Illumination-installation for Elderly Brains' Activation

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Abstract: In Japan, today, the number of elderly people with dementia is estimated to be about 4.62 million as of 2012. Furthermore, it is said that the number of patients suffering from dementia will exceed 7 million in 2025 and it is considered necessary to take dementia measures easily. So we are developing an interactive device that detects motion and voice of the elderly and outputs back moving images and sounds to elderly according to the human sensor signals for the purpose of understanding human brain activation and states of mind and of supporting the elderly active. We aim to develop a per-remedy system that encourages human positive emotions and promotes activation of the brain with this interactive treatment device.

1. Background and Purpose

One of the characteristics seen in people with dementia is depression of behavioral motivation. Due to deterioration of own body functions caused by aging and change of surrounding environments, their voluntary and active approaches to anything tend to decline. These negative changes further accelerate to degrade the body functions with synergistic aging. Thus, it is currently expected to innovate novel supporting devices to guide elderly people to move their own body and expressing their voice, which must protect them from dementia.

2. Concept and Idea

The concept of this system is for any elderly people to use it easily in hospitals and at home with fun and joys. The crossing sounds and lights would facilitate variously neuronal circuits of emotion, sensory such as vision and hearing, and motor functions of whole body simultaneously. The system should be purposed to promote anyone's motivation and cognitive functions. So, we attempted to create a system of varying play image projection interactively with visual and auditory augmented reality between elderly and machine with any other people.

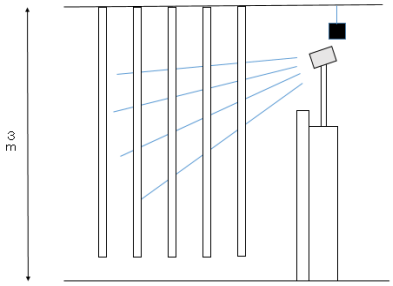

Fig.1 Side view.

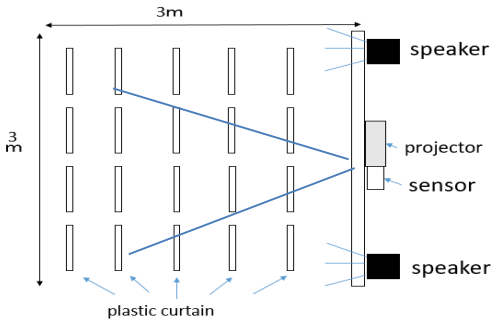

Fig.2 Top view.

3. Design and Functions

Twenty of transparent vinyl screens (*w: 60×v:200* [cm]) were hung down from the top suspenders near the ceiling (Fig.1 and 2). These screens were aimed to design to activate elderly's space cognition that is known significantly

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Fig.3. Elderly participants at this device

deteriorated in elderly with dementia. Illumination images emitted by a projector were expressed on these multiple transparent screens with music and sound effects supplied by two speakers set at both sides. Two kinds of sensors, a Kinect (Xbox) and a microphone (SONY) detected elderly behavioral activities including motions and voices. The sensor signals controlled the visual image and auditory sound expression that realized interactive function between human brains and the system image and sound outputs regulated by a computer programming networks. In addition, these soft vinyl screens could be touched which was frequently seen with projected images induction. In results, these novel technologies could realize to stimulate elderly's visual, auditory, tactile, space cognition and to induce their voluntary movement, then in consequence, cross-modal interplays of multiple neuronal functions leaded elderly's joyful and active thinking. We made our efforts to produce multiple kinds of play programs to keep elderly's un-wearying. The plays could be categorized into three types as follows:

- Type 1. Body motion-dependent, circle designs Fig.3. Elderly participants at this device;
- Type 2. Voice/sound-dependent;
- Type 3. No dependency, with practical designs.

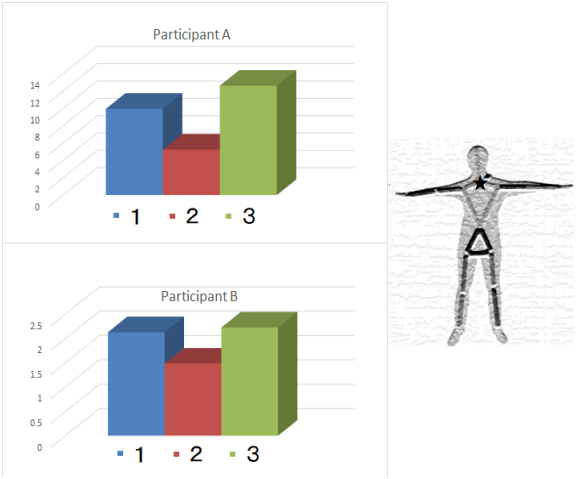

Fig.4. Preliminary analysis of elderly motion per play.

4. Problems and Future Work

The problem is the device size bigger than easily using at home generally. This is planned to be improved with our making a compact and portable design near future. This device should be evaluated the effectiveness for dementia diagnosis and intervention in the clinical fields. Before promoting the evaluation, we pre-clinically attempted to analyze the motion characteristics quantitatively utilizing Kinect (Xbox) detection with small numbers of elderly participants. In Fig.4, we present the result examples of two participants, A and B to find discriminable motion characteristics of each play type pre-mentioned as Type 1-3. The common points of body motion could be said as lower at play Type 2 and the biggest at play Type 3. We will furthermore evaluate this system with a number of elderly participants.

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