

# A KIND OF INFORMATION CONTENT APPLIED FOR THE HANDICAPPED AND DEMENTIA SITUATION CONSIDERING PHILOSOPHICAL ELEMENTS

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**Abstract:** There has been developed a communication system among the blind deaf persons and others, they have been able to communicate easily. And its information contents are needed to be discussed when the situation of their dementia is needed to be analyzed, and the information contents are needed to be estimated to correspond to changing signals of this system when they become dementia. In this paper, firstly the outline of an example of such communication system is described, and secondly the philosophical elements and its structures are discussed and such information contents are considered from the philosophical side. Here on the Peirce's semiotic the interpretants which were defined by Peirce are introduced into the analytical method as the philosophical elements to analyze the information structure and communication system of handicapped and dementia situations. And the new information contents different from the Shannon's ordinary information content are discussed to be introduced into the method of analysis of information process of handicapped and dementia situations. Thirdly considering the new information contents the concept of compartment system is introduced into the consideration of relations among interpretants, and as a result an example of concept of the new information content with regard to the elements of structure of the handicapped and dementia situation is proposed on the basis of discussing the compartment system characters.

## 1 INTRODUCTION

For the blind deaf persons A communication system (Its name is "YUBITSUKYI" system) has been developed to communicate among them and others. Of course involving the ordinary people, such system is able to be used for communication each other, and it has been developed until now by authors. This system is designed as a module of the Life Support System which has been developed from the Expanded EMR (Electric or Electronic Medical Record) system, and embedded into the Life Support System. This Life Support System is able to be applied to the situation of the handicapped and dementia situation. As in authors' previous papers it

has already been defined that the dementia situation is a kind of handicapped situation, here too this definition is adapted. Therefore after this in this paper the word "handicapped situations" means the word which involves dementia situations. From this view point the Life Support System is able to be applied to such handicapped situation as a kind of the compensated system which has been synthesized along the ubiquitous concept. This Life Support System is developed from the Expanded EMR system that is the system that authors have subjected from the beginning. Moreover it has been estimated that the Life Support System shows some useful signal data containing the information to be able to find such handicapped situation, especially to be able to find the dementia of blind deaf persons. In

this Life Support System the accomplishment of communication among such persons and others and the analysis of its information structure are important and these information contents in the communication are fundamental elements. And in this paper such new information contents differed from the ordinary Shannon's information content are researched and some results are derived. Then firstly the outline of the "YUBITSUKYI" system of a module of the Life Support System is described and the functions of the system are discussed from the side of such information contents. There it is described too that the Life Support System has been synthesized on the concept that the "YUBITSUKYI" system is structured on the technique of the finger Braille which was developed from the ordinary Braille rules. And it is described that the quantitative consideration of such information process is important and useful, and also the quantitative expression of such information is needed to be introduced into the analysis of the information and communication mechanism of such handicapped situation and of the ordinary people's situation.. When the new information contents are considered the three directions of consideration have been adapted, and those discussions have been performed. The first case is from the entire different view point from the ordinary information concept like Shannon's information content and the second case is from considering the philosophical view point like Peirce's semiotic and the third case is from considering Fuzzy concepts expanded from the ordinary information contents. In this paper the second case is adapted and discussed and on the author's previous paper the philosophical concepts to explain such handicapped situation are discussed and developed. As a result, the idea of the interpretants that the Peirce's Semiotic had defined and named is developed, and an example of a first step of new information content and analyzing method of such handicapped situations is proposed. After that the concept of compartment system is introduced into the consideration method of the elements which exist really in a philosophical space and discussed to analyze the new quantitative information contents. There the outline of compartment system is described and some characters that have already been derived from the analysis of compartment system are shown, and it is discussed that they are applied to the method of derivation of the new information quantitative characters and those element meanings. Finally the conclusions derived from the research of this time are shown and the future tasks are described.

## 2 THE OUTLINE OF A COMMUNICATION SYSTEM AND DISCUSSION OF ITS INFORMATION CONTENTS

In today's Japan the blind deaf persons are seamed to be about 20,000. From this estimation it is seamed that the present whole world has much more such persons. Although such persons have not sufficiently supported until now, recently some communication systems and techniques with which they can communicate among themselves have developed. Of course those systems and techniques are not sufficient as communicating ones. As such one's examples the Finger Braille based on the ordinary Braille rules which is designed by professor Fukushima of University of Tokyo and his mother and the "YUBITUKYI" system which is made on the Finger Braille techniques have been developed. [see Figure 1, Figure 2, Figure 3]

Although there have been described the functions of the "YUBITUKYI" system in authors' previous paper the outline of the functions of the "YUBITUKYI" system is briefly described at the following. That is; For the blind deaf persons the "YUBITUKYI" system has been developed for themselves to communicate with it. And it was designed as it was embedded into the Expanded EMR (Electric or Electronic Medical Record) system which was structured on the base of Linux Operating System. As a result the Expanded EMR was structured as a kind of Life Support System and the "YUBITSUKYI" system is used as a module of the Life Support System. Then the "YUBITSUKYI" system of its module is made on the basis of the Finger Braille communication techniques. And the "YUBITSUKYI" system is designed as a kind of system with which the blind deaf persons and others are able to communicate among themselves. The word "YUBITSUKYI"(see Figure 3) is the name of terminal tool of this "YUBITSUKYI" system. The "YUBITSUKYI" system has total  $4 \times 2 = 8$  vibrating points of its two terminals, and total  $3 \times 2 = 6$  vibrating points are used for communicating the Finger Braille patterns each other. And total  $1 \times 2 = 2$  vibrating points are for functions of the "YUBITSUKYI" system. Here 2 means Right and Left hands. Such vibrating points are operated along the finger Braille technique. In the Finger Braille technique the total six fingers of right and left hand are used, (they are from the index finger to the third finger) are used along the method of the Braille system. And the Braille system has two kinds of expression point patterns of Convex side and Concave side. In this paper Japanese point patterns are considered for the

information content with regard to the handicapped situation. A Braille pattern of Japanese character "ka" is shown in the Figure 1 which shows two symmetrical patterns of expression of the Braille and the Finger Braille. The finger Braille patterns are shown in the corresponding number fingers to show the character "ka" of Japanese of the Braille patterns. The "YUBITUKYI" system is able to show such patterns with total its six vibrating points corresponding to the patterns of six fingers of the finger Braille.

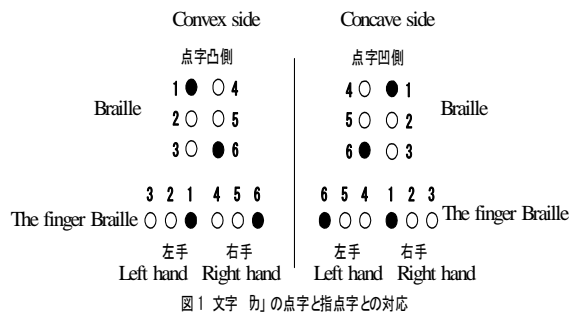


Figure 1: The correspondence of Braille and the Finger Braille.



Figure 2: The Finger Braille.

The data of the "YUBITUKYI" can be collected with electric methods and its data processing are able to be performed with electrical techniques and their transformed data are too able to be used for analysis of the information structure.

The users of the "YUBITUKYI" system able to transmit their communicating information signals to their companies, and they can send those signals to strike 1-6 vibrating points of the "YUBITUKYI" terminals. As the "YUBITSUKYIs" are portable terminals and the "YUBITUKYI" system has some optional functions, for instance, a REPEATER TAG function, a BROADCASTY function etc, they can walk and use the system carrying them and can receive the telegram message of Braille from the



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

attaching TAG and the telegram message translated by computer into Finger Braille patterns. As a result, without touching directly as before they can know the every objects which has the recorded memory in the TAG about characters of the object; for example, its existence position, size, material character, form, other necessary characters and so on. As its system can translate the Finger Braille patterns into the text forms doctors can communicate with such blind deaf persons by the functions of it. Therefore with the Life Support System it is made possible to make the measurement of signal changing from ordinary situation. Therefore, to analyze the handicapped situations it is useful for the information structure of the Life Support System to be made clear. Especially this system has most simply  $2^6$  patterns in its expression and its entropy is 6 bit from the view point of ordinary Shannon's information theory. But considering changing meaning from the view point of inner contents of the situation the ordinary Shannon's information theory is not sufficient. Then it is needed for some new information contents to be discussed and analyzed. Therefore, at preset the following three cases have been subjected in parallel as their meanings were described in authors' previous papers. That is;

Case 1: The information content is discussed from the entirely and essentially different view point from the information content of Shannon's theory. This case has studied by authors in parallel, and this case will be taken up in other papers.

Case 2: The information content is discussed 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 and the compartment system.

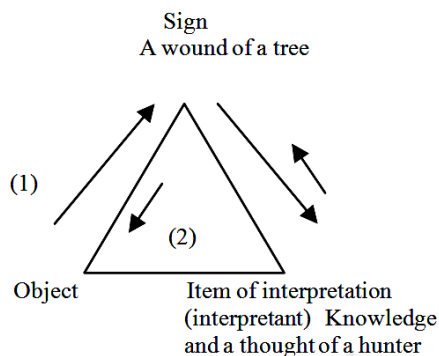
Case 3: The information content is discussed from the view point taking account of the concept of Fuzzy Set to be applied for the handicapped situation and to be expanded over the information content of ordinary Shannon's theory. This case 3 will be presented in other papers.

In this paper the Case 2 is treated and discussed to make the new information content applied for the handicapped situation clear and the Peirce's Semiotic and its philosophical elements are considered as elements of new information contents introducing the compartment system to analyze their relations.

### 3 THE CONSIDERATION OF PHILOSOPHICAL ELEMENTS AND COMPARTMENT SYSTEM

The process of recognition of human being is able to be analyzed more detail in the Peirce's semiotic consideration than the one is able to be analyzed in Kant's epistemological consideration. As the Peirce's semiotic consideration is useful to the discussion of new information contents, firstly the Peirce's semiotic idea, a sign process as Triadic relations is introduced into the analysis of the basic mechanism of recognition process of human beings. In the Peirce's semiotic, a sign, or representamen is something which stands to somebody (interpretant) for something (an object). Although these words "representamen, interpretant" are used in Peirce's Semiotic, in this paper the consideration of the information contents use these words after this.

Here at the following the triadic relations example is shown. The scene is that a hunter finds a damaged certain tree in a forest and supposes that a deer is in his neighbourhood. Here, 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 are shown in the following figure 4, and it is important and useful ontology for the analysis of new information contents that they give a kind of sign process on the consideration, and human recognition process has been performed with the interpretants. That is; as the Figure 4 the arrow (1) suggests that "a deer" causes "a wound of a tree"(Diacadic relations), and the arrow (2) suggests that "a wound of a tree" makes a hunter know that there is "a deer"(Triadic relations). Here it is the fundamental structure that the interpretant is involved as something to be real (of course it is a philosophical reality.) and it is able to be considered as the element of the information system.



There is a deer

Figure 4: Triadic relations of a sign process.

Therefore the relation among such interpretants must be investigated. In this paper the concept of compartment system is introduced into the discussion of the relation among interpretants which exists in the ontology of human recognition situation process and represents the handicapped situations too. As a result it is estimated that such semiotic concept and compartment system concept are useful to analyze the information theory and contents over the ordinary Shannon's information theory and contents.

### 4 A KIND OF NEW INFORMATION CONTENT TAKING ACCOUNT OF PHILOSOPHICAL ELEMENTS AND COMPARTMENT SYSTEM

As previous chapters describe, the various information contents different from the Shannon's information content are able to be considered. Considering the interpretants the probability distribution is applied to such philosophical entities although the Shannon's information theory uses the probability distributed to the events. Now the Shannon's events are not such philosophical entities, but to consider the new information contents here the philosophical entities interpretants are introduced as the targets for probability to be distributed. Of course although the distributed values may be not necessary probabilities and other values may be introduced into this discussion here the probabilities are considered as the distributed values. To analyze the new information contents quantitatively, for example, as author's previous paper proposed, the following relations are proposed again And the expanded concepts of relations into which the compartment system concepts and characters are

introduced are proposed. For example, the probability values are the following. That is; firstly the probability value of an event arising is  $P(a)$ , and the quantitative expression of every interpretants like these probability values is the total probability value  $P(b_0)$  and it becomes the following formula expression.

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

Here,  $P(b_0)$  is the whole probability value,  $P(b_1)$  is the Immediate object probability value,  $P(b_2)$  is the sign probability value, and  $P(b_3)$  is the interpretant probability value. And  $b_1, b_2, b_3$  are like arising events. Here the each  $P(b_1), P(b_2), P(b_3)$  is firstly a value of distributed probability, but each one is not necessary to be fixed, it may be considered as a function derived from the model of object situation (here the compartment system is introduced as such model). 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 derived from the compartment system characters. On the other hand, the outline of compartment system and its characters is the following.

Ordinary compartment system is expressed with a transfer matrix  $A$  and the state variable vector  $x$  and  $Bu$  is controllable term and  $t$  is time.

$$d x./dt = A x. \text{ or } d x./dt = A x + Bu$$

And here it is considered that each compartment corresponds to each interpretant. Therefore considering such compartment system as a model of relations among the interpretants the characters of them are derived from the electric circuit analogy. As a result the distributed probabilities to the interpretants are given as the values which are functional values derived from the compartment system corresponding to the object situation, for example, to the handicapped situation. As an example the following compartment system model which is represented with the electric circuit analogy is used as a model of such situation. And in this analogy model such electric elements are like the real circuit elements and not the real circuit elements themselves. And the following concepts are used with regard to the circuit Laws. That is;

- ① Every  $i(t)$  satisfies the Ohm's Law and the characteristics of capacitance on the every node.
- ② Every  $i(t)$  satisfies the Kirchhoff's current Law on the every node. And generally  $g_{ik} \neq g_{ki}$  is defined.

As a result this compartment system model is proposed to be applied to the relation model among the interpretants.

## 5 THE CONCLUSIONS AND FUTURE TASK

It was clear that to discuss the information process and structure of the "YUBITSUKYI" system embedded into the Life Support System and the Peirce's Semiotic and the compartment system the new information contents and theory could be obtained, and it is estimated for them to be applied to the handicapped situation. As a result the introduction of the compartment system model is proposed to analyze the new information contents. And the information contents considering the situation of handicapped situation are discussed on the backbone of a philosophy and the compartment system model. And the characters of its information contents are estimated to be able to be analysed. After this the concrete function of the compartment system is needed to be obtained and the better function models for the handicapped situation must be derived and the concrete analysis method of the information contents able to be applied for such situations is needed to be subjected.

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## REFERENCES

- Masahiro Aruga, S.Kato, H.Xiaodong, 2003, Tokyo : A study of direction of a design of the electric medical record system on the basis of Linux, The 2th United Symposium Science Technology and Human, pp63-66..
- Masahiro Aruga, S.Kato, H.Xiaodong, K.Endou, T.Nagashima, A.Kodama, H.Tsunekawa, 2003, Tokyo Japan.: On the advantageous and expanded characteristics of the electric medical record system on the basis of Linux, The 2th United Symposium Science Technology and Human ,pp59-62.
- Masahiro Aruga, T.Takeda, S.Kato, July 2006, Orlando Florida USA : A Communication system taking account of the blind deaf persons and the Life support system to be expanded from Electric Medical Record

- system, The 10 th World Multi-Conference on Systemics, Cybernetics and Informatics Proceedings Volume 2, pp178-183.
- Masahiro Aruga, Shinu Ryu, Shuichi Kato, September 2006, Tokyo Japan : *A Life support system expanded from the EMR on the basis of Linux system and the consideration of essential meaning of the Ubiquitous System*, Joint 3<sup>rd</sup> International Conference on Soft Computing and Intelligence Systems and 7<sup>th</sup> International Symposium on advanced Intelligent Systems Ver. CD-ROM, SA-D3-4.
- Masahiro Aruga, Takashi Takeda, Shinu Ryu, Shuichi Kato, July 2007, Orlando Florida : *An Essential Meaning of Ubiquitous Concept and the Expanded Function of the EMR System taking account of the Life Support System*, The 11 th World Multi-Conference on Systemics, Cybernetics and Informatics Proceedings Volume V, pp182-187.
- Masahiro Aruga, Shuichi Kato etc, 1991 "*Johosyori Gairon;The outline of information processing*", Tokai University Press.
- Masahiro Aruga, Takashi Takeda, Shuichi Katok,2006: "*The Blind Deaf Persons and the Life Support System to be expanded from Electric Medical Record System*", The 10th World Multi-Conference on Systemics, Cybernetics and Informatics Jointly with The 12th International Conference on Information systems Analysis and Synthesis:ISAS2006, Volume 2, pp178-183.
- Masahiro Aruga, Shinu Ryu, Shuichi Kato, 2006: "*A Life support system expanded from the EMR on the basis of Linux system and the consideration of essential meaning of the Ubiquitous System*", SCIS&ISIS 2006, CD-ROM SA-D3-3S.
- Masahiro Aruga, Takashi Takeda, Shinu Ryu,, 2007 :"*Dementia and Information content of the Yubitsuki taking account of Ubiquitous concept*", 5<sup>th</sup> BME on Dementia, Vol.2 No.3; pp 1-4.
- SHINWU Ryu, TAKASHI Takeda, HIROSHI Egawa, MASAHIRO Aruga, 2007: "*Grapple with the early dementia on the basis of the Ubiquitous concept*", Japan Ergonomics Society 15<sup>th</sup> System Conference, CD-ROM.
- Takashi TAKEDA, Hiroshi EGAWA, Masahiro ARUGA, 2007: "*A consideration of the data of "YUBITSUKII" for early dementia* ", Japan Ergonomics Society 15<sup>th</sup> System Conference, CD-ROM.
- MASAHIRO Aruga, 2007: "*The compartment system taking account of fussy concept*", Japan Ergonomics Society 15<sup>th</sup> System Conference, CD-ROM.
- Masahiro Aruga, Takashi Takeda, Shuichi Kato, July 2006, Orlando Florida: *A Communication system taking account of the blind deaf persons and the Life support system to be expanded from Electric Medical Record system*, The 10 th World Multi-Conference on Systemics, Cybernetics and Informatics Proceedings Volume 2, pp178-183.
- Masahiro Aruga, Takashi Takeda, Shinu Ryu, Shuichi Kato, July 2007, Orlando Florid: *An Essential Meaning of Ubiquitous Concept and the Expanded Function of the EMR System taking account of the Life Support System*, The 11 th World Multi-Conference on Systemics, Cybernetics and Informatics Proceedings Volume V, pp182-187.
- Masahiro Aruga, Shuichiro Ono, Shuichi Kato, June 2007, Portugal: *On the detection of early dementia and the communication system for deaf blind person*, Tenth International Conference on Enterprise Information Systems, Proceedings pp272-277