

Logical Reasoning and Emotional Response System using Structured Association Technique

Takashi UOZUMI*, Yasuo KUDO**, Yoshihide OOBAYASHI**,
and Tsunetsugu MUNAKATA***

* Dep. of Computer Science and Systems Engineering, Muroran Institute of Technology, Japan

** Venture Business Laboratory, Muroran Institute of Technology, Japan

*** Inst. of Health and Sport Sci., University of Tsukuba, Japan

Abstract: There are several methods to implement the logical machine reasoning such as a frame theory and a production system of artificial intelligence. And these algorithms can explain the obtained result through the inference processes. However, emotional (*KANSEI*) patterns are not so easily implement. One of reason is that some emotional expression is the result of process from unconscious level to conscious level, and not easily identified the original unconscious causes. Therefore, a function of *KANSEI* database needs to structuralize unconscious level. Our approach is to develop the computerized counseling support system which can structuralize the unconscious brain functions from the view point of the psychology with focusing physiological and emotional responses. Especially, development of the algorithm that can form the network from unconscious to conscious using the image recollection is the application of the structured association technique (SAT). The developed system was implemented on the Web using CGI and emotional network database.

1. Introduction

Considering the historical process of the artificial intelligence, the structure of the logical knowledge has been established using Lisp and Prolog languages, and then now implemented with the Object Oriented language such as C++ and Java. Logical process can explain the obtained result through the inference processes. On the other hand, the structure of the nonlogical *KANSEI* is not established yet. One of the reasons is that the *KANSEI* compose from the instinct level to the emotional level such as like/dislike and safe, and the perception level through the sense, to more high level such as recognition and memory related. The physiological structure of those levels is the focus of the brain research field. Another difficulty is that *KANSEI* is formed from unconscious level to conscious level, holding a parallel characteristics contrast to that the logical cognition mechanism is

based on a serial and conscious level. Most of the case, it is a difficult to point out the reason.

Approach of *KANSEI* engineering is necessary to have ways from an application and an implement direction to structuralization of *KANSEI*. We are interesting to construct a user-friendlier interface, and in such a case computer agent need to have an ability to understand the psychology of a user. There are many counseling system. Among them, Munakata developed a health counseling system that is based on the structured association technique (SAT) [1,2]. Our aim is to develop the system that contains the self-counseling system and the physiological data acquisition system such as ECG and respiration synchronized with the questionnaires. Application of the system is intended to the support system of the counseling and the user-friendly computer agent system that can understand the user's *KANSEI*.

2. Structured association technique and fundamental data acquisition

The structured association technique is the counseling method developed by Munakata and used for the education of skilful counselor and the self-counseling method. The method is fundamentally based on the emotion of the client. Starting its emotion as a trigger, a client is trying to find out the cause using associated images. In that situation the counselor is not a consultant or advisor, and then does not show his/her opinion. The clients have to find out the cause of trouble by themselves. Therefore, it is possible to change the behavior of the client.

We have developed several computerized systems and can be used on the Web (Fig.1), such as MMPI (Minnesota Multiphasic Personality Inventory) as a psychological analysis system [3] and TEG (Tokyo University Egogram) as a pattern of personality [4,5]. MMPI is structured as a rule base system and easily implemented on the computer and obtains the result immediately. TEG is also clustered its characteristics pattern using Fuzzy theory.

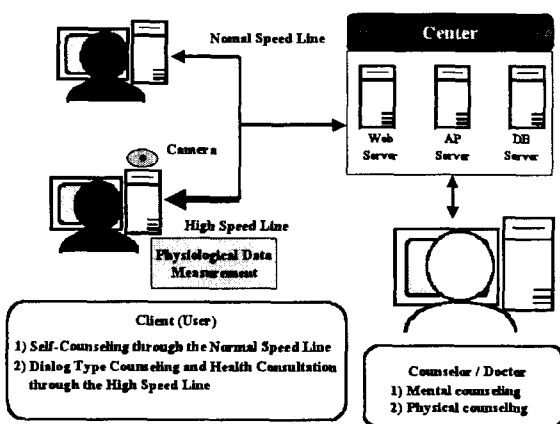


Fig. 1 The health counseling system on the Web. The mental and daily physical data can be sent to the database of the center.

Munakata system is also equipped many check lists from adult to elementary school children (Fig.2). The counselor can select a proper item from the

menu, adjusting the situation of the client and obtain the fundamental profile of the client (Fig.3).

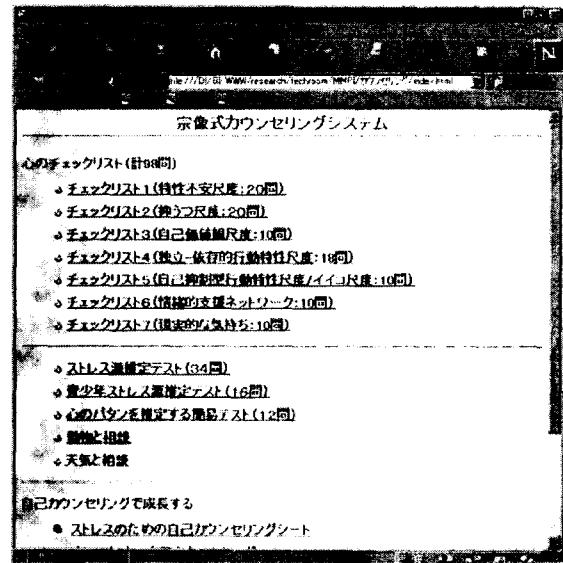


Fig. 2 The fundamental check lists such as a stress and a depression.

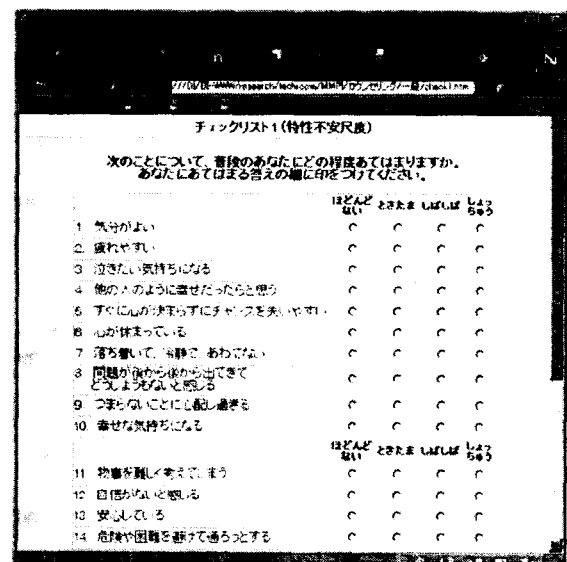


Fig. 3 The Web based checklist using CGI (common gateway interface).

3. A solution of a problem by the image association method

Most important point of SAT is based on the images using right brain and a self-finding of the source that is annoying the client and makes

behavioral change of the client. For example, suppose that the client want to take some action, but it is hard to do. Step 1 of SAT is the hearing or describing stage of the action. Step 2 describes the feeling that obstructs the action of the client. At Step 3, the feeling is related to emotion, and then tries to select a suitable item from the structured table of emotions. At Step 4, imaging its emotion, try to select a soul message from the table. The message is related with some key word and then selects the proper word at Step 5. At Step 6, remembering the experienced image in times past and try to correct the image to what would be. Repeating these Steps and finding the cause of the problem under the unconscious level is SAT method. SAT for counseling is mainly applied to find a negative cause, however also applicable to a positive effect. A positive experience is easy to search its image under the conscious level, but a negative memory is tend to driven away to unconscious level. For a healing system and an image training system, a suitable combination of the activation and suppression system is interesting as for an application of SAT.

4. A natural language analysis and self-counseling

As mentioned at previous section, counseling for the behavioral change process a series of steps refer to the structured tables, but some step include a description of a natural language. Input sentences are processed with a syntactic analysis and a semantic analysis method. Total data from a checklist to descriptive information can be stored to the formatted database as a reference for the counselor [6,7]. For the current technical levels, it is a difficult to make a fully computerized counselor. However, an acquisition of fundamental data, a structured process of self-counseling and a physiological data that related to the response for the questionnaire as describe at next section are useful information.

5. Measurement of KANSEI and health

information.

Electronic version of the diagnosis by the psychological query becomes a more sophisticated system by using more wideband communication line and it enable to send a fine image of the client's face such as blink, gaze or even the color. And ECG and blood pressure data can be send at the same time by combination with a commercial physiological data collection system. The electronic camera can be used to analyze eye movement that response to the query context, ECG shows an index of the activity of sympathetic and parasympathetic nerve and blood pressure is an index for daily health condition. Synchronized to the questionnaire, physiological data can be monitored as shown in Fig. 4. The correlation diagram between R-R interval and P-R interval is also good index for the relaxation [8].

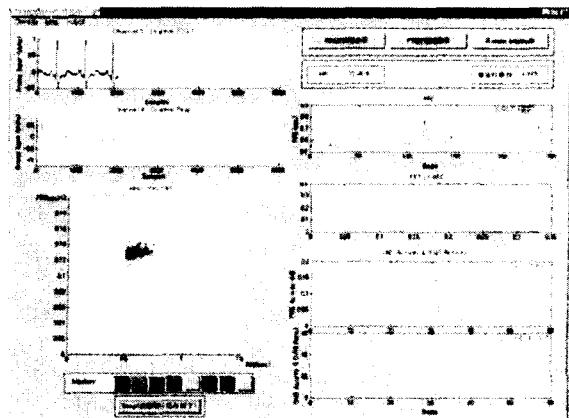


Fig. 4 The monitoring system of physiological data such as ECG and respiration. The correlation between R-R interval and P-R interval is shown in the bottom left.

6. The system configuration

Developed Web-Based counseling system is composed of several subsystems. As shown in Fig.1, the client side has two types of network lines, one is a normal speed and the other is a high speed special

line. The former is used for a counseling with the checklists only. The latter is equipped with an electric camera and the system can accept a face-to-face communication with a counselor. This system is also connected to a physiological data acquisition system and is used for a medical counseling and a consulting. The database systems have three tiers considering a network traffic and data securities. All programs run under the Windows environment.

7. Discussions

Web version of MMPI, self-counseling and TEG system combined with physiological data measurement devices has been developed. Application is two ways. One is to use for a counseling support system such as the young mothers who are in trouble with her childcare and can be applied to other field like a college student and an old person. Some data shows that daily check of blood pressure at home reduce medical expenses. This is a quite important issue to reduce medical expenses in our country. Several commercialized health data measurement systems are now on the market. However, many systems are used for a physical check and a mental check system is usually not included. A physical condition is not unrelated with a mental condition, so our health counseling system is intended to aim at mental and physical health.

Another application is to collect data to construct the *KANSEI* database. There is a tendency of increasing number of consultation and stress source seems to be changing compare with few decades ago. In our country, the total system of mental and health care is not fully established.

Because young people gets accustomed to the portable telephone system easily and access to

various Website, counseling system through the Net might be useful for the early stage of counseling. It is usually difficult to obtain a mass of psychological data using a conventional questionnaire sheets. However, Web-Based system with a proper data-mining program can handle such a case.

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