Development of Support Applications for Elderly and Handicapped People with ICT Infrastructure

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Abstract. We work on studying and developing support applications for aged and handicapped people. First, we developed a new communication assistant application for autistic children, "Let's Talk!". We especially focused on an easy and simple manipulation. We also developed a to-do application for kids, "Hanamaru" and a scheduler application for elderly people, "Anshin". We used ICT infrastructure, especially computer network systems such as SNS (Twitter, Facebook), e-mail, Skype, Line, and a message board on the web site, to collect the requests and opinions of users, and tried to feed it back to improve the applications.

1 Purpose of the Study

Lately, an electrical device that support people who are unable to use natural speech to express their thoughts or needs has been developed. It is called a Voice Output Communication Aid (VOCA). And also, PDA (Personal Digital Assistant) is getting attention as assistant tools for communication with its advantages as a communication tool. Fist of all, it is easy to carry around. A user can create symbols by him/herself that are suitable his/her situation with easy steps. And also, a user can actually talk to others by the voice of the application. Some assistant applications for PDA, such as Drop Talks[1], Voice4u[2], Tap to Talk[3], aimed to help autistic children have already introduced. Although many studies about VOCA [4][5] had been made and school educational fields have adopted these applications, they are not come into general use because of the high price and complicated operations. Therefore, we tried to develop a new VOCA for PDA with simple and easy manipulation in low price, and named it "Let's Talk!"

2 Construction of the System

2.1 Usability of the Application

We focused on a simple manipulation without complicated explanation to develop this application. In most of the existing VOCA applications, a user needs to choose the suitable words from a large amount of symbols. (Figure. 1, Left) It is hard for the autistic children that have severe mental disturbance. On the other hand, in "Let's

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Talk!" a user needs to tap only one button and a sentence of two words comes out automatically. (Figure. 1, Right) The autistic children can learn this easy operation quickly. It gives them a feeling of satisfaction at having achieved to communicate with others by themselves.

Fig. 1. Left: The example of screen of VOCA application Right: The example screen of "Let's Talk!"

2.2 Supportive Mode/Self-use Mode

On Supportive Mode of the application, a supporter starts to pick symbols fitting to the situation and the condition of an autistic child who needs assistant for communication. When an autistic child touches the symbol what he/she wants to tell, a sentence comes out by voice sound. It is difficult for autistic children to choose what they really need to say among too many choices. So we limited the numbers of symbols picked by a supporter from 1 to 4 and make it easy to choose.

If an autistic child understands how to manipulate this application, he/she can tell what he/she wants directly with categories or symbols in Self-use Mode.

2.3 Make / Original Page and Stamp Mode

This application has about 120 icons that fit our daily life, but more icons may be required depending on the situation. On Make Page, a user can make his/her original icons with a camera or a voice recorder the PDA has or using an illustration or sound founded on web sites. It is sure to broaden the communication if there are some original icons that suitable with an autistic child's dairy life, such as the places he/she goes frequently, familiar people or the dairy activities. Original Page is customizable to put icons that are created by a user or existing symbols freely.

On the newest version of "Let's Talk!"(iPhone / "Let's Talk!"AppVersionNumber:4.0 June 10, 2012), we added Stamp Mode. On this mode, a user can make a chart with a goal. Children get a stamp whenever they have done what they needs to do.

3 Updating the App with ICT Infrastructure

After we released "Let's Talk!", we have collected suggestions and requests from users through ICT infrastructure and the data from schools for handicapped children. We modified and updated the app 14 times till September 2012 referring to those opinions and the data.

We used ICT infrastructure, especially computer network systems such as SNS (Twitter, Face book), e-mail, Skype, Line, and a message board on the web site, to collect the requests and opinions of users, and tried to feed it back to improve the application. There were some inconveniences which beyond our expectations. For example, freezing when a child swipe the screen too fast, malfunctioning when the button is hit repeatedly, the icons were too small to see, the sound is not big enough to use outside or noisy classroom, and so on. We modified the application based on all of these requests. If a company tried to develop a same application for profit, it would have cost a lot. Since we developed the application as a part of our study in the laboratory, we could cut down on expenses. There is a big possibility to apply the supporting system for handicapped people.

4 Experiments at School for Handicapped Children

Introducing "Let's Talk!" on the experimental basis was carried out at Miai Yogo School, which is the school for handicapped children in Aichi, Japan.

4.1 Case Study 1

The subject of investigation was a 8 year-old autistic boy (T) with no ability to speak. T tried to tell his teacher he wanted to have another plate at lunchtime with the application. Figure 2 shows how his behavior had changed when he started to use this application.

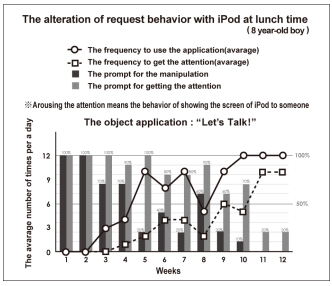

Fig. 2. The alteration of request behavior with iPod at lunchtime (8 year-old boy)

The dark bar graph shows how many times the teacher thought T the manipulation of this application. The manipulation is divided into 5 levels. 1) To get the iPod 2) To release the lock of the iPod 3) To start the application 4) To choose an icon 5) To show it to someone. Autistic children will learn 1) to 4) quite easily, but they will not understand 5), which means they need to show the screen to someone to communicate. The light bar graph shows how many times the teacher told him to get the attention of others. The teacher's support was needed more than 50% till 10th week for T. The Solid line graph shows how many times he actually used this application. The dashed line graph shows how many times he tried to get attention of his teacher. In this case study, it is clear that his motivation to communicate with the teacher had been increased by using iPod with this application..

4.2 Case Study 2

The subject of observation was a 11 year-old autistic boy (M) with severe mental disability. In April 2011, we gave iPad to M with "Let's Talk!" on the screen. He understood that the screen would change when he touched it immediately. In May, he became to show the words such as " Can I start?" "Can I have some more?" and so on with iPod at lunchtime. In late May, we took pictures of the lunch menu and saved them in "Let's Talk!" as original symbols. M showed what he did not like to eat when he saw the pictures. At this point, he did not try to arouse someone's attention. In June, M started to use "Let's Talk!" in different situations besides lunchtime. For example, he told his teacher that he had done with his test by tapping "I'm done" button. (Figure 3) He started to arouse someone's attention by tapping his/her shoulder or arm. In September, M became to be able to create original symbols by himself. And in November, he became to be able to use some other application besides "Let's Talk!". In February, M has been using "Let's Talk!" less often at this point. He used his gestures to tell us simple requirements such as "Can I start to eat?" or "Reduce some of this, please." If the person he tried to tell his request could not understand his gesture, he used pictures in iPod or typed words on memo function. He sometimes made voice sound to get someone's attention that he had never done before.

Fig. 3. M tells the teacher "I'm done" with iPod

M understood the function of communication quickly with this application and became to be able to communicate with others. We consider repeating the experiences to communicate with others stimulates the desire for communications and arouses initiative. It is obvious "Let's Talk!" is useful to raise the communication ability.

5 Another Support Application

5.1 Hanamaru

It is a To-do application for autistic children. It will show you a schedule by voice sound and text. A user can also show the processes of a behavior by symbols with this application. It is easy to understand for child what he/she needs to do next and he/she can get on the next step by him/herself. Figure 4 shows the situation of students in the school for handicapped children using "Hanamaru" to make a cake. The student confirms the process of "check the cake" on the screen of iPod. The students can figure out what they need to do next with this function by themselves without the instructions of the teachers.

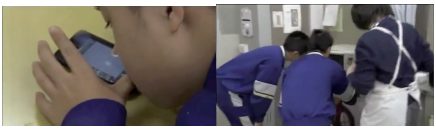

Fig. 4. Using “Hanamaru” to make a cake

5.2 Anshin

We also developed a scheduler application for elderly people, “Anshin”. It is easy to understand "what to do next" at a glance by pictures, letters, and voice. We tried to make the manipulation as simple and easy as possible for the elderly people who are not familiar with portable equipments to be able to use it by own. In Japan, it has been a social problem that solitary death, which means someone who lives alone dies at home without anyone knowing. If a user doesn't use "Anshin" for 3 days, it will send e-mail to his/her family or friends (up to 2 people) automatically and let them know a user’s situation.

6 Conclusion

We developed a new communication assistant tool with PDA, “Let’s Talk!”, for autistic children. If autistic children feel the joy of communication by using this application, they will be strongly motivated to try to understand others thoughts. This application may have much possibility to be used by not only autistic children but also people who have problems of communication because of some diseases, such as pharyngeal cancer, cerebral palsy from a stroke, or senile dementia. We think if people can communicate with each other regardless of disabilities, it will provide new human resources and encourage developing the society where people support each other. In future prospective, it is urgently necessary for us to develop supporting systems for children with Limb/Trunk Dysfunction or bedridden old people who even cannot touch the screen. We consider the core categories and symbols for basic communication is established through the development of “Let’s Talk!” We will apply the method for future studies.

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