Development and Implementation of Nursing-Care Robots

OUTLINE:
Introduction
Robotic Devices for Nursing Care Project
Benefit and Safety

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Number of Elderly Persons who need Care in Japan

Ref. Ministry of Health, Labor and Welfare

Unit: 10,000 persons

Care Level 5
Care Level 4
Care Level 3
Care Level 2
Care Level 1
Support Level 2
Support Level 1
Why robotics for elderly care?

• Goal
  – Less burden for care givers
  – More efficient care with less care givers
  – More participation and activities of elderly persons
Robotic Devices for Nursery Care Project of METI/AMED (2013FY-2017FY for Five years)

- Regulatory Science
  Is studied to establish a scientific protocol for evaluating the effects and safety of the robotic devices.

- Development of the robotic devices
  Is financially supported for the applications specified by the government based on the investigation of the nursery care problems.
  - 98 manufacturers has contributed.
What does robotics mean here?

- **Smart Sensor**
  - Safety surveillance sensor using a smart processing of range data

- **Smart Control**
  - Smart motor control of a walker for power and safety assist

- **Multi-link structure**
  - Multi-link structure to implement a transfer assist device
The project has launched 15 Commercial Products.

Transfer Assist

Walking Assist

Smart Toilet

Safety Surveillance Sensor
List of Robotic Devices for Elderly Care

- Robot Suit HAL for Care Assist (Cyberdyne)
- Muscle Suit for Care Assist (Inophys)
- Robotic Bed (Panasonic)
- ROBOHELPER SASUKA (Muscle)
- Transfer Assist Device (Fuji Machinery)
- Transfer Support Device (Yaskawa)
- RT.1. RT.2 (RT Works)
- Little Keepace (Kowa)
- Walking Assist (Kawamura Cycle)
- Portable Toilet with Wastes Processing (TOTO)
- Portable Toilet with Water Washing (ARONKASEI)
- Wells Aids for Bathing (Sekisui Home Techno)
- Neos+Care (Noritsu Precision)
- Silhouette Surveillance Sensor (King Tsushin Kogyo)
Definition of Safety
ISO/IEC GUIDE 51:2014

- Safety
  - Freedom from risk which is not tolerable

- Risk
  - Combination of the probability of occurrence of harm and the severity of that harm

- Harm
  - Injury or damage to the health of people, or damage to property or the environment
Tolerance of Products by Risk and Benefit

Risk and Benefit Diagram

Risk

Benefit

IT device
- Personal Computer
- Smart Phone

Automobile
- Ear

Home Appliance
- Robotic Bed
- Autonomous Robots
- Game Machine
- Toilet with Shower
- Washing Machine
- Massage Chair
- IH oven
- Juicer/Mixer

Personal Mobility
- Powered Suit Lift
- Electric Wheel Chair
- Escalator

Home Appliance

AIST
<Objectives>
1. Establishment of safety standard, safety test methods and certification scheme for service robots
2. Development of safe service robots based on the safety standard
3. Proposal of the international safety standard and creation of the test facility and certification body

<Organization>
- Development of the Protocol for Evaluating the Safety of the Robots
  - Establishing the Safety Standard
  - Designing the evaluation protocol

- Evaluation Protocol of the Safety
  - Certifying Body (ISO/IEC Guide 65)

- Robot Builder

- Related Test Facilities

- Safety Test Institute (Robot Safety Center)

- International Standard ISO13482 (Safety Requirement for Personal Care Robots) (TC184/SC2/WG7)

- Development of Safe Robots (Mobile Servant, Powered Suits, Personal Mobility)
  - Developing safe robots
  - Evaluation of the safety

- Mobile Servants
- Powered Suits
- Personal Mobility
AIST Robot Safety Center
- Provides one stop service for safety tests of personal care robots

- Collision Avoidance Test
- Collision Test
- Durability Test
- Environment Test
- Dynamic Stability Test
- EMC Test
- Visual Sensor Test

Temperature
Humidity
Vibration
ISO 13482 Certification

- Robotic Bed (Panasonic, 2014/4/1)
- Robot Assist Walker (RT Works, 2015/7/14)
- Honda Walking Assist (Honda, 2015/7/21)
- Powered Suit (Cyberdyne, 2014/9/30)
- CE Marking on MDD (Honda, 2017/12/18)
Goal 1: Less burden for care gives

- Care services with high burden
  - Transfer among bed, wheel chair and toilet
  - Safety surveillance of dementia patient especially in a night

- Applicable robotic devices
  - Transfer aid of wearable type
  - Transfer aid of non-wearable type
  - Safety surveillance sensors
  - Smart portable toilet
Goal 2: More efficient care with less number of care givers

- Care services with low efficiency
  - Safety surveillance of dementia patients especially in a night

- Applicable robotic devices
  - Safety surveillance sensor for nursing home
  - Safety surveillance sensor for home
  - Safety surveillance sensor for outside
Goal 3: More participation and activities of elderly persons

- Normalization of elderly persons
  - Using toilet instead of diapers
  - Autonomous moving
  - Living at home

- Applicable robotic devices
  - Walking aid for outside
  - Walking aid in a domestic space
  - Aid for taking a bath
  - Autonomous wheel chair
  - Safety surveillance sensors
The contribution of goal 3

- Care receivers
  - More participation and activity
  - Less accidents

- Care givers
  - Less burden
  - More sense of satisfaction
  - Low income

- Robotic device manufacturer
  - More sales of the robotic devices

- Nursing service providers
  - More profit
  - More care givers
  - Many accidents

- Government
  - Decrease of the cost
  - More care givers
Summary

• Increase of the number of elderly persons under care
  – Increase of the cost for elderly care
  – the lack of care givers in Japan

• Development of the robotic devices for nursing care
  – 98 devices have been developed in the project
  – 15 commercial products have been deployed for nursing care

• Benefit and Safety of the robotic devices
  – Benefit: less burden for care givers, more efficient care, and more participation and activities of elderly persons
  – Safety: international safety standard, robot safety center, and certificate of the standard