*K. SAGAWA (Convener)* ***Accessible design for older people: A design method for making things accessible by taking into account age-related changes of human abilities.*** *Gerontechnology 2014;13(2):125;* doi:10.4017/gt.2014.13.02.171.00 **Participants** K. Sagawa (Japan), S. Lee (Korea), K. Kurakata, N. Itoh (Japan). **Issue** Seeking for design methods for products, services, and environments in everyday life to increase accessibility (the extent to which products etc. can be used by those with special needs) for older people who have weakened sensory, physical, cognitive abilities with aging, and consideration on how to incorporate ergonomic knowledge and data on aging in developing design methods. **Content** Due to the decrease in human sensory, physical, and cognitive abilities with age, older people have difficulties using products, services, and environments in everyday life. Accessible design is a method 'to compensate' (as one of the concepts of Gerontechnology) these human ability decreases by a design strategy of products, services, and environments which meet to the weakened human abilities and consequently to include those people in the range of users of the products etc. This concept can be differentiated from so-called assistive technology, in which human abilities are directly dealt with by technological enhancement of the ability itself - such as hearing aids for increasing hearing ability. Accessible design, on the contrary, tries to design products not to extent human abilities, but to accommodate products to the users without any additional tools. In this symposium, the principle of accessible design will be introduced and discussed further. The discussion is to be carried out by presenting examples of the basic design methods in vision (color, contrast, font size etc.), hearing (sound pressure, frequency, etc.), tactile (tactile symbol size, vibration, etc.) and some cognitive (memory) aspects as well. Because all these design methods should be based on human data, preferably taken for a large number of samples, discussion will also be focused on how the human abilities change with age, how those changes are distributed among older people, and how the best fit of the design is obtained. As concepts and methods of accessible design are being disseminated by standardizing bodies, national or international, such as Japan Industrial standards (JIS), Korean Standards (KS), ISO standards, the discussion will be directed towards the role of standardization in implementing accessible design into commercial and industrial applications **Structure** There will be 4 oral presentations, each on concept (Sagawa), sensory characteristics (Kurakata), Tactile (Lee), and Vision (Itoh), respectively, followed by a general discussion on introducing accessible design into Gerontechnology. **Conclusion** Raising awareness of accessible design and establishing a way for useful implementation of the concept in Gerontechnology

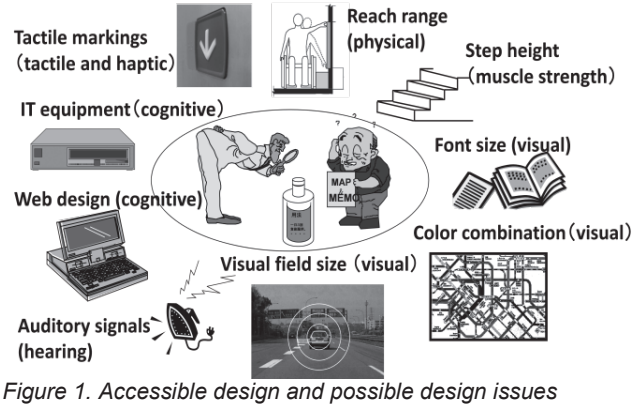


*Figure 1. Accessible design and possible design issues*

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*K. SAGAWA.* ***Concept and goal of accessible design for older people.*** *Gerontechnology 2014;13(2):125-126;* doi:10.4017/gt.2014.13.02.372.00 **Purpose** There are several design concepts proposed for addressing the needs of older persons and persons with disabilities, including universal design, inclusive design, and barrier-free design. Among these concepts,

accessible design has been developed and promoted through the international standards organizations ISO, IEC and ITU, and in many other national standards bodies. This paper presents the concept of accessible design and discusses devices' impact on gerontechnology, particularly focusing on problems associated with aging. **Method** Accessible design is defined in the ISO/IEC Guide 71 as 'design focused on diverse users to maximize the number of potential users who can readily use a system in diverse contexts'. This means that accessible design tries to include the widest range of users given different capabilities and characteristics. *Figure 2* shows some possible steps of increasing users. For example, one may increase the number of older people using a product by enlarging font-size. To increase the number of blind people using a product, we may provide tactile information like Braille on the surface of a packaging label. Two particular design strategies can be addressed. One is called 'alternative format of information' or 'alternative means of input/output devices' to meet the needs of people with special requirements. Alternative format includes, for example, the tactile floor-information presentation in a lift to replace visual information for blind people. The other strategy is to design products, services, and environments that are numerically fit to the abilities of the elderly or disabled. For example, we could design legible font size or comfortably audible sound signals by taking into account the age-related changes of visual acuity or hearing sensitivity, which have been addressed as 'compensation' in the concept of Gerontechnology. **Results & Discussion** Accessible design is a useful design concepts to be implemented in Gerontechnology in the fields of products, services, and environments. Modern technology, including information-communication technology, can effectively use this design concept to solve various problems that older people face in their daily lives.

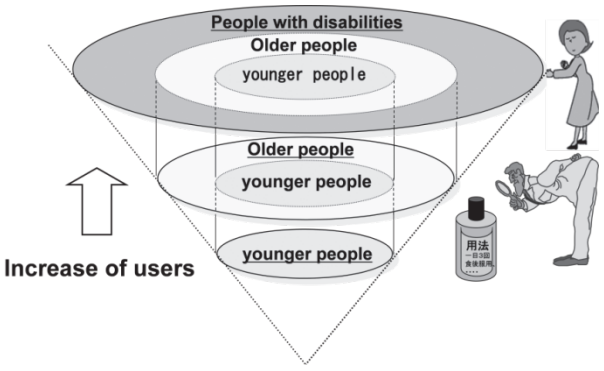


*Figure 2. Increasing users in accessible design*

**References**

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*K. KURAKATA, N. ITOH, J. OHYAMA, H. SATO, K. SAGAWA.* ***Database of sensory characteristics of older persons and persons with disabilities.*** *Gerontechnology 2014;13(2):126-127;* doi:10.4017/gt.2014.13.02.260.00 **Purpose** It has long been common practice to design consumer products, living spaces, services, etc., with the assumption that the main users are healthy young people. However, when products are designed for older persons or persons with disabilities, the designers need to consider the sensory characteristics and abilities of these groups of users. The authors have constructed the 'Database of sensory characteristics of older persons and persons with disabilities'. Referring to the database will make it easier for designers to design products that accommodate various people who differ in their sensory characteristics and abilities[1]. **Method** The database displays sensory characteristics of vision, hearing, and touch measured at Advanced Industrial Science and Technology (AIST), Japan, by the authors from more than 3,000 young and older persons as well as persons with disabilities. These data for sensory characteristics have been adopted for establishing the Japanese Industrial Standards (JISs) 'Guidelines for older persons and persons with disabilities'. The database graphically presents the JIS contents described by equations and tables. **Results & Discussion** Japanese and English versions of the database have been released on the web

free of charge to the public (*Figure 3*). Anyone can access and use the data as long as they comply with the terms of use. In addition to contact information, the database has a questionnaire page to gather opinions and requests from users. Data released at this time are limited to 16 items, but the authors plan further expansion, including refinement of unreleased data and addition of new items in response to feedback from users through the questionnaires.

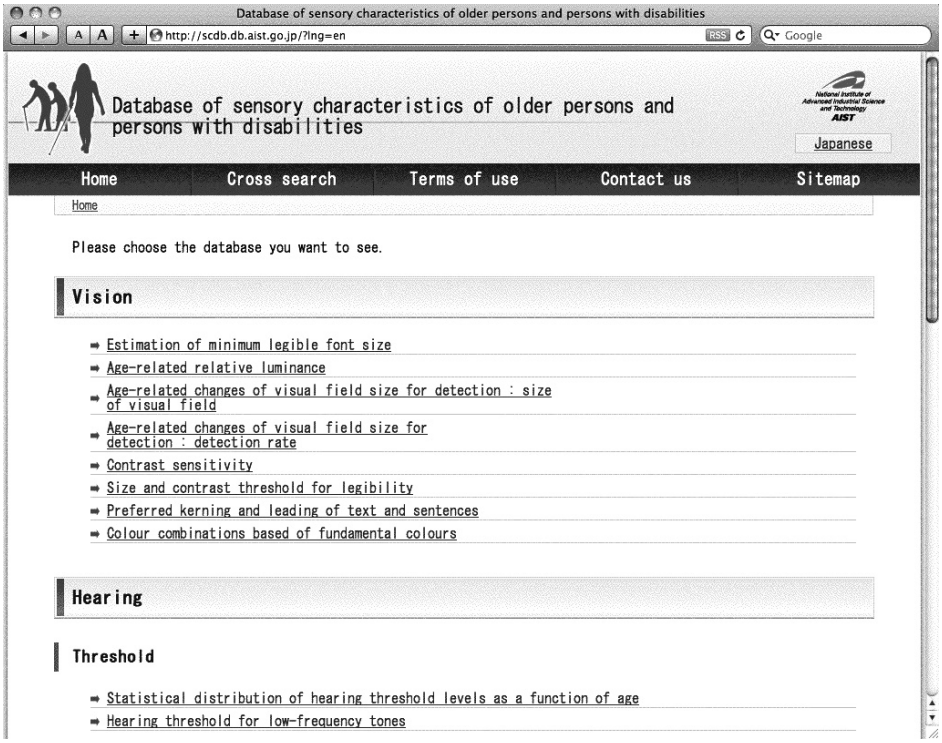


*Figure 3. Top page of display screen of database (partial section)*[2]

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*S. LEE, D. KIM.* ***Accessible information structure with no visual feedback for electronic house appliance design.*** *Gerontechnology 2014;13(2):127-128;* doi:10.4017/gt.2014.13.02.422.00

**Purpose** A complex interface with several controls and multiple choices, such as an interface of a washing machine, would be hard to recognize and manipulate without visual information and feedback. People with visual disabilities are always exposed to this type of difficulty when using such interfaces. This study examines the informational structure of interfaces of various electronic appliances in terms of arrangement width and depth. This is expressed by multiplying the number of controls by the number of choices. This study then reveals how the structure affects the usability of the interface. We examined this usability question: "Will the canonicity (information structure in the canonical form) affect learning and performance of a person attempting to locate a choice from a series of multiple control options particularly when there is

no visual information but only with auditory feedback?" **Method** The choices can be grouped under each control in two ways: canonically balanced and random. The canonically balanced arrangements of 3×5 (three controls with five choices each) and 5×3 (five controls with three choices each) were used in our study. The random and non-balanced arrangement does not have a canonical arrangement: three controls with three choices for the first control, five choices for the second control, and four choices for the last. The usability was assessed using the learning time (actually time to memorize the structure), and time to locate a given choice for 30 young blindfolded subjects with a prototype control panel that has three to five push buttons. **Results & Discussion** The learning time and locating time increased as the number of controls and the choices increased (*Figure 4*). Performance improved when the canonicity was maintained and when the amount of the information to transmit was equal between the balanced and random arrangements (*Figure 5*). Within the canonically balanced structure, the interface with fewer controls and more choices in a control are better than the opposite structure in learning and locating times. In general, user performance was better when canonicity of the information structure is maintained, and when information is densely chunked within a control. The study can provide guidelines for user interface designs of various household appliances with controls for the blind users and older users. For some users who have the short-term memory problems, such as the users with cognitive impairment or older users, auditory feedback seemed to not convey as much information as visual information does for learning where the option to select is located for the desired function. Even without auditory feedback, the interface needs to be designed with canonicity maintained in information structure in order to provide accessibility to the users with visual impairment or memory problems.

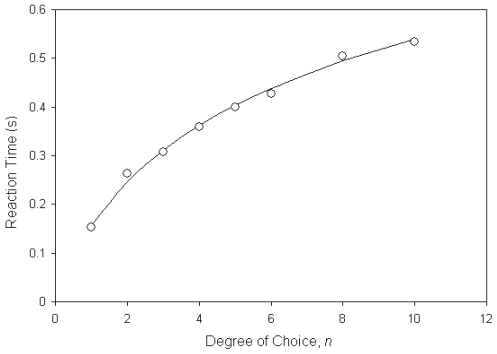


*Figure 4. Search time vs. degree of choices*

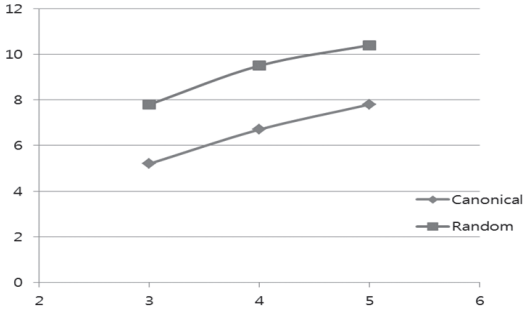


*Figure 5. Search time vs. number of choices*

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*N. ITOH, J. OHYAMA.* ***Visual sign design for older adults.*** *Gerontechnology 2014; 13(2):128-129;* doi:10.4017/gt.2014.13.02.263.00 **Purpose** The important elements of visual signs that enhance visibility are color, contrast, size, and font type (*Figure 6*). Furthermore, the illumination level of the environment, layout, and distance of visual signs must be considered. This study was conducted to develop methods for designing and evaluating the elements of visual signs such as contrast between figures and backgrounds, color combinations, and legible letters for older adults. Moreover, features of visual functions of older adults were examined. **Method** Study participants were 50 older adults (60 years and older) and 50 younger

adults (20 and older). For some participants, visual acuity was adjusted to each individual's maximum attainable level using corrective lenses to avoid effects of differences among individuals. Some experiments used CRT monitors or projectors to measure the legible font size, contrast sensitivity, and visual field size. Furthermore, for experiments using color combinations, color chips were used to judge the color similarity. **Results & Discussion** Sensitivity to lighting for older adults declined, especially in shorter wavelengths such as blue[1]. The span of color similarities for older adults is shifted slightly to higher-saturation colors. The span differs in relation to the level of illumination[2]. Results show that relative luminance contrast and conspicuity of colors should be considered to select a proper color combination that is distinguishable by older adults. Regarding the font size, effects of viewing distance and luminance are significantly age-dependent[3]. For example, for a 5m visual distance and 100 cd/m$^2$ background luminance, the minimum legible font size (MLFZ) of gothic type Arabic numerals of older subjects was about 30 pt, although that of younger subjects was about 23 pt. For lower background luminance of 10 cd/m$^2$, MLFZ of 60s subjects was 1.44 times that of younger subjects. Furthermore, for greater visual distance of 10 m, the MLFZ of 60s subjects was 1.49 times that of younger subjects. Contrast and size of the target in an actual environment exert effects on the detectable visual field size[4,5]. Therefore, the size of visual fields for older adults should be considered when placing visual signs in public spaces. To improve design for accessibility of visual signs, one must consider the visual function of older adults and choose appropriate colors, contrast, size, and font type. Simultaneously, attention must be devoted to environmental factors such as placement of visual signs and illumination. Some data obtained from this examination were processed for standardization[6] or were released as a database of sensory characteristics of older people and people with disabilities.

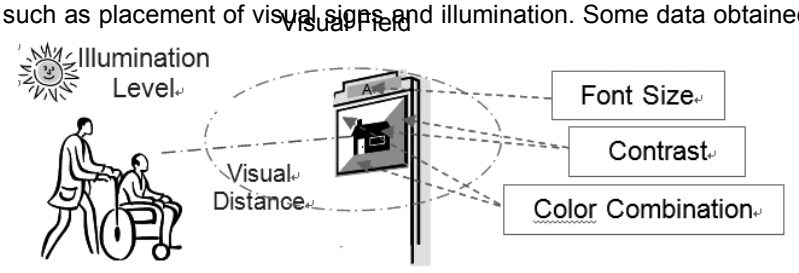


*Figure 6. Elements to be considered in visual signs*

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