

ON THE DETECTION OF EARLY DEMENTIA AND THE COMMUNICATION SYSTEM FOR DEAF BLIND PERSON

Masahiro Aruga^{1,4}, Takashi Takeda²

¹*Department of Human and Information Science, School of Information Science and Technology, Tokai University*

²*Graduate school of Engineering, Tokai University, Kitakaname 1117*

Hiratsuka-shi, Kanagawa-ken, Japan

⁴*Institute of Intelligent Communications (corporative NPO, Japan), Kashiwanoha 5-4-6
Kashiwa-shi, Chiba-ken, Japan*

Shuichi Kato^{3,4}

³*Graduate school of informatics, Teikyo Heisei University, Uruido-Aza-Otani 2289-23*

Ichihara-shi, Chiba-ken, Japan

⁴*Institute of Intelligent Communications (corporative NPO, Japan), Kashiwanoha 5-4-6
Kashiwa-shi, Chiba-ken, Japan*

Keywords: The “YUBITSUKII”, the expanded EMR (Electronic or Electric Medical Record), the early dementia, the Linux operating system, the blind deaf person, the detection system, the diagnosis system, the finger Braille.

Abstract: The “YUBITSUKII” is the personal digital assistant terminal developed as communication system for blind deaf persons. The blind deaf persons have not been cared sufficiently until now. Therefore, they cannot fully convey their thoughts and feelings and cannot freely live in their daily life. Generally, even their family members cannot sufficiently know their capability of recognition of their outside. And it is difficult to discover early dementia of the blind deaf persons. In this paper, it is considered and estimated that there is some possibility of realization of the detection method and system of early dementia of the blind deaf persons and others.

1 INTRODUCTION

The dementia is raised by the disease of brain and by any other many reasons. It makes some difficulties in the brain and nervous system, and the patients of dementia lose their memories and discernments and so on, which were obtained before, and have the big difficulty on their ordinal life style. Especially the Alzheimer’s disease arise the big obstacle on memories for recognition, and it is the progressive disease and the frequency of its arising becomes higher and higher as the age becomes older and older. And on this disease there is the case that it cannot be found when and where this disease arises, and this disease is the disease of nervous system which has made some social problems nowadays. 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, and recently their communication methods have been

developed, for example the finger Braille is one of them. (see Figure 1, Figure 2). The blind deaf person has the big difficulty on their ordinary life style that not only they cannot sufficiently show their intention to other people, but also cannot completely receive the conversation contents of them. Therefore it is very difficult that the situation of early dementia of the blind deaf person is found and diagnosed. And the” YUBITUKYI (the name of tool)” developed as the communication tool for the blind deaf person is useful not only for the communication of the blind deaf person but also for the diagnosis of disease in connection with communication by using the communication data measured via the use of tool. (see Figure 2)

Therefore in this paper the orientation of design of structuring the diagnosis system for early dementia not only of the blind deaf person but also of ordinary healthy people is so proposed as the diagnosis system of early dementia is structured by

embedding the “YUBITUKYI” as a module into the expanded EMR (electronic or electric medical record) system on the basis of Linux system. This proposal has sufficient possibility and significance by considering the differences of situation of communication between ordinary healthy people and the persons of Alzheimer’s disease as it is estimated that the characteristics of Alzheimer’s disease show amnesia, difficulty of recognition, difficulty of behaviour and action and the progressive situation, as a result, the clear difference of communicating situation appears. Therefore discussing the communication tools not from the point of view of ordinary healthy people, but from the point of view of handicapped persons (especially the blind deaf persons) it is shown too that the system construction of detection of early dementia of the blind deaf persons is made possible by starting from the analysis of the differences of communicating situation among the ordinary healthy people and the handicapped people, and by considering the progressive and changing situation of communication along the time passing.

2 THE “YUBITSUKYI” SYSTEM AND THE MEDICAL DIAGNOSIS

Nowadays it is as a matter of course that the medical examination by interview to the blind deaf persons cannot be sufficiently available between the doctor and the blind deaf persons as they cannot completely show and make their intention known to the doctor and cannot completely receive the conversation contents from the doctor on the scene of medical treatment, and as it is estimated that the enough transfer of diagnosis information is not made possible. Therefore it is estimated that the medical examination by interview to the blind deaf persons becomes easy on the scene of medical treatment reading the conversation contents by the use of the functions of the “YUBITSUKYI” system, transforming them into the phonetic sound or into the image of letter by the use of information processing technique, and transferring these data by the use of the functions of network system. On the basis of the communication technique of "finger Braille", the “YUBITSUKYI” system has been developed. In the finger Braille technique the six fingers of right hand and left hand from the index finger to the third finger are used totally and the technique was designed by taking account of the concept of the Braille system. Of course in Japan

such a system is adapted for Japanese language and character pattern system. In the finger Braille technique the direct touch method to a communication partner’s fingers is used, and the character patterns of one partner of transmission side are sent to another partner to strike their fingers with his/ her fingers directly corresponding to the Braille rules. And in finger Braille technique there are generally two kinds of form. The one is the PERKINS SUBURERA formula in which the form is read corresponding the form of the convex side of Braille. The other one is the LIGHT BURERA formula in which the form is read corresponding the form of the concave side of Braille. In the Figure1 there is shown the "ka" of Braille of Japanese character. When reading the communication signal on the basis of the convex side of Braille, the relation of corresponding signal between Braille and hand fingers of the finger Braille can be shown like the left figure of Figure1, in the same way, when reading the communication signal on the basis of the concave side of Braille, the relation of corresponding signal between Braille and hand fingers of the finger Braille can be shown like the right figure of Figure1. As understanding from Figure1, these two patterns of expression of the Braille and the finger Braille are symmetric respectively with regard to the corresponding number positions of the expression patterns of a character. The “YUBITUKYI” system is made using this finger Braille forms of characters, this system has the six vibrating points corresponding to the pattern form of six fingers of the finger Braille and can make mutual communications among users of it. The “YUBITUKYI” is the name of mobile terminal device of the “YUBITUKYI” system, and is constructed with electrical devices and elements (of course, at present yet being improved). Here not reporting the engineering and technique details of that system itself (they will be shown in other papers.), the characters of “YUBITUKYI” are able to be used as the function of a module of the Life support system which has the diagnosis function and is structured on the basis of the expanded Linux base EMR system.

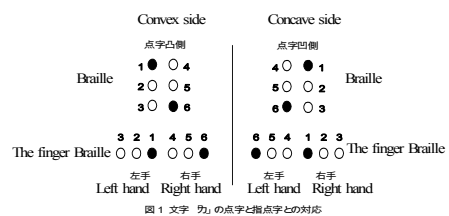


Figure 1: The correspondence of Braille and the finger Braille.

As the data of a device “YUBITUKYI” are electric signals and their transformed signals, these data are put directly into the information processing, although the data on the case of using only the finger Braille are not able to be directly processed with electric system.

Holding the joysticks of the “YUBITUKYI” terminals with both hands the users can send and receive the conversation signals from each terminals to vibrate the vibrating points, for instance, when transmitting communication signals, the users strike 1-6 vibrating points, on the other hand when wanting to receive these signals, they can receive the vibration of 1-6 vibrating points of the “YUBITUKYI” terminals. As a result the mutual communication among these users is able to be easier than before. And as the “YUBITSUKYI”s are portable terminals, the users can ordinarily and freely walk carrying them, and can use them anytime and anywhere. Especially the blind deaf person can take communication easily and freely with this tool the “YUBITUKYI” among others in any times, but it was difficult for them to communicate among others before the “YUBITUKYI” having been developed. As the “YUBITUKYI” system has some optional functions, for example, a REPEATER TAG function, a BROADCASTY function etc, although the blind deaf person was before able to know the content of objects only by direct touching of it, after developing the tool, they can know the content of objects not to touch the objects directly by using the repeater tag function as the “YUBITSUKYI” system can receive a telegram message of Braille by attaching a tag to every objects. Namely, by the use of this function the blind deaf person can get the present and surrounding information not to contact the objects directly. Furthermore, with BROADCASTY function the telegram messages from “YUBITSUKYI” are received and translated by the computer into finger Braille and these translated messages are broadcasted, and moreover these contents can be displayed by the text documents. Even if a partner does not know finger Braille technique, the natural communication among people can be structured immediately using these functions. Nowadays the blind deaf person's world is covered calm and dark, and they are intercepted from almost all information media, such as television and newspaper and so on. Even talking with their family is difficult. The “YUBITSUKYI” system is the indispensable system for the blind deaf person in order to act like a healthy person. Among healthy persons, the equipment like the voice input interface, such as a microphone, can be used in the

processing of communicating information. There the uttered sound can be translated into finger Braille, and it can be transmitted to the blind deaf person. Therefore, if the characters of the “YUBITSUKYI” system are embedded as a module into the Life support system expanded from the EMR on the basis of Linux system and such an equipment system as the voice input interface is structured in the Life support system, not only the communication among the handicapped people themselves and ordinary people but also the data processing of communication are made possible and useful in order to make the diagnosis of disease to affect the communication because the “YUBITSUKYI” system and the equipment system like the voice input interface are structured in the Life support system which can make information processing of the data taken from the communication among the handicapped people themselves and ordinary people. The medical record of a hospital has been processed electronically as IT has progressed. At that result, it comes that a patient can also read the medical record. The EMR system can store his/her medical history, the present medicine, being allergy, and so on. Moreover, it is made possible that using the EMR system, the advice of meal and exercise which suits a patient will be received timely. On automatic voice guidance service seen recently the blind deaf person cannot understand its message directly. But the “YUBITSUKYI” system can solve the problem of such situation and make communicating situation between the user and automatic voice guidance service. And the “YUBITSUKYI” system can make the measurement of needed factors possible as it is embedded into the Life support system which can make data processing. As a result the function of the “YUBITSUKYI” system can make the measurement of signal changing from ordinary situation using the Life support system embedded by the “YUBITSUKYI” system, when the other conditions are added to the original signal. And it is estimated that the diagnosis of early dementia not only of the blind deaf person but also of the ordinary healthy people is made possible not only by the use of conversation on daily life and medical examination by interview but also by using the information obtained from the “YUBITSUKYI” system. Moreover the possibilities of the Life support system is increased by the use of the characters of the “YUBITSUKYI” system embedded into it. Here the changing data of communication during the situation of dementia are abbreviated and the analyzing methods of those data will be discussed and reported

separately. (Masahiro Aruga, S.Kato, et al, 2003), (Masahiro Aruga,T.Takeda et al, 2006)

3 THE EXPANDED EMR SYSTEM

Today, introduction of the EMR system is advanced all over the world. It is well known that the Linux system is an open source operating system and the characteristics of Linux system are advantageous and able to be expanded as the base of the EMR system, and at same time there is the expanding possibility of the functional ability of the EMR system. (Masahiro Aruga, S.Kato, et al, 2003), (Masahiro Aruga,T.Takeda et al, 2006), (Masahiro Aruga,Shinu Ryu et al, 2006))



Figure 2: The “YUBITSUKYI”.



Figure 3: The finger Braille.

Namely from these fundamental characters of Linux system the fundamental ability of the EMR system can be expanded. The idea of the expanded EMR system involves the concept which has the character of expansion and the system idea which is able to change the organization of modern medical scene and educational scene of society and the base of recognition and senses of social system.

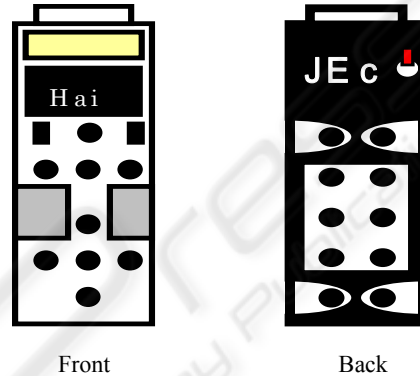


Figure 4: The new version of the “YUBITSUKYI”.

In this paper the consideration of service function for the blind deaf persons is mainly proposed using the expanded EMR system and the comprehensive life support system which has the concept of life support and welfare system is introduced and described. The target of the expanded EMR system is decided to the Life support system and the orientation of design of the system and the algorithm of structuring the system are proposed. Especially in this paper it is described that the “YUBITSUKYI” system is embedded and the diagnosis of early dementia is able to be made possible using the embedded system, and the orientation of design and the structuring process of that system are shown. This measurement system image is shown in Fig. 5. (Yuhei Karato, M. Aruga et al,2006),(Shinwu Ryu, M. Aruga et al, 2006),(Takashi.Takeda, M. Aruga et al, 2006)

4 THE EARLY DEMENTIA DIAGNOSIS AND THE COMMUNICATION

It is understood very important in order to detect the symptoms of early dementia that the family members or the close members take notice of their

mutual ability of recognizing each others through their mutual communication in their daily lives. Nowadays it has become clear that the problem action and the mental symptoms are able to be mitigated by the communication method or by the internal medicine, and such symptoms are not necessarily appeared on the surface only by the reason of changing situation of brain by the disease. That is; it is seemed important in order to diagnose the early dementia to consider such many elements connected with communication as the human relation, the environment and so on. Therefore, in this paper firstly discussing how to reflect these elements on the design of early dementia detective system the following adjusted procedures are described as the first step of performance of designing. That is;

- (A) Introducing the embedded algorithm which has been in the expanded EMR system concept as the expanding character of Linux system is made the good use of.
- (B) Reconstructing the algorithm to transfer and receive the data of the "YUBITSUKYI" system as it can be matched to the embedded algorithm.
- (C) Placing the module of the expanded EMR system which is expanded by the "YUBITSUKYI" system as the support system for the blind deaf person and on this concept analyzing the transferring data through this module.

This processing is widely adapted not only to the data of blind deaf person but also to the data of ordinary healthy people and others if it can be possible. This is the reason that after this the real system synthesis is continued and the consideration and discussion of the relation between its data change of transferring process and the diagnosis of early dementia are needed at that time.

- (D) Being based on the result of the above (C), analysing those data and taking out important and efficient factors to detect the early dementia. After that, discussing the algorithm which can reflect these factors on the diagnosis system of early dementia although some algorithms are estimated possible.
- (E) Establishing the diagnosis and evaluation method with which the observation of daily activity of the blind deaf person is quantitatively able to be made possible, and which is needed on the case of proposing the direction of design of the Life support system to adopt such analysing results as the above processing produces.

- (F) Developing the analysing method with which the necessary elements can be taken out from the information in the data processed on the basis of the algorithm of early dementia diagnosis system in order to structure the function of this Life support system on which the quantitative diagnosis of daily activity of people and its evaluation method is directly reflected just as they are established. Next on the basis of this analysing method performing the target system design on which the quantitative diagnosis and its evaluation method is reflected.

As a result, it is proposed that the real target Life support system should be synthesized according to the above procedure to design the Life support system. The Fig.5 shows the above procedure and the idea of communicating environment connected with the possibility of detecting the early dementia until the realization of target is completed. As understanding from the Fig.5 it is estimated that the communication and transferring data by the "YUBITSUKYI" system involve the elements of detecting the early dementia.

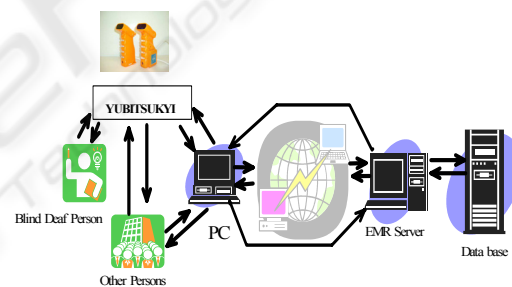


Figure 5: The Life support system and the diagnosis of early dementia.

5 THE CONCLUSION AND FUTURE TASK

Before the "YUBITSUKYI" system was developed the blind deaf persons were not sufficiently able to communicate directly themselves and others. Especially they could not make the direct communication to a doctor when he needed their medical examination by interview. But the "YUBITSUKYI" system could make such communication possible. Therefore, in this paper, it was able to be reported that there were the possibility that the system in which the "YUBITSUKYI" system was embedded as a module of the Life support system was useful for the

detection of early dementia although it was impossible before. As a result, the orientation to design a system having the detecting functions of dementia and early dementia situation was able to be proposed by discussing and considering the expanded EMR system reconstructed as the Life support system.

In the future task, the "YUBITSUKYI" system must be improved as being applied to other countries (not only Japan), and the Life support system into which the "YUBITSUKYI" system being embedded must be realized concretely and by using that system it must be taken to collect and analyze the data of early dementia in detail.

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