

Friday Afternoon

LUNCHEON SEMINAR; CHAIR: TO BE DESIGNATED

*Research and business related to an aging society at Matsushita Electric Works
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This paper discusses Matsushita Electric Works' strategy for designing equipment from the viewpoint of Ergonomics and Kansei Engineering to assist the elderly.

We refer to Universal Design philosophy related to the development of equipment to assist elderly people.

PAPER SESSION 'PHYSICAL CHARACTERISTICS'; CHAIR: KAZUO TANI (JAPAN)

*Design of sliding door based on effects of applied force, shape and dimension
of operating part*

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The applied force of sliding door and the shape and dimension of its operating part were examined in terms of friendliness for users including elder people in order to learn the basic design requirements of sliding door. The maximum force was measured with subjects using the operating parts installed on a wall. The maximum force of elder male observed was 42N on average, elder female 44N. The sensory evaluation test was held to

check the influence of applied force and form and dimension of operating part on opening and closing with a full-size mock sliding door. While the applied force of 10N was highly evaluated, 30N was poorly valued regardless of the shape and dimension of operating part. The most remarkable effect was observed in case of 20N: the shallower handgrip was strictly assessed and the bar handle was highly appreciated.

Model and impedance control of human skin muscle by using a multi-fingered robot hand

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In recent years, special attention has been paid to the need for robots that can assist human beings with their health and welfare needs. Robots that can perform these specialized tasks require complex mechanisms, and the ability to realize complex motions like those performed by human beings. An expert massage robot with a hand that has four fingers and 13 joints was built to be used for welfare purposes. First, modeling and identifica-

tion of human skin muscle is conducted, and the validity of its models is demonstrated via comparing between simulation and experiments. Secondly, impedance control for massage motion is designed based on the human skin muscle. In the proposed system, massage robot can find the painful part using the sensor, and robot can massage adequately for human beings. The usefulness of this paper is demonstrated through experiments.

Computer simulation of human gait for gerontechnology

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This paper describes a computer simulation model of human walking that seeks to improve the practicability of the simulation method for application to rehabilitation and gerontechnology. The musculo-skeletal system was represented by a three-dimensional, 14-rigid-link model and 60 muscle models. Muscular forces were controlled by a neuronal system model consisting of 16 pairs of the neural oscillators. This simulation model was applied to

investigate biomechanical relationship among walking stability, body dynamics properties, and the neuronal properties, such as time-delay in the nervous system. Also, the model could synthesize falling patterns similar to those in the older adults. Such simulation methods will provide us with a novel computational assessment tool of human movement that we call computer aided rehabilitation engineering (CARE) system.

Instrument and evaluation of wheelchair propulsion for user friendly matching

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The evaluation of loads on upper limbs during wheelchair propulsion is required not only for preventing secondary injuries but for matching a wheelchair to user. Many studies of analyzing loads on upper limbs during wheelchair propulsion have been carried out for finding better stroke patterns or seating positions. Most of studies are based on the analyses in sagittal plane or on 2 dimensional measurements. However, 3 dimensional measurements are necessary to evaluate quantitatively the required muscle forces and consumption energy since movements of upper limbs are essentially 3 dimensional. Therefore, we have developed a new 3 dimensional instrumental system

for wheelchair propulsion. Using this system, we can measure the 3 dimensional force and moment at the contact point of the hand and handrim without giving any constraint on the wheelchair motion. The mechanical work, estimated consumption energy, and generated torques at joints of the upper limb can be calculated from the measurement values. Moreover, we can optimize the seat position or the movement of upper body based on the calculated values and the 7 links model of upper limb. A particular example is given to show the effectiveness of the optimization in which 20% reduction of mechanical work is obtained.

PAPER SESSION 'GERONTECHNOLOGY GENERAL'; CHAIR: DARIO BRACCO (ITALY)

Will Nagoya bring the breakthrough?

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Invention and development of Gerontechnology has been largely influenced by societal and technological developments such as greying of society, the emergence of omnipresent ICT, increased individualization of citizens, diminishing of the working population relative to the total population and an increased dependence on technological means. An additional societal tendency is to extend the duration of full citizenship by lowering the minimum age. In the Netherlands, for instance, the minimum age for marriage

without parent or guardian consent, decreased within a century from 30 to 18 years of age. Gerontechnology has emerged to increase effective full citizenship also on the other end of the age scale by increasing vitality, independence, mobility, and self-esteem. However, gerontechnology has not yet rolled out massively. In this contribution we analyse the contributions to 5 international gerontechnological conferences in order to understand the process of a possible final breakthrough of the domain.