DEVELOPMENT OF MEDIATING INTERFACE DEVICE DESIGN (2)

For Care of the Elderly

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1. Introduction
With the steady aging of society, the number of aged users of health care devices and services continues to increase rapidly. Currently, various health products designed for health checks are being used and commercialized. However, not many designs have straightforward usability that allow recipients to self-apply them or even to understand the manuals. Instead, they are much too focused on the application of the technology. Therefore, it is essential to develop a device that considers the characteristics of the aged as users of the products as a first step to overcoming these difficulties. Designing and developing devices for elderly care is necessary as these are often devices that mediate between primary caregivers and the recipient, thus playing an important role in specific health care service cases. For example, such devices are often capable of measuring the pulse and receiving vital signs by analyzing behavior and condition data.

2. The aged and mediating interface
Mediating interface devices are assistant devices for natural interaction between a human and a robot. They transmit and process users’ movements, gestures and the human signals using multi-modal sensor applications such as acceleration sensors, gyro sensors, touch sensors or pulse sensors.

Elderly care systems conduct health monitoring for emergencies by detecting signals from a patient’s body. These devices provide prompt management in emergency conditions and help with emergency calls. For fluent communication between a user and a computer system, mediating interface devices for the aged require some improvements. Therefore, the appropriate region of the body for application of pulse wave sensor technology was investigated, as were design elements such as the size, form, weight, material, thickness, battery, and location on the body. The following requirements were determined:

- These devices should be approximately the size, weight, and thickness of a common wristwatch.
- The battery life should be eight hours.
- The material can be plastic but should not feel unusual when touched or worn.

3. Design requirements from traits of the aged
Through this research, four design requirement domains were identified: application of technology, wearable position, human factors and service contents. Among those domains, human factors were mainly considered in the design of a mediating interface device.

3.1 Traits of the aged
The human factors for the aged are distinct from other user targets. The research in this area has focused on eliciting requirements for prototyping devices through analyzing the physical, emotional, and perceptual traits of the aged. This is summarized here after the literature review. The five summarized main human factors are declining physical strength, reduced physical balance, reduced senses of hearing, sight and touch, declining ability to concentrate and reliance on experience.

3.2. Analysis of requirements
The five human factors were analyzed in terms of the relevance of design elements and the wearing position

3.2.1. Human factors and wearing position
A wearable type of device emphasizing mobility was the key criteria when combining the wearable concept with all aspects of the five factors. There also appeared to be a strong connection with the region of the hands. It was assumed that even the aged feel that using the hands is more practical than using other parts of the body, such as the feet or the head. Therefore, it was decided that the mobile device and tool used with the hands was likely to be most appropriate type from the viewpoint of wearability.

Key words: Mediating Interface Device, Elderly Care, Human Factor
3.2.2. Human factors and design elements
The same method of relevance analysis was repeated by constructing a matrix of the design elements. This result showed that the device should be light enough for grasping and should not harm the body due to its weight. It was deemed better if the material was somewhat adhesive rather than too smooth. In terms of balance, the proper size and weight should be considered for the aged, who tend to rely on their experience. It was deemed as better to design the device with a familiar form to appeal to users.

3.3. Direction from the results
The direction from these results, first, was a wearable type of device that is managed as an expert tool. Its general form should be at least as a partially wearable device. Secondly, a watch-type device was selected as an alternative design direction, as this design is not generally commercialized despite of the efforts. Moreover, there is less of a negative response, as it is not perceived as an unusual type of wearable device. Mobility can be applied to both types.

4. Proposal of the device design
Two types of device design are proposed here with 3D renderings that fulfill the requirements under various user scenarios.

It was assumed that the watch-type device, shown as Figure 1, is useful for the aged, who have less balance, because wearing it on wrist or hand can be rigidly stable and adhesive. A soft and flexible band material was used in a universal design that was not significantly affected by the different physical traits of different users. Additionally, its interface is simple enough to enhance usability. Figure 1 shows a device that measures the pulse. It is worn around the wrist.

The distinctive feature of Figure 2 is that this type of device is a new concept of a glove-type device which surrounds the palm and one finger. It has been shown that measuring the pulse at the finger is very stable and accurate. Therefore, the sensor was designed to be located on the side of the finger. It is also highly universal because the band can be put on easily by nearly all intended recipients. Health care products for the aged normally have a conventional appearance. We, however, wanted to make it a fashionable device that eliminates the stereotype by using unique natural material and designing it with a unique shape.

5. Conclusion
The aim of this research is to suggest a mediating device that measures the pulse considering human factor features of the aged under an environment characterized by health care computing services. By researching the physical, emotional, and perceptional features of the aged, the wearing location and design requirements were determined. The pulse is easily measured at the finger region; thus, a new concept of a device that surrounds the palm and that has the familiar appearance of a watch was designed. Future research can determine a new service that strengthens human-centered human-robot interactions using this device.

6. Reference
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