Relation between Brain Activity of fMRI and NIRS image at the Rehabilitation Training

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Abstract

Recently, the number of stroke patient has been increasing in many countries including Japan according to aging of population. Besides the number of physical therapist (PT) has not increased despite of the aging of society and the absence of PT is one of the social problem. Therefore it is necessary that a PT treat with several stroke patients at the same time, but it is difficult problem for the PT. We think that one of the solutions of this problem is to use the some devices for rehabilitation, which device called “Pata-Koro” made by Biophilia institute. First, we study the efficacy at the rehabilitation, because those of those devices have been not studied. In this study the purpose is to measure the brain activity by fMRI and NIRS at the rehabilitation. Although the fMRI images are adequate for brain activity detection, the patients cannot use the devices at the measurement. Although the patients can use the devices at NIRS measurement, the NIRS image data is not efficient for the brain activity detection. We study the relation between fMRI image and NIRS image at the rehabilitation. In the next step we study the efficacy of devices will be studied with NIRS image at the rehabilitation.

Method

In this research, we study the relation between the active site of fMRI and the active channel of NIRS. First, the head contours are obtained from each frame of fMRI and the 3D head shapes are constructed by those contours. Next, the active sites of fMRI are extracted from fMRI images and are mapped on the obtained head shape. Next, the NIRS image corresponding to fMRI is mapped on the same head shape. Finally, in this study we show the distances between the NIRS channel and the active sites in the head part.

Result

Figure 1 shows the active sites of fMRI and detection channels of NIRS mapped on the head shape. The head shape is made by integrating the head contours obtained from each frame of fMRI. Figure 2 shows the active image obtained from NIRS signal mapped on the head shape. Figure 3 shows the distance between NIRS channel and the nearest active sites obtained by fMRI. The connection value in the figure means an active level of fMRI.

Future Work

After the sufficient results will be obtained on the first step study, we will perform the measurement of brain activity at the rehabilitation from NIRS and study time-series efficacy from NIRS image at the rehabilitation. Moreover we will try to discuss about time-dependent change according to difference of rehabilitation methods.