept of a state of mind). A state of mind is a relatively coherent pattern a composite of diverse forms of experience and expression that appear almost simultaneously. These states of mind are accompanied by characteristic expressive behaviors, tone of voice, facial expression and etc.

The user ego is defined based on advanced analysis on the users. There are 50 experimental users who have been requested to enter their responses for 60 questionnaires of TEG based test. Each user ego gram has a key indexed in the data base. Please refer to Fig. 3.

Fig. 2 shows an example of types of transaction analysis between two person based on complementary transaction (Rogerian style), and cross transaction (non Rogerian style). We have used the one on the far right side for interaction between Kenji system and the user transactional engagement.

A survey has been carried out to collect data on Japanese subject persons of different gender (male, female), and different ages (children, adults and old age). Each person has entered their responses for questionnaires (TEG 2.0 based 60 questions).
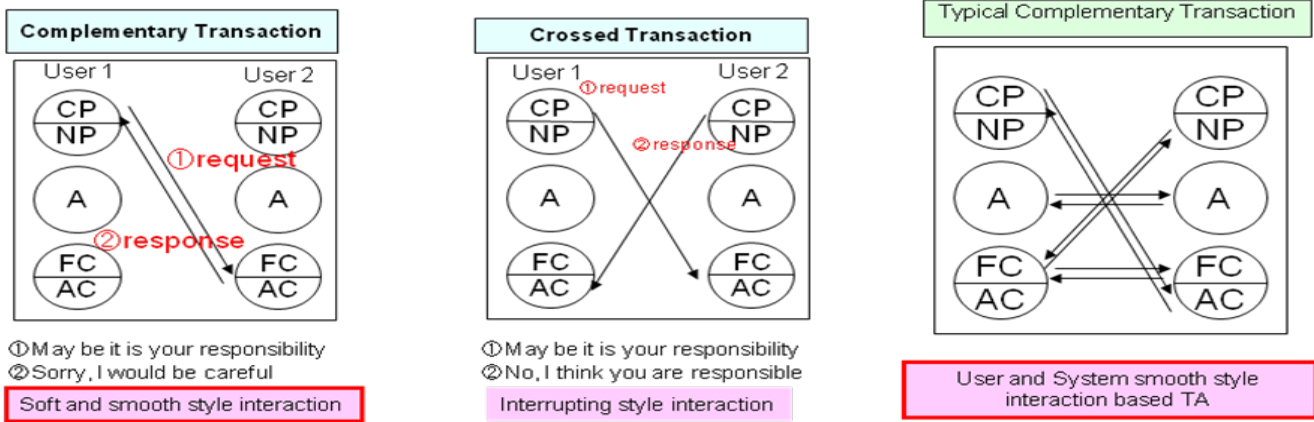
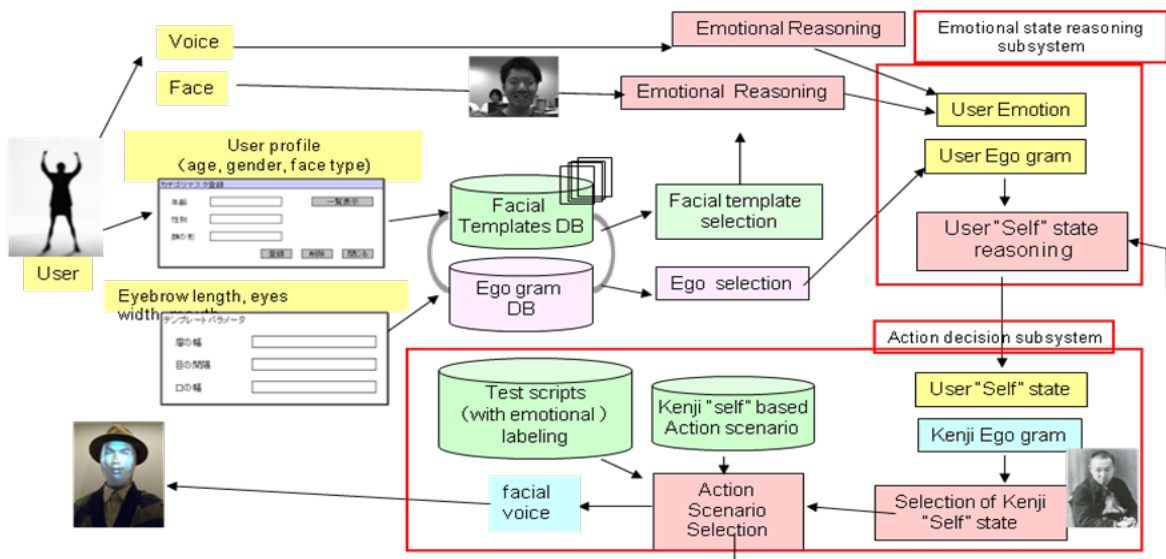Fig. 2: Different types of Transactions between two persons.

Fig. 3: The system outline

The user after entering the user profile information (gender, age range), would answer(response) to these 60 questions as Yes, Yes/No and No. The Scoring answers as specified by TEG would be 2, 1, and zero, respectively. The collected sum answer would represent their ego state as number and is shown as in Fig.3 The highest value would represent the
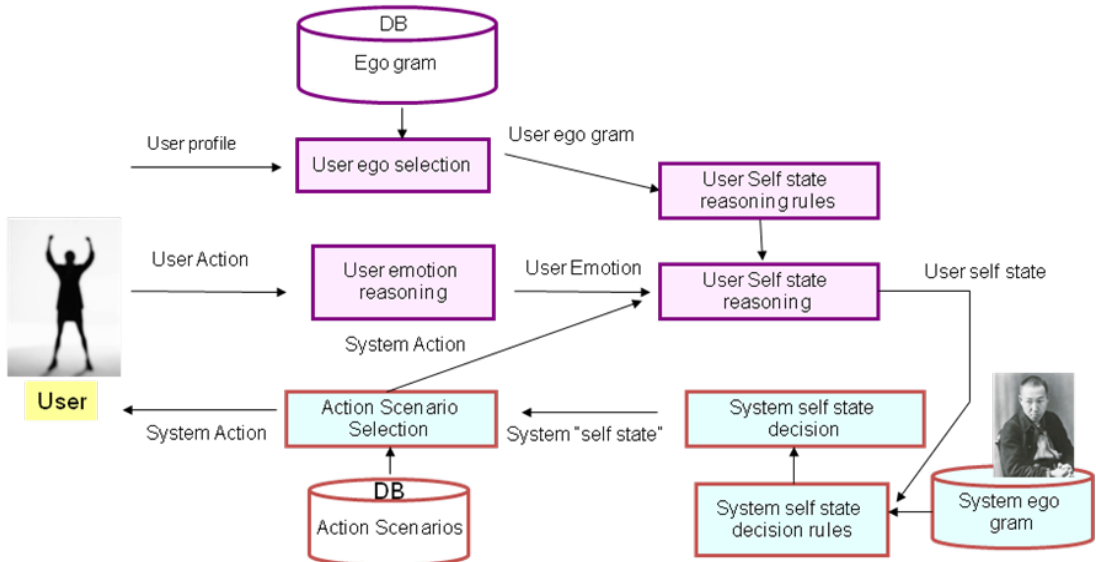

Fig. 4: The interanl system between human user and the Kenji System

best estimation of self state of that person as one of the any state in Fig.1 (also refer to Fig. 6). These ego gram and related values are stored in database as indexed. There are five categories of age class and these are: Child (6 to 12) years, Junior young (12 to 18), senior young (18~26), adult (26~45), Senior adult (45~60), Old (61~). These categories are set according to the educational system and working structure in Japan. 1st category to is related to elementary school class, 2nd category is related to intermediate school and high school. The 3rd category is relative to university class and young inexperienced workers. The 4th category is related to middle class workers of different slices. The 5th class is relative to experienced workers and advanced middle class. The last class is the old and retired class people. Such classifications reflect the relative social characteristics of people as general class reflecting each class personality and its relative characteristics reflected as specific specialization on each class.

Fig. 5, shows the face tracing movement on face parts using FSE version 4.of OKI Co. [17].

III ACTION DECISION MODEL BASED ON USER EMOTIONAL REASONING

Our system is as presented in Fig.3. The user when visiting Virtual Miyzawa Kenji, is sitting on chair where there is touch panel beside him/her. The user enters information by clicking on check box, on his gender selection box and age class box. The system uses a generative program to computer the user personality using what we have called a universal template [3]. In [3] we explain what is the universal templates and how is been used. The user face using the active appearance technology [4] as a computation model to compute and categorize the searching keys to localize the best estimation to select the best "fit" of the human user from the template data base. The Templates data base is a collective database of 50 persons samples data of human users collected for experimental purpose on human users.
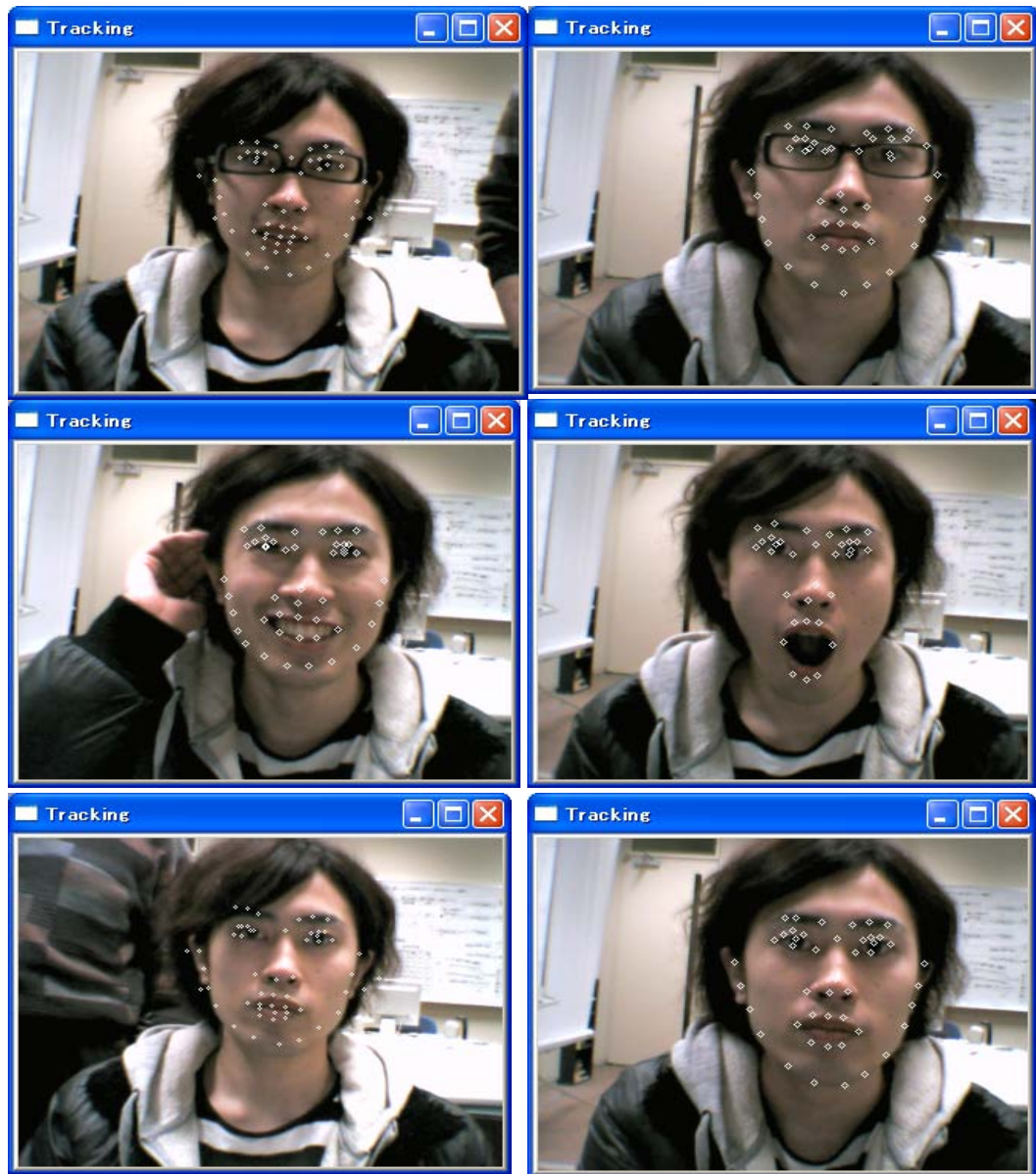
Each human user would record his Ekman six emotional act face (sad, happy, disgust, surprise, angry, fear) and neutral (no emotion). These 7 types of face templates are been categorized according the user gender key and age class key.

The localization of the user emotion is based a systematic estimation approach presented in [15], [16], that use Active appearance technology based on OpenCV which is a computer vision library originally developed by Intel. The AAM model is been created using OpenCV and Software Development kit (SDK). Recently thanks to OKI human sensing division [17] we could also extract the emotional feature from human face parts movement. There are features' points that detect the movement of the face parts as shown in Fig.5. This detection has been done using OKI FSE V4, SDK [17]. For the eyes center there is one feature point for each eye. For the eyelids there are 5 feature points for each eye. For the eyebrows there are three points for each eyebrow. There are 8 feature points for the mouth and three
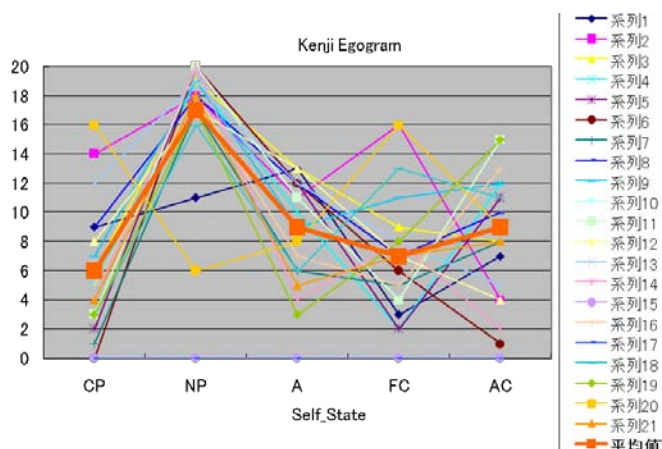
Fig. 6: The ego gram of Kenji based on survey

Fig. 7, Conclude the Kenji egogram from Fig. 6.

feature points for localizing the nose. Also, there are 12 feature points specifying the contour of the face from the ears down around. Using these feature points we can track the emotional feature of the human user based on the value difference between the tracked point and the labeling dictionary in the database specifying the best emotional estimation and the selection of the emotional state among the six Ekman universal emotional states.

IV. HCI FOR MIYZAWA KENJI SYSTEM

In this part we would discuss how to define and establish the "self" or internal mental mechanism through which the system (virtual Kenji), would use to interact with the mental self of the human user. We have used an experimental survey to collect data. Based on these collected data we have created the mental self of the Kenji system as would be shown in Sec. 4.1.

IV.1 KENJI EGO GRAM SELECTION SUB SYSTEM

The Kenji Ego gram has been studied and experimentally brought up using empirical analysis. Kenji personality and his answer related to the TEG Questionnaires have been carried using an empirical study analysis and analytical based observations. This has been done by requesting expertise and people who know Kenji art work and personality, These people have been requested to answer questions based on TEG 60 questionnaires asif they are Kenji himself. Their responses have been collected and analyzed to gather the ego gram of Kenji personality. As shown in Fig.6 the all relation (affiliation) between the ego state based on TA and the Related Label (value) computed using the TEG TA analysis. The bold think line in Fig. 6 or the relation in Fig.7 is showing the self state of Kenji's personality. The computation is based on the high values collected from the people answers. This accordingly determines the self of Kenji when he interacting with human user based on the ego gram shown in Fig. 7 or Fig.6.

The trait of extraversion-introversion is a central dimension of human personality. *Extraverts* are gregarious, assertive, and generally seek out excitement. *Introverts*, in contrast, are more reserved, less outgoing, and less sociable. They are not necessarily loners, but they tend to have smaller circles of friends,
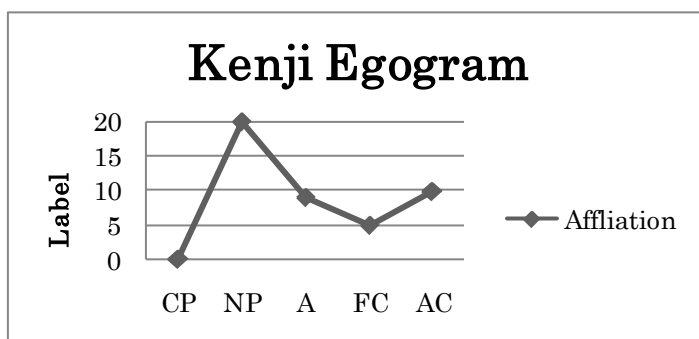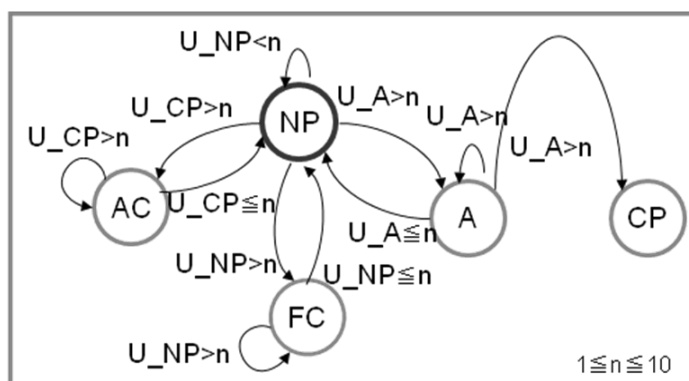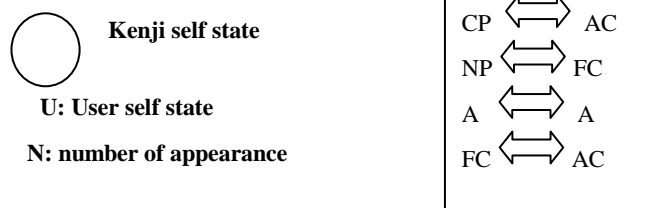

State transition of Kenji Self State decision

Fig. 8, Shows the transition state based interaction

and are less likely to thrive on making new social contacts. They generally do not need to seek out excitement in others because they are already stimulated with their own thoughts and imagination. Through this analysis we think above is reflecting the meaning of what we think Kenji «self» is.

Depending on this state, the user collected emotion when Kenji is speaking in a role act with a human user with emotion; the corresponding user emotion is also recorded and reasoned.

We think that the style of Kenji thinking is based on Leibniz [18] as expressed by M. Yoshimi in his book Kenji words (heart). This is related to looking to the issues from minutes things to larger parts, collecting the micro views and macro views in different prospective for analytical based reasoning. These collected images have been analyzed and reasoned in Kenji world in similar prospective as Leibniz sees. This has created an analogical cognitive based thinking into our system based on such analytical framework. Miyzawa Kenji as a Japanese writer has been reflected through his art work and scripts. His work has

Table 1:(User ego gram, Kenji emotion, user emotion）→（User Self state）

System (Kenji) Emotion

U s e r E m o t i o n		Happy	Sad	Angry	Disgust	Fear	Surprise	Neutral
	Happy	NP	NP	NP	NP	NP	NP	NP
	Sad	CP	NP	CP	CP	CP	CP	CP
	Angry	CP	CP	NP	CP	CP	CP	CP
	Disgust	CP	CP	CP	NP	CP	CP	CP
	Fear	CP	CP	CP	CP	NP	CP	CP
	Surprise	FC	FC	FC	FC	FC	NP	FC
	Neutral	A	A	A	A	A	A	A

Table 2: Show the style of Interactyion based Scenario between Virtual Kenji System and the human

賢治自我状態	朗読の進行	感情の込め方と強度	場面が変わる際の問いかけ	emotion
N P	朗読を続ける Continue act role	テキストの感情：中 Text emotion: medium	（user：child）「楽しそうだね」Looks fun! （User：adult）「聞いてくれてありがとう」 Thank you for your attention	Happy
F C	朗読を続ける Continue act role	テキストの感情：強 Text emotion: strong	（User：Child）「もっと面白くなるよ」It will be fun pretty soon （User：adult）「とても楽しんでくれてるね」 It is fund and enjoyable	Happy
A C	朗読を続ける Continue reading	テキストの感情：弱 Text emotion: weak	（user：child）「つまらないかな」No Fun! . （User：adult）「気を悪くしましたか」Sorry for boring you!	Sad
A	朗読を続ける Continue act rome	感情を込めない：なし Without emotion	（user：child）「面白いから聞いてね」It would be just fun! （User：adult）「楽しめていますか？」I think it was fun!	Happy
C P	朗読をやめる Stop interaction	感情を込めない：なし Without Emotion	今日はこの辺りにしましょうか Let finish till here, today! ぜひまた来てくださいね Please come again!	Sad

been analyzed by many scientists from different views literature side, psychological, and cultural side.

We have selected one piece of his art work script represented by what is called "Restaurant of many orders" or "Chumon OI Riyori Ten;" in Japanese http://www.aozora.gr.jp/cards/000081/files/43754_17659.html (Japanese). The same scripts "The Restaurant of Many Orders" http://www.kenji-world.net/english/works/texts/restaura.html (English).

However, on this stage, for simplicity, in this paper we assume that the style of communication between the user and Kenji' system is Rogerian style (based on Cal Rogers' work in psychology), which encourages the involved two parties in positive style of engagement based on empathic position assuming that they share to explore common ground. So there is no argument, where Virtual Kenji's commitment is to express the human user' perspective on the issue in subject and acknowledge the circumstances and context in which the user's position or perspective is valid.

As shown in Fig. 8 the state transition of Kenji's self change due to emotion state change of the user. Fig. 5 observe the user emotion state by computing the change in the feature points, and accordingly Kenji system can estimate the emotion state of the user as shown in Table 1, according the self state of the user and Kenji can be predicated as well. Table 2 is stating the related scenario that Kenji system would express to the user when a self change is concluded. The system implementation of Fig. 8 is shown in Fig. 9 and Fig. 10. That shows the snapshot of the system implementation.

IV.2 HUMAN USER RELATED SELF REASONING

Extraversion and introversion are typically understood as a single continuum. Thus, to be high on one is necessarily to be low on the other. That said, people fluctuate in their behavior all the time, and even extreme introverts and extraverts do not always act consistently.

Colin Ross is a highly respected veteran DID researcher and clinician, and past president of the International Society for the Study of Dissociation. In The Plural Self - Multiplicity in Everyday Life (1999), he writes (p. 193) that *multiplicity - having a multi-faceted (modular) mind and self - is normal.*

In a psychotic state a person, elements of the unconscious intrude into the conscious ego. If the intrusion is partial the ego may merely continue to exist with this unassimilated element. If the intrusive element is integrated into the ego, the ego may identify with it and accept it as an ego-derived element. In a neurotic the conscious element of the ego remain in control of the psyche, in a psyche the unconscious elements are in control. Berne proposed the theory of personality (called as structural analysis we mentioned in the early pages of this paper), and theory of interpersonal relationships. He used the term ego state which is a coherent system of feelings and behavior patterns. Complete ego states can be retained in the memory permanently. The defense mechanisms can operate upon complete ego states. Structural analysis is concerned with analysis of ego states. Berne classified the psychological processes of the person into three parts. Parent identifying ego state, Adult; data processing ego state, Child; regressive ego state. The Parent ego state parallels the superego in psychoanalytic theory. The Adult ego state is concerned with transforming stimuli into information. The Child ego state is reacts impulsively using prelogical thinking and poorly differentiated and distorted perception. People are always in some ego state. They can shift from one to another and these ego states are usually, Parent, Adult or child ego states.

The system would look to the user in a time period of 10 sec margin for reasoning. Kenji system is the initiative to talk with the user. The stem estimate and compute the emotional state of the user while Kenji system is talking, to collect if there is any change in the emotional state of the user. At the initial state the user emotional state is set as determined by the best match of the that user with the best estimate for the selected ego gram that set with the user personality(as explained in previous section). Then the user initial personality set is been selected. Then the system (i.e.,Kenji) would talk and check

and collect if there is any change in the user emotion according to the rules shown in Fig.11. If there is a change then Kenji
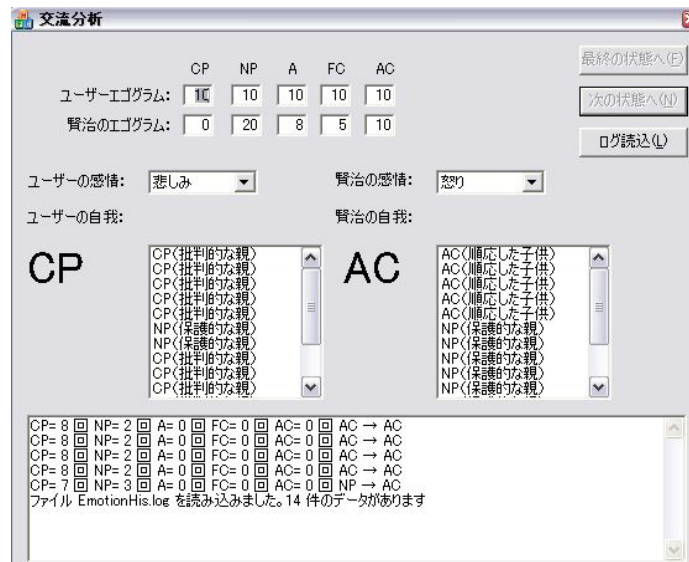

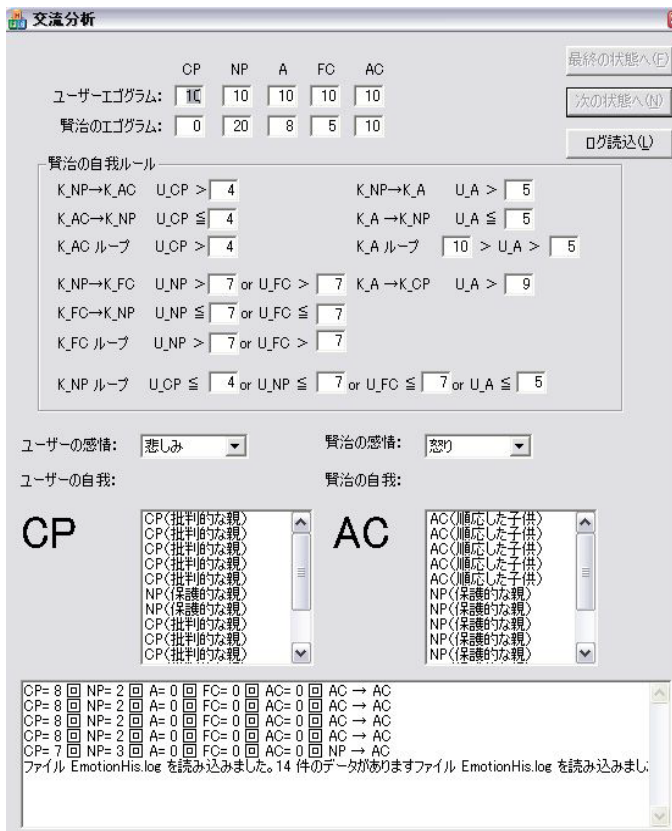Fig. 9 the implemtation of Table_1 Kenji self and user self

Fg. 10 State Transition implentation of Fig. 8 and Table_2

would record this state and select the appropriate action to that state. The action can be represented by appropriate transaction state, selected among the 5 states mentioned in Fig. 1. The system should have a trace to all states so that it can return back to it original state when there is no specific emotional state change in the user emotions.

As stated in Fig.11, rule 1, if the user emotion state is neutral, this reflects that the user is adult state, in the term of TA. Rule 2

represents that if the user is happy state, then the user is nurturing parent state.

Rule 3, if both the Kenji system emotion state and the estimated user emotion state is the same, then the user emotion state is NP. On Rule 4, if the estimated user emotion state is surprise then the user state is FC. In Rule 5 if the estimated user emotion state is «angry» or «sad» or «disgust» (negative response) then the user emotion state is CP. The priority sequence of these rules is rule 1> rule 2> rule 3 > rule 4> rule 5. Table 1 represents the relation between Kenji emotion state and user emotion stae as specified in these rules in Fig. 11. The implementation of these rules is shown in Fig. 9 and Fig.10 and it is as follows:

Self state   Condition

K_NP→K_AC   U_CP＞4

K_AC→K_NP   U_CP≦4

K_AC ループ U_CP＞4

K_NP→K_FC U_NP＞7 or U_FC>7

K_FC→K_NP U_NP≦7 or U_FC≦7

K_FC ループ U_NP＞7 or U_FC>7

K_NP→K_A U_A＞5

K_A →K_NP U_A≦5

K_A ループ   10＞U_A＞5

K_A →K_CP U_A＞9

（Transition finish）

※ K_CP→K_A and K_CPループ not exist.

K_NP ループ U_CP≦4 or U_NP≦7 or U_FC≦7 or U_A ≦5

V EMPIRICAL MEASUREMENT AND EVALUATION

The system has been implemented and to be exhibited at an experimental show on February 10~14 at city hall for evaluation by expertise and literature scientists. Also on exhibition at Seishkan museum, Morioka city, Japan., from April 25, 2009 to August 10, 2009.

On the 1st experiment was observed the following issues:

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1. User emotion＝ {Neutral} → A（Adult）
2. User emotion＝ ｛Happy｝ → NP（Nurturing Parent）
3. User emotion＝Kenji System emotion → NP
            （Nurturing Parent）
4. User emotion＝ ｛Surprise｝ → FC（Emotional）
5. User emotion＝ ｛Angry｝ or ｛Sad｝ or ｛Disguest｝
   or ｛Fear｝ → CP（Critical Child）

Fig.11, User-Kenji self states reasoning rules

The mental Kenji system interaction was successfully estimated the human user emotional state and according interact with the user based on that mental state estimated measurement. However, we noticed that the user is expecting that the system interact with the user in explicit way. The scenario specified by Fi.11 and table 2, is not suffici8ent yet. There are other related aspects that should be taken into account to enhance the interaction that would participants to

entertain the user but without sacrificing the ego state of Kenji self.

VI CONCLUSION

This paper is reporting a progress status of our project related to mental cloning based concept on how to reason and represent human emotion in scientific way and use that emotion to reason with human user. Miyzawa Kenji (a well-known literature person), has been examined in this work. His artwork manuscripts have been examined by literature expertise on Miyzawa Kenji. Their views have been integrated into our representation in Kenji ego gram. Using this with other related information we could create a system that can interaction with the user based on Transaction analysis. The system would be examined in Beta space at http://www.hellomorioka.jp/seishunkan/

Seishunkan Museum in Morioka city, Japan. This would have people (human users) interact with Kenji system to experience his emotional transition to evaluate Kenji personality and his transactional based analysis with human users. The collected data of the evaluation would be examined to revise Kenji personality. The personality is reflected from majority of answers that reflect how people can look to him through his work and the gathered cognitive thinking on him. As the person has passed away, we think this approach may contribute to create the foundation of mental cloning based computing that can contribute to establish the best engagement and harmony between human and machine taking into consideration the human emotional recognition as computational mechanism in this interaction.

Emotions are expressed through changes in speech, facial expression, posture and physiological processes and these changes provide essential clues to a person beliefs, desires, intentions and likely future behavior understanding of the cognitive and social function of human emotion complements the rational individualistic and disembodied view of cognition that underline most recent cognitive research.

These issues would be examined more extensively in forthcoming paper.

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H. Fujita (ACM Senior member):

Dr. Hamido Fujita, is a professor at Iwate Prefectural University(IPU), Iwate, Japan. He is the director of Intelligent Software Laboratory.
He has directed and led many project sponsored by the Ministry of Science, Education and Culture of Japan, and others from International sponsors and Japanese company sponsors project on new software methodologies.
Also, he is the founder of SOMET organization, and ARISES. He published books in IOS press. He guest edited several special issues on International Journal of Knowledge based systems, Elsevier. Also, he has editor role in this journal since 2008.