Study on collaborative work for collaborative drawing among acquired visually impaired and healthy persons

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A research on collaborative work for collaborative drawing among acquired visually impaired and healthy persons. In this study, we developed a support system for collaborative that promotes to play acquired visually impaired and healthy persons. From the consideration of collaborative drawing among acquired visually impaired and healthy persons using the developed system, we proposed elements to promote collaborative work. As a proposal, we mentioned that it is effective to set the attention target by mutual conversion of a visual information and a tactile information. Setting the attention target promoted interaction among the participants. The developed system can support acquired visually impaired persons as well as healthy ones. The support for both persons can promote collaborative work.

"Convention on the Rights of Persons with Disabilities" is a treaty to protect the rights of persons with disabilities. It is important that people with disabilities can participate in recreation. People with disabilities sometimes not be able to participate in recreation due to disability. In my research, we focused on visually impaired persons. Acquired visually person means a person who lost sight in the middle of life. Visually impaired persons take time to accept disability. Also, it takes time for them to get used to their daily lives. Therefore, the opportunities for them to participate in recreation are reduced. We think that any activities related to drawing are difficult tasks for visual impaired persons due to visual matter.

We expect the support for drawing activities leads to support on daily life of acquired visually impaired persons. We will support the collaboration among acquired visually impaired and healthy persons. We selected a collaborative drawing as a collaborative work. Collaborative drawing is a collaborative work that plural people complete one picture. Collaborative drawing promotes mutual understanding between visually impaired and

healthy persons. Also, with collaborative drawing, we will support the drawing of visually impaired. There are "Dot diagram display" and "AuxDeco" as support for the drawing of the healthy persons. It is not easy to adopt these devices for supporting collaborative drawing due to technical and cost issues. They have too low resolution to display drawing sheet in spite of expensiveness. In my research, we propose a support method of collaborative drawings among acquired visually impaired and healthy persons. The design method in this research is based on inclusive design. Inclusive design is a way to design in collaboration with users who have been excluded. We set an acquired visually impaired person as a lead user. By deciding the lead user, we incorporate the experiences of the daily life of visually impaired in the system design.

We mention support for the visually impaired persons and cooperative work as related works. Several systems have been developed for helping visually handicapped persons understanding pictures. They have some drawbacks. For example, the users cannot draw a picture in the system because it has no input function. Collaborative drawing have activities to draw picture themselves and to see picture of others. In order to support collaborative drawing, a support system need not only input function but also output one (displaying a picture). There is few researches on collaboration among acquired visually impaired and healthy persons. Collaboration among acquired visually impaired and healthy persons is aimed at the support of the visually impaired. On the other hand, my research will support acquired visually impaired people and healthy people halfway.

First, we conducted activities in which pseudo-visually impaired and healthy persons draw a picture together. We also investigated the features. Collaborative drawings were held twice. The first time is a collaborative drawing activity among healthy persons. The second time is a collaborative drawing activity of pseudo-visually impaired and healthy persons. We compared the first and second activities. In the first time (collaborative drawing activities among healthy persons), all subjects could share the information about drawing activities. On the other hand, in the second time (collaborative drawing activities among pseudo-visually impaired and healthy persons), some subjects could not share the information about drawing activities. Therefore, pseudo-visually impaired person seems to take more time to draw. As a result of the second time, the necessity that visually impaired and healthy persons share the information about drawing activities has been confirmed.

Next, we interviewed the acquired visually impaired person as lead users in inclusive design. The experience of his daily life is incorporated into the design of the system. As a result of the interview, we can find that it is necessary to give feedback to the system. We also can find that feedback for visually impaired persons is a means of information acquisition. Based on the results of collaborative drawing activities and the interview, we developed a support system "co-play tactile display". This system has a tactile display and a few tablet PC, and can mutually transform between visual information and tactile information. Using the tactile display, acquired visually impaired person can draw picture with a tactile sense. The tactile display outputs a convex shape as tactile presentation. A acquired visually impaired person touches the convex shape and recognizes the picture.

Using tablet PC, healthy person can read the picture information visually. The tablet PC displays a picture on the screen as a visual presentation. This system connect between tactile display and tablet PC are linked. Using different devices, acquired visually impaired persons and healthy persons cooperate to complete a picture. Next, we conducted activities in which acquired visually impaired and healthy persons draw a picture together using this system. We also investigated the influence of this system. Collaborative drawings were held twice. The first time is a collaborative drawing activity without the system. The second time is a collaborative drawing activity with the system. We compared the first and second activities. Whether using the system or not, a change was seen in collaborative work. Without this system, acquired visually impaired persons seems to take more time to draw. We think that acquired visually impaired persons and healthy persons cannot share information of drawing activity. With this system, they seem to share the information.

We think the mutual conversion of visual and haptic information can increase the amount of shared information of drawing activities. We also think increasing information of drawing activities promote to collaborate at the activity. This system can help the acquired visually person to grasp the display position because this system has a flame on its screen. And, healthy persons can easier to support the acquired visually impaired person using this system. The healthy persons provided information about drawing activities using the body touch to the acquired visually impaired. But there is a possibility to make body touch uncomfortable. A healthy person can support to draw a picture without causing discomfort to the acquired visually person using this system. We think that it is difficult to understand a picture using a tactile diagram. The acquired visually impaired person seem to understand the picture receiving information about the picture from healthy persons. In this research, we developed the support system for collaborative drawing among acquired visually impaired and healthy persons. We conducted activities in which acquired visually impaired and healthy persons draw a picture together using this system. From the results of collaborative drawing activities, we proposed a method to support collaborative work.