

# A CONSIDERATION METHOD OF INFORMATION CONTENT TO BE APPLIED FOR THE DEMENTIA SITUATION AND THE “YUBITSUKYI” SYSTEM

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**Abstract:** The communication among the blind deaf persons and others became more easy than before using the “YUBITSUKI” system. When they become dementia it is estimated that the “YUBITSUKI” system shows some information processing signal of the situation corresponding to the dementia situation. Therefore, it is important that the structure model of information process and information content applied to this situation are made clear. In this paper, firstly the outline of the “YUBITSUKI” system working is described and the necessity of analysis of information structure of such communicating situation is shown. As a result, it is described that it is important for the new information content different from the Shannon’s ordinary information content to be introduced into the analysis of information process of dementia and its communicating structure with the “YUBITSUKI” system, and an example of consideration with regard to the elements of the new information content is proposed on the basis of discussing Peirce’s semiotic and other concepts of some information elements.

## 1 INTRODUCTION

The “YUBITSUKYI: the name of terminal of a communication tool” system has been developed for the blind deaf persons to communicate with each other and with other people (of course involving the ordinary people). And it has been researched by authors for the “YUBITSUKYI” system to be embedded into the Life Support System which has been developed from the Expanded EMR (Electric or Electronic Medical Record) system as a communication module system among the handicapped persons, especially the blind deaf persons and the others to involve the ordinary people. Here, the word “the Expanded EMR system” (which is the system that authors have subjected from the beginning.) is used as a name of the system which has wider and deeper concept than ordinary EMR has. Then it has been estimated that the Life Support System shows some useful signal data containing the information to be able to find the

dementia situation, especially to be able to find the dementia of blind deaf persons by discussing the information of operation of such YUBITSUKYI system as a module of the Life Support System. And the consideration of such operating information is very important and useful to analyze the information process and the communication state among the blind deaf persons and others. Especially the quantitative consideration of the information process is not only important and useful but also needed to analyze the information and communication mechanism in dementia situation not only of the blind deaf persons but also of others (including the ordinary people). The dementia is caused by the disease of brain and by any other many reasons. In the dementia situation some difficulties are made in the brain and nervous system, and the patients of dementia lose their memories and discernments and so on, which were obtained before. As a result they have some big difficulties on their ordinal life styles. Especially the Alzheimer’s disease not only makes

the big obstacle on memories for recognition, but also makes the disease progressive. Furthermore the frequency of its arising becomes higher and higher as the age becomes older and older, and there is the case that it cannot be found when and where this disease arises. Therefore nowadays this disease is seamed as a difficult disease of nervous system which has been making some social problems. On the other hand the blind deaf persons are the handicapped persons who have the double difficulties not only on the sense of sight, but also on the auditory sense. For this reason their dementia situation is very difficult to be found with the method for ordinary people. But recently some their communication methods have been developed, for example, the finger Braille and the "YUBITUKYI" system are those ones. [see Figure 1, Figure 2, Figure 3] As a result it has been estimated that using such communication methods the dada of dementia of these handicapped people and the other relational data are obtained. Therefore firstly the outline of the "YUBITUKYI" system is described and the discussing points of its communication process with regard to information content are considered. Secondly considering the application to the dementia of them and ordinary people the Peirce's Semiotic are discussed to analyze the recognition process of human being and introduce the new information theories and contents by the consideration of virtual reality. Thirdly on the idea of the interpretant which the Peirce's Semiotic introduced and named an example of a first step of new information content and method of analysis of such dementia situation is proposed and the related concepts are described, there, it is described that as the quantitative expression method of the Shannon's information theory is not sufficient for such dementia situation this kind of new information content and new analyzing method are needed to be introduced for quantitatively analyzing such dementia situation (involving ordinary people's dementia situation) and the structure of communication process of such handicapped and dementia people. Finally in the conclusion and further works it is shown for the new information content to be able to be applied to the dementia situation.

## 2 THE OUTLINE OF FUNCTION OF THE "YUBITSUKYI" SYSTEM AND THE CONSIDERATION OF ITS INFORMATION PROCESS

In today's Japan it is seamed that there are about 20,000 blind deaf persons. Therefore from this point of view it is estimated that there are more much blind deaf persons in whole present world. But until now the sufficient support system of them has not yet developed, though it is so, recently some communication systems have been developed although they are not sufficient. For example the Finger Braille and the "YUBITUKYI" system have been developed. [see Figure 1, Figure 2, Figure 3] Here the outline of functions of the "YUBITUKYI" system is described. The "YUBITUKYI" system has been developed for the blind deaf persons to communicate with each others and with other persons. Now it is discussed for this system to be embedded as a module into the Life Support System which is expanded from the Expanded EMR on the base of Linux Operating System. And this system is made on the basis of the Finger Braille communication technique. Then it is estimated that the Life Support System can show the information corresponding to the dementia situation and the quantitative information process of them through the "YUBITSUKYI" system of its a module. The "YUBITSUKYI" system is a kind of system to communicate among the blind deaf persons and others. The word "YUBITSUKYI"(see Figure 3) is the name of this communication terminal tool in the "YUBITSUKYI" system. The "YUBITSUKYI" system is made by the use of vibrating points of the tools "YUBITSUKYIs". In the finger Braille technique the total six fingers of right and left hand from the index finger to the third finger are used along the method of the Braille system to have two kinds of expression point patterns of Convex side and Concave side. Here Japanese point patterns are treated and discussed to consider the information content with regard to the dementia situation. The finger Braille technique in Japan has been developed in the direct touch method to be able to send the finger patterns meaning Japanese characters to the blind deaf person from the transmission side partner on the basis of the Braille rules. In the Figure 1 a Braille pattern of Japanese character "ka" is shown, and it is shown in symmetrical patterns of expression of the Braille. The finger Braille patterns are made in the corresponding number fingers to

show a character of the Braille patterns. The “YUBITUKYI” system is constructed to use this finger Braille patterns of characters, that is, the pattern made by the six vibrating points of its mobile terminal devices “YUBITUKYIs” can give the character patterns corresponding to the patterns of six fingers of the finger Braille.

The “YUBITUKYI” is the electrical devices which have been improved at present. Therefore, the data of the “YUBITUKYI” can be treated with electric methods and its data processing is made with electric signals processing and their transformed signals processing. At the same time, those signals processing can directly give the information in the data of the “YUBITUKYI” system as the information processing data.

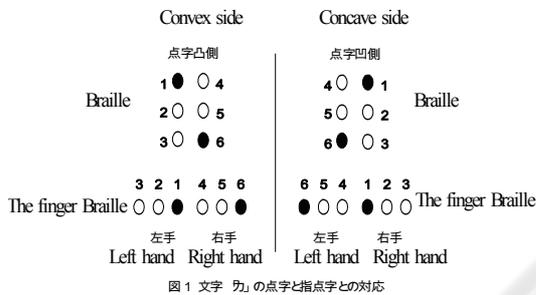


Figure 1: The correspondence of Braille and the Finger Braille.



Figure 2: The Finger Braille.



Figure 3: The ” YUBITUKYIs” (Left:Ver.1, Right: Ver.2).

Holding the joysticks and vibrating the vibrating points of the ” YUBITUKYI” terminals with both hands the users can send and receive the conversation signals from each joystick terminals. When the users need to transmit their communicating information signals to their companies, they can send those signals to strike 1-6 vibrating points of the ” YUBITUKYI” terminals. And when they want to receive those signals from their partners they are able to receive their partners communicating information signals from the vibration of 1-6 vibrating points of the ” YUBITUKYI” terminals. As a result the mutual communication among such users have become easier than before. And the “YUBITSUKYIs” are portable terminals and the users are able to ordinarily and freely walk carrying them and to use them anytime and anywhere. Furthermore, the “YUBITUKYI” system has some optional functions, for instance, a REPEATER TAG function, a BROADCASTY function etc. The “YUBITUKYI” system can receive the telegram message of Braille from the attaching TAG to every objects which has the recorded memory about the object for it to be pasted to, therefore the blind deaf persons can know the information of characters of the object, for example, its existence position, size, material character, form, other necessary characters and so on, from the signal of TAG without direct touching of the object, although they could not know those characters without direct touching of the object before the” YUBITSUKYI” system had not been developed. Namely, by the using such function the blind deaf persons can get their present and surrounding information without contacting the objects directly. Moreover, the BROADCASTY function of the “YUBITSUKYI” system can give the users the telegram messages translated by the computer into finger Braille, and can broadcast these translated messages, and can display the text document. Even if the partner of users does not know finger Braille technique, the natural communication among such people can be performed immediately using such functions. Nowadays the blind deaf persons are intercepted from almost all information media, such as television and newspaper and so on, and it is difficult for them to talk even with their family. As a result today is the indispensable system for the blind deaf person in order to live among the healthy persons. As the expanded function the equipment like the voice input interface, such as a microphone, can be used in the processing of communicating information of the “YUBITSUKYI” system. There

the communicated voice can be translated into finger Braille, and can be transmitted to the blind deaf persons with such function as a module of the Life Support System expanded from the Expanded EMR system on the basis of Linux system. Furthermore, ordinarily the blind deaf persons cannot directly understand the automatic voice guidance service used recently, but the "YUBITSUKYI" system can solve such problem and make the communication between the users and automatic voice guidance service. And the "YUBITSUKYI" system embedded into the Life Support System can make the measurement of signal changing from ordinary situation, that is ; it is able to be measured that the other conditions are added to the original signal. Therefore, in order to make the diagnosis of disease to affect the communication the "YUBITSUKYI" system and the equipment system like the voice input interface are able to be estimated to be used as a module of the Life Support System. And it is also able to be estimated that the "YUBITSUKYI" system can give the diagnosis of early dementia not only of the blind deaf person but also of the ordinary people by analyzing its data to show the changing and in a sense abnormal state from the ordinary situation.

Then it is needed for the information processing structure and information contents obtained from the "YUBITSUKYI" system to be discussed. Here going into the first step of discussion of the information processing structure and information contents of the "YUBITSUKYI" system of a module of the Life Support System the most simple case is taken up for discussion of the information processing structure and contents applied to the dementia situation. That is; although the joysticks of the "YUBITSUKYI" terminals have total 8 vibrating points the 2 points in those are the points for the functions of its system. Therefore the 6 points of them are considered, which show the fundamental Braille in Japanese. In this case the information content of the "YUBITSUKYI" terminals is 6 bits if it is calculated by the Shannon's theorem when the active state of vibrating points of the joysticks is able to be defined to be the events of the Shannon's theory meaning the ON or the OFF. As a result total  $2^6 = 64$  patterns of Japanese character can be considered. And as each pattern can express each character of Japanese the combination of such patterns constructs some Japanese words and sentences. If ordinary state, it is able to be forward assumed that such 64 patterns are alphabets of information source and their alphabets can

synthesize Japanese words and sentences and on this assumption the analysis of information process and communicating structure among users is able to be performed. But if the dementia situation is treated, for the characteristics of dementia like the difficulty of remembrance the event of the ON or the OFF is not necessarily able to be made clear when vibrating 6 points of the joysticks. Then inevitably the character patterns are not able to be recognized and understood clearly and definitely. Therefore, the discussion of information content idea over the Shannon's theory is needed for the analysis of information process of dementia situation. Now some directions of consideration of the new information content exist. For instance, at least the following 3 cases are able to be considered.

Case 1: Considering the information content entirely and essentially different from the information content of Shannon's theory. This case has studied by authors in parallel, but this case will be taken up in other paper. .

Case 2: Considering the information content from the stand point taking account of the Philosophy and the structure of the recognition of human beings. This case has been advanced by authors to some extent, and has been presented in this paper considering the Peirce's Semiotic.

Case 3: Considering the information content from the stand point taking account of the concept of Fussy Set to be applied for the dementia situation and to be expanded over the information content of Shannon's theory. At this time this case 3 is not taken up and will be taken up in other papers.

In this paper the Case 2 is treated and discussed to introduce the new information content by examining the Peirce's Semiotic and the virtual reality. The dementia situation has its special recognizing spaces different from the ordinary real spaces. It is able to be said that this situation has something like virtual spaces and the analysis of virtual reality is overlapped to the analysis of the dementia state. From this point of view it is estimated that the consideration of the Peirce's Semiotic and the virtual reality are useful to analyze the dementia situation. The virtual reality is generally understood like a pseudo experience of various senses and a kind of the situation which is caused by virtual world formed by some computer technologies and an electronic network systems. And it is seemed too like an appearance and form being not source substance itself.

### 3 THE CONSIDERATION OF THE PEIRCE’S SEMIOTIC AND THE VIRTUAL REALITY

From the today’s definition it shows such meaning as “Existing in essence or effect though not in actual fact or form”. Namely, this word of “Virtual” means that the appearance of the object is different, but the effect of the object is almost same. The real world objects have something to come from the essence of them, and from such meaning the virtual objects must be able to have something to show the equivalent effect for the essence of them. That is; some characteristics of the virtual reality are artificially realized by the human being extracting the important elements and essences among components of the real world, the virtual reality can be said as "artificial reality". The virtual reality gives us such a sense as there exists what is not existing really on the front of us as the thing to be observable. Therefore, the human recognition system and its mechanism are needed to be discussed from many sides to include a consideration of the Peirce’s Semiotic. Although many modern researchers of virtual reality recognize the forming of virtual reality on the epistemology of Kant, but the consideration of virtual reality on the basis of the epistemology of Kant has following two problems, that is;

- (1) there is no sign of the semiotic view to be able to make the object evoke the subjectivity, and
- (2) the existence of the thing in itself which we cannot know is recognized.

On the other hand, the process of recognition of human being is analyzed more detail in the Peirce’s semiotic consideration than the one is analyzed in Kant’s epistemological consideration. Then here it is needed for the Peirce’s semiotic consideration to be discussed to reconsider the basic mechanism of recognition process of human beings. Peirce defined a sign process as Triadic relations. Namely, "A sign, or representamen, is something which stands to somebody (interpretant) for something (an object) in some respect or capacity”. Here, these words “representamen, interpretant” are introduced into Peirce’s Semiotic, therefore although the information contents are discussed in this paper we use these words in the discussion of information contents after this.

Here let’s consider the triadic relations example, that is; a hunter finds a damaged certain tree in a forest and supposes that a deer is in his neighbourhood. In this case, as shown in the following figure 4, the triadic relations are structured among the "a wound (a sign) of a tree", the "deer (an object)" and the "knowledge / experience (interpretant) of a hunter". And this triadic relations give a kind of sign process on the Peirce’s semiotic.

Here, the arrow (1) suggests that “a deer” causes “a wound of a tree”(Diadic relations), and the arrow (2) suggests that “a wound of a tree” makes a hunter know that there is “a deer”(Triadic relations). Namely, here two relations are considered, the one (arrow2) is from “a wound of a tree”(sign) to a deer ( object) and the other(arrow1) is from a deer ( object) to “a wound of a tree” (sign). These facts mean that there are two objects, that is; the one (a deer) which makes the sign (a wound of a tree) and the other (existence of a deer) which is made by the sign (a wound of a tree). Therefore, it was proposed by Peirce that the Immediate object must be distinguished from the Dynamical object.

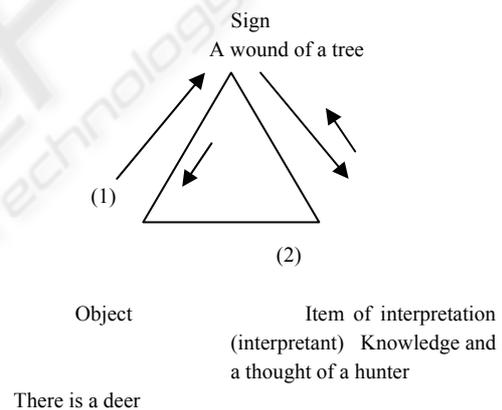


Figure 4: Triadic relations of a sign process.

Here the Immediate object means that it is expressed with a sign and include hypothesizes or virtual things, and the Dynamical object means the real existence which cannot be expressed with a sign, which can be only indicated and it is put in the interpreter’s hands to find it. From these elements the evolution models from an Immediate object to a Dynamical object are able to be derived and through the revision of interpretants finally the Final interpretant is obtained. As a result the Peirce’s Semiotic concept can show a framework of recognition system and mechanism of human beings and support to understand the virtual reality. Furthermore, it is estimated that such Semiotic

concept includes the information theory which gives the new information contents over the ordinary information content in the theory of Shannon.

#### 4 THE CONCEPT OF THE NEW INFORMATION CONTENT EXPANDED FROM PEIRCE'S SEMIOTIC

Considering the information process on the Peirce's Semiotic, it is estimated that there are various kinds of information contents different from the Shannon's information content. The Shannon's information theory uses the probability theory in which each probability is distributed to such real events as recognition objects, and the information content is quantitatively defined considering the events which are subsets of the whole set of unit elements and the probabilities given to them and the logarithm calculation. But from the Peirce's Semiotic the objective event understood by the interpretants and the recognition of their situations are needed to be introduced into the definition of information content. That is; the concepts corresponding with the interpretants of Peirce's semiotic are not able to be neglected and it must be involved into the concept of the quantitative information content. Then an example is proposed. Of course, although no probability values are used as the values in the new information theory, but even if the probability values are adapted to define the quantitative information content the quantitative expression of every interpretants can be understood as the expression of new information theory. In this case, although the probability value of an event arising is  $P(a)$ , when  $a$  is an event, in the Shannon's information theory, using the quantitative expression of every interpretants like these probability values the total probability value  $P(b_0)$  becomes the following formula expression example.

Of course as there are considerable the other formula expressions for the interpretant concepts, the following formula expression is able to be given in other some functions. And the other formula expressions etc will be presented in other papers.

$$P(b_0) = P(b_1) P(b_2) P(b_3)$$

Here,  $P(b_0)$  is the whole probability value and  $b_0$  is the defined final object event,  $P(b_1)$  is the Immediate object probability value and  $b_1$  is the defined Immediate object event,  $P(b_2)$  is the sign probability value and  $b_2$  is the defined sign event,

$P(b_3)$  is the interpretant probability value and  $b_3$  is the interpretant event. Of course these values and events must be changed corresponding to the situations (for instance, the dementia situations etc.) for them to be discussed. Therefore here the concepts is proposed which is shown at the following formula. The each  $P(b_1)$ ,  $P(b_2)$ ,  $P(b_3)$  is firstly a value of distributed probability, but the value is not necessarily needed to be fixed value, it may be a kind of function derived from the model of object situation (for instance the model of dementia). That is;

$$P(b_1) = f_{b_1}(x_1), P(b_2) = f_{b_2}(x_2), P(b_3) = f_{b_3}(x_3)$$

here,  $x_1, x_2, x_3$  are the characteristic variables in the object model.

From this fundamental concepts the new information contents can be derived using the logarithm calculus. And like this, many other concepts can be considered on the basis of Peirce's Semiotic idea and its interpretant concepts. and the new information theories are able to be derived for the object situation. These details will be presented in other papers.

#### 5 THE CONCLUSION AND FUTURE TASK

Considering the information process and structure of the "YUBITSUKYI" system embedded into the Life Support System and the Peirce's Semiotic the new information content and theory can be introduced into the discussion and an example was able to be proposed. And the information contents considering the situation of dementia are discussed on the backbone of a philosophy and the characters of its information contents are estimated to be able to be analysed. After this the function obtained is needed to be researched more detail and the better functions for the dementia situation must be derived and the concrete analysis method of the information contents is needed to be derived.

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