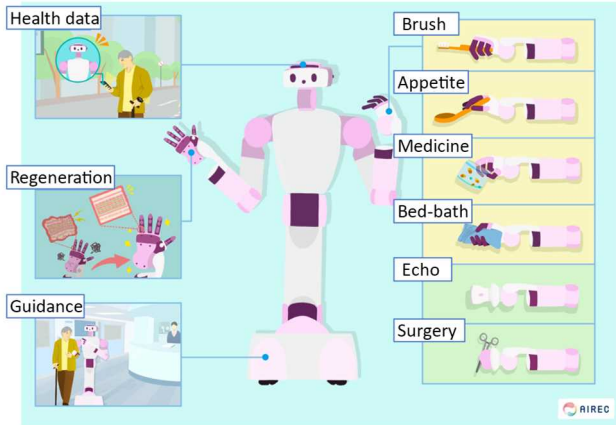


Technologies for welfare and medical care with smart robots

Progress until FY2022

1. Outline of the project

Research and development have been conducted to develop a smart robot (AIREC, AI-driven Robot for Embrace and Care) to assist healthcare workers and visitors in healthcare facilities and hospitals where elderly care, nursing, and medical care are provided. As AIRECs interact with people, it is necessary for AIRECs to move gently and safely and to be able to use a variety of specialized tools for treatment. AIRECs are expected to play an active role in the medical and welfare fields, taking into consideration their affinity with people and safety.



2. Outcome so far

1) Information infrastructure system for health monitoring
A sophisticated server that stores data in a format that is highly compatible with other databases has been built to

enable AIREC to touch people in their daily lives and acquire biometric information for health management. Demonstration experiments for data collection have been initiated at nursing care facilities.

2) Developing robotic hand skin

Our goal is to create a bio-hybrid robotic skin that can replace human hand skin. Focusing on the characteristics of hydrogen-bonding materials, we developed gels with elasticity, adhesive strength, high extensibility, and self-healing properties suitable for human contact (Fig. 1 left).

3) AIREC functions for facility guidance

Thirty-five demonstrations were conducted in hospitals where prototype robots guided visitors to various examination rooms, identifying the functions required for AIREC to "gently" guide people and the challenges to be overcome.

4) Ability to administer and manage medications correctly

We surveyed the needs of nurses and caregivers in current nursing and medical care settings and developed a prototype of the system.

5) Robot hands that can be used in various places

A special hand was attached to the AIREC to simulate the function of providing oral care (Fig. 1 middle). To develop a hand that can perform medical examinations (palpation

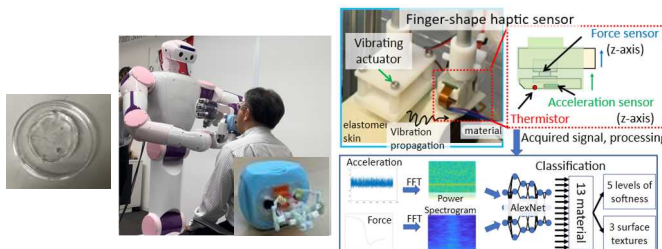


Fig.1 (Left)Hydrogel developed, (Middle)Oral care hand and testing, (Right) Palpation AI.

and care), we constructed an AI that can determine features essential for determining the severity of an affected area (Fig. 1, right) and verified the principle of a tactile sensor.

6) Welfare and medical robot design, quality assurance, international standardization, and risk management

A new standard framework is needed for robots that handle medical devices, therefore a preparatory committee for guidelines was formed. A multi-person location detection system was installed in a nursing facility to enable ongoing data collection and analysis for risk management, safety, and quality assurance. AIREC was installed at the facility to implement and evaluate some of the gymnastics support and

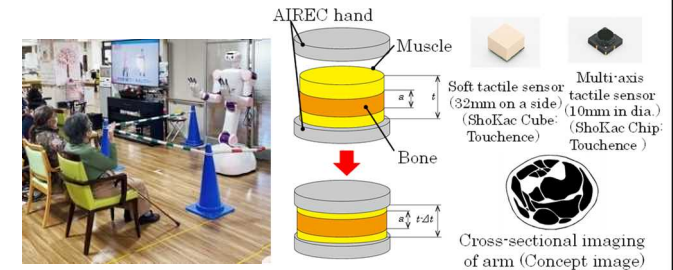


Fig. 2 (Left) AIREC in a nursing facility, (Right) Stiffness measurement method for evaluating arm condition with AIREC hand.

conversation functions (Fig. 2 left). A study was conducted to assess the physical characteristics of the elderly (Fig. 2 right).

3. Future plans

In the future, we plan to link AIREC with the development results we have achieved so far and introduce AI to enable AIREC to perform each function accurately and autonomously. We also promote research that considers social ethics to enable AIREC to work in society.