

A kind of discussing method of information contents taking account of the
YUBITSUKIYI system embedded into the Life Support System

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ABSTRACT

It has been described in authors' previous papers that the essential meaning of the ubiquitous system is in such idea as the lost functions in today's ordinary society should be recovered or supported up to their ordinary levels. And along such concept the authors have discussed the direction of design of the expanded EMR (Electric or Electronic Medical Record) into which the "YUBITSUKIYI (This is the name of communication tool for blind deaf persons. See Fig.3)"

system is embedded, and have proposed that the expanded EMR system should be made and used as the Life Support System. And by authors that Life Support System has been described so useful not only for such handicapped persons as the blind deaf persons, but also for the ordinary people, especially for the doctors, because the doctors are able to communicate with these handicapped patients by using that Life Support System. As a result it has been estimated that the Life Support System can be applied to find the dementia situation, especially to find the early dementia situation

of the blind deaf persons. Therefore, to find the dementia situation correctly and treat it quantitatively through the communication with these people by using the Life Support System the analysis of information process of communication is needed to be performed. Now, there are many varieties of analysis methods and directions of it, at this time the analysis method and direction is considered from the point of view of information contents in the communication. In this paper firstly the outline of the “YUBITSUKIYI” system is shown. Secondly the outline of information contents taking account of the “YUBITSUKIYI” system is described and the concepts of new information contents are discussed. Furthermore, the information content taking account of the Fuzzy Set is described. Thirdly the consideration of relation between the Fuzzy Set and the dementia situation and the characters of information content on the basis of Fuzzy concept are performed and described. Finally the conclusion and further works are described

Keywords: Ubiquitous system, YUBITSUKIYI system, the Life support system, the information content, the Fuzzy Set

1. INTRODUCTION

It has already been reported in authors' previous papers that the recent concept of ubiquitous system has been more popular and has been put on the stress of its merit side, but there is no essential meaning of ubiquitous system only in that merit side, that is, the essential meaning of ubiquitous system and concept is in the idea that the lost functions in today's ordinary society should be recovered or supported up to their ordinary levels by using the ubiquitous system as a tool. Therefore, considering the essential meaning of ubiquitous system the direction of design of the Life Support System has been proposed on the basis of the expanded EMR system of Linux operating system.

There, the YUBITSUKIYI system has been embedded into that Life Support System as a module of communication system among the handicapped persons, especially the blind deaf persons and the others, of course, involving the ordinary people. Furthermore, it has been estimated that the Life Support System is useful to find the dementia situation, especially to find the dementia of blind deaf persons from operating information of the YUBITSUKIYI system. And the consideration of this operating information is very important for analyzing the information process and the communication state among the blind deaf persons and others. Especially the quantitative consideration of the information process is more important and useful to analyze the information and communication state in dementia situation, of course, of the blind deaf persons, and of others. Therefore, in this paper, firstly the active situation of the YUBITSUKIYI system is reconsidered from the point of view of information shown by the correspondence with the signs to Japanese characters. And the Life Support System is re-discussed, and the fundamental patterns of the character sign of the YUBITSUKIYI system are reconsidered and a kind of view of fundamental information concept is introduced and the first step of discussion of information content and analysis of information process is proposed. Secondly considering the dementia situation the concept of information content to be able to be applied to such situation is discussed and some points of view of this information content are described. And at this time the information content taking account of the Fuzzy Set and the Fuzzy concept is treated on the basis of the consideration of these points of view of information content. There an example of the Fuzzy Set applied to such dementia situation is described as the first step of analysis of quantitative character of the dementia situation and the communicating state among the blind deaf persons and others. Of course, its

example is the one on the theory of information content taking account of the Fuzzy Set, and the concrete example applied to the real dementia situation has some needs to be revised with concrete values. [1],[2] Thirdly the Fuzzy concept introduced for analyzing the information content to be able to be applied to dementia situation is developed and the characters of the information content are discussed. As a result the factors which are estimated to be useful to analyze the dementia situation and the communicating state among the blind deaf persons and others are proposed with their characters although the concrete revisions of these factors are of course needed in this case. Finally some conclusions are described and further works about the information content to be able to be applied to the dementia situation are described.

2. THE "YUBITSUKYI" SYSTEM AND THE TREATMENT OF INFORMATION CONTENT

Today it is said that there are about 20,000 blind deaf persons in Japan, from this it is estimated that there are more much blind deaf persons in whole world at present. On the other hand the concept of the ubiquitous system is getting around in many kinds of fields mainly to stress the side of its merits. Especially since the IPv.6 has been developed the easy concept of ubiquitous system is being discussed and proposed to use it. As this easy situation has the important and dangerous problems the essential meaning of the ubiquitous concept has been made clear in authors' previous papers. That is; An essential and fundamental meaning of ubiquitous system concept exists in compensations of lost functions of life style. Here the expression "lost functions of life style" means that the functional level of life style is lower than the average functional level of ordinary people's life style in the meaning of lost or lack, and that lower level of life style causes the difficulty in their life style And its

meaning not only involves, of course, the persons who had ordinary functions of life style before they were lost, but also involves the handicapped persons from their birth. From this point of view the development of the support system of the blind deaf persons is along the ubiquitous system concept. Therefore the Life Support System into which the "YUBITSUKYI" system is embedded as a module has been proposed in authors' previous papers. The design idea of this Life Support System is the one which is made on the base of the expanded EMR system. And this Life Support System is not only useful to communicate among the blind deaf persons and others, but also is estimated to be able to make the diagnosis of dementia, especially the diagnosis of the blind deaf persons which was very difficult before the communication tool like the "YUBITSUKYI" system was made. Here it can be considered that the dementia situation is a kind of handicapped situation of persons as the situation means the lost functional state of persons. Now as it is estimated that the Life Support System can show the information corresponding to the dementia situation through processing state of communication among the people, especially through communicating with the "YUBITSUKYI" system the quantitative consideration of information process of the Life Support System is very useful to analyze the dementia situation and communicating structure among these people. Therefore, at this time firstly the information of the "YUBITSUKYI" system is needed to be quantitatively discussed as the first step to analyze the dementia situation and communication process of such situation. That is; the information content applied to such situation is needed to be considered over the ordinary Shannon's information content on the basis of ordinary set of events and probability theory for the events. Then firstly the activity of the "YUBITSUKYI" system is needed to be reconsidered. The "YUBITSUKYI" system is a kind of system using a tool to communicate

among the blind deaf persons and others, and the word "YUBITSUKYI"(see Fig.3) is the name of this communication terminal tool which is used in the "YUBITSUKYI" system. As the blind deaf persons are the persons who have both obstacles to sight sense and hearing sense, of course although their obstacle levels are many sorts of levels, and they cannot use both senses sufficiently. At this present some communication methods not only among such persons themselves but also between them and others have been developed. For example, the Touch finger language, the Finger Braille (see Fig. 2) etc have been developed as the methods which can satisfy user's needs to some extent. Here considering that the "YUBITSUKYI" system is embedded into the expanded EMR on the basis of Linux Operating System and is made as a module of the Life Support System, the operating and indicating functions of the "YUBITSUKYI" system are again discussed now. The "YUBITSUKYI" system is made on the base of the Finger Braille technique and is made to be able to communicate among the blind deaf persons and others by the use of vibrating points of the tools "YUBITSUKYIs". The finger Braille technique uses total six fingers of right and left hand from the index finger to the third finger taking account of the method of the Braille system which has two kinds of point patterns (Convex side, Concave side). In this paper these point patterns are treated and discussed in Japanese patterns to consider the information content with regard to the dementia situation. The finger Braille technique in Japan is the direct touch method with which the transmission side partner sends the finger patterns which show Japanese characters on the basis of the Braille rules. The Fig.1 is a Braille pattern of Japanese character "ka", and it is made in symmetrical expression patterns of the Braille and the finger Braille among the corresponding number of a character. The "YUBITUKYI" system uses this finger

Braille patterns of characters, and the six vibrating points of its mobile terminal devices "YUBITUKYIs" make the character patterns corresponding to the patterns of six fingers of the finger Braille. And it makes the mutual communications of users of this system. [1],[2]

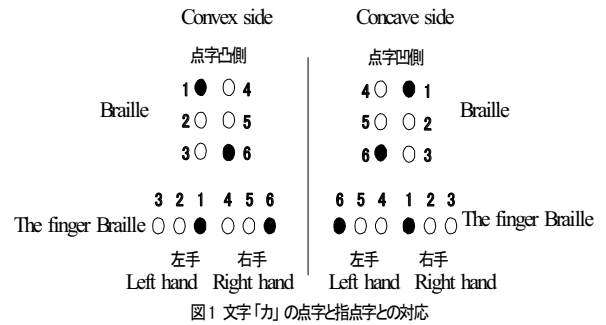


Fig.1 The correspondence of Braille and the Finger Braille



Fig.2 The Finger Braille



Fig.3 The "YUBITUKYI" (Left: Ver.1, Right: Ver.2)

The "YUBITUKYI" is made with electrical devices (at present having been improved). Therefore, the data of the "YUBITUKYI" are treated and processed with electric signals and their transformed signals, and at the

same time, those signals are able to be used directly as the information processing data. Here at this time it is the first step of discussion to take up the most simple case for discussion of the information content applied to the dementia situation, that is; Although the joysticks of the "YUBITUKYI" terminals have total 8 vibrating points the 2 points in those are for the function of transmission of signals, therefore it is the first step of discussion to make the 6 points of them which are with regard to the character patterns the object for consideration of information content. On this condition the information content that the "YUBITUKYI" terminals have is 6 bit from the Shannon's theorem, for the active state of vibrating points of the joysticks is interpreted to be the event which shows ON or OFF. As a result total $2^6 = 64$ patterns of Japanese character can be produced. And as each pattern shows each character of Japanese the combination of these patterns makes some Japanese words and Japanese sentences. If ordinary, the analysis of information process and communicating structure among users can be put forward assuming that such 64 patterns are alphabets of information source and their alphabets can synthesize Japanese words and sentences, but if the dementia situation is considered, from the characteristics of dementia (for instance, with regard to the difficulty of remembrance) the event of ON or OFF is not necessarily made clear at the vibrating points of the joysticks and inevitably the character patterns are not recognized and interpreted clearly and definitely. From these reason the discussion of information content over the Shannon's theorem is needed for the analysis of information process of dementia situation. Now there are some directions of consideration of the new information content. For instance, there are at least the following 3 cases.

Case 1: Considering it from the entirely new stand point which is essentially different from the stand point of Shannon's theorem. This case is now studied by

authors in parallel, but here this case is not taken up. .

Case 2: Considering it from the stand point which is taking account of the Philosophy and the recognizing structure of human beings. This case has been advanced by authors to some extent, and has been presented in authors' other papers considering the Peirce's Philosophy, that is; the Peirce's Semiotic. Therefore, here this case is not taken up.

Case 3: Considering it from the stand point which is taking account of the concept of Fuzzy Set being able to be applied to the dementia situation and being expanded over the Shannon's information content. In this paper this case 3 is treated and discussed in consideration about how to introduce the Fuzzy Set to analyze the dementia situation. Of course there are many sides which must be discussed as the object to which the Fuzzy Set concept is applied. But here as there are 64 patterns with regard to the total expressed characters the consideration is begun from the most simple assumption that the Set which makes each pattern of the 64 patterns each element of the Set itself is made as the Fundamental Set of the Fuzzy Set. Namely on the first step the other points, of course, involving the production of words and sentences are omitted here. On this condition a dementia state, for instance, like the difficulty of remembrance can be treated by applying the Fuzzy Set which is defined with the Fundamental Set and its membership function. Here making each pattern of each element of the Fundamental Set x_i $i=1,2,\dots,64$ and the membership function $m(x_i)$, the characters of this Fuzzy system are derived though considering such membership function.

3. THE CHARACTERISTICS DERIVED FROM THE FUZZY SET

Now here the sign of Fundamental Set described in the before chapter 2 is made SF, and the sign of the Fuzzy Set derived from the Fundamental Set is made

FA. Then x_i ($i=1,2,\sim 64$) are the elements of SF and each x_i ($i=1,2,\sim 64$) belongs to FA with some degree shown by the membership function $m_{FA}(x_i)$ ($i=1,2,\sim 64$). Therefore corresponding to each different situation of the dementia each different membership function is able to be defined and each derived Fuzzy Set (FB,FC,...) is able to be considered. At this time each Fuzzy Set (FB,FC,...) is derived by the definition of each membership function ($m_{FB}(x_i)$, $m_{FC}(x_i)$, ...). As a result the consideration of some relations of a SF, a FA and $m_{FA}(x_i)$ ($i=1,2,\sim 64$) can make a part of characteristics of the dementia state to which the FA was applied clear. For example, from the following characters of the FA the information structure of the dementia state to which the FA was applied can be made clear. That is; Let the membership function $m_{FA}(x_i)$ ($i=1,2,\sim 64$), and the Probability of the element x_i ($i=1,2,\sim 64$) $p_i=P(x_i)$ ($i=1,2,\sim 64$), here p is a set of $p=\{p_i\}$, then the probability of the Fuzzy event $P(FA)$ defined from the Fuzzy Set becomes $P(FA)=\sum_{i=1\sim 64} m_{FA}(x_i)P(x_i)$. As a result, the information content, $I(FA | p)$ with regard to Fuzzy set FA becomes $I(FA | p) = (1/P(FA)) \sum_{i=1\sim 64} P(x_i) m_{FA}(x_i) \log m_{FA}(x_i) + \log(1/P(FA))$, ($i=1,2,\sim 64$), here, the calculating progress is omitted. And the Fuzzy content, $F(FA | p) = I(FA) - I(FA | p)$ is introduced. Here $I(FA)$ is the information content in such case as the set FA is an ordinary set. That is; $I(FA) = \log(1/P(FA))$ and the values of the membership function with regard to this Fuzzy Set are 0 or 1.

4. THE CONCLUSION AND FURTHER WORKS

It was made clear that System was needed to be discussed from the view point of some new information content applied to the dementia situation. Therefore, in this paper, as a first step to introduce the

new information content the concept on the basis of the Fuzzy Set derived from the Fundamental Set made the pointing patterns of Japanese characters of the "YUBITUKYI" has been discussed on a simple assumption, and as a result a part of the information structure of dementia situation has been made clear. After this on the more concrete and real condition (for instance, derived from statistic data) the consideration of the new information content on the Fuzzy Sets and of these membership functions is needed. Furthermore, the discussion not only of character patterns but also of words and sentences must be performed.

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