R&D Theme

Social implementation of a collective of coevolution AI robots

Progress until FY2022

1. Outline of the project

This research theme aims to develop a self-organizing social AI that adapts to people and the environment and modifies its assistance plan and functions on its own, as a technology necessary for anyone to be able to use AI robots anytime, anywhere with peace of mind. In other words, we will develop simulation technology that automatically determines which AI robots will assist when, where, who, what, and how.

In addition, we will address issues necessary for social implementation, such as the establishment of a demonstration experiment environment (living lab), the creation of social proof scenarios, the design of development concepts for standardization, the establishment of safety evaluation standards and risk assessment methods, protection of personal information, and ELSI.

2. Outcome so far

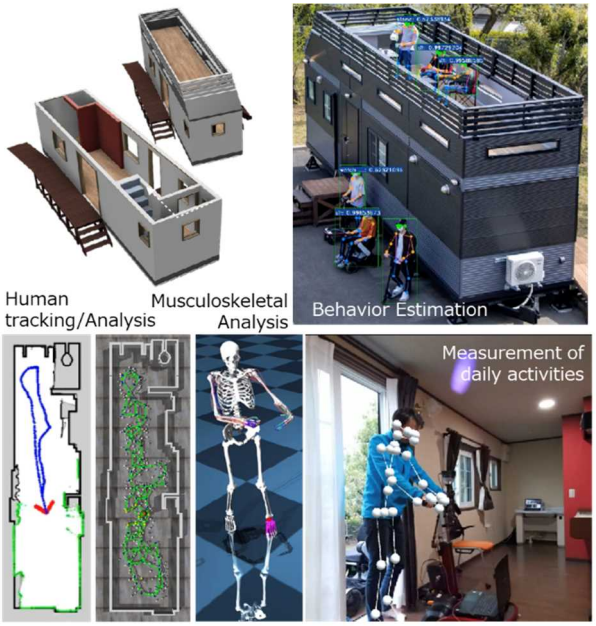
We are working on standardization for the social implementation of new robots, ELSI strategies, development of demonstration sites, construction of technology for the cooperative operation of multiple AI robots, and development of simulators for system integration. In addition, we are working on a framework for sharing the data set developed in R&D item 3 with R&D item 1, as well as on control and operation methods for the adaptable AI robots in R&D item 2, to ensure close collaboration in anticipation of demonstration experiments.

An organizational development framework for ELSI/RRI, which includes concept design, analysis, ethical compliance, and risk assessment of the robot to be developed, was established in accordance with IEEE SA 7000. In addition, to integrate people, robots, and AI, we developed a support tool for developing social implementation scenarios based on the Service Robot Design Matrix (SRDM) by identifying relationships among stakeholders and pain points extracted from them.

Furthermore, as an elemental technology for self-organizing socially implemented AI, we constructed a living laboratory for measuring daily life functions in which various sensors are placed. This living lab is a space where users can understand "what they can do" and "what they cannot do" and "what they want to be able to do" through activities in the lab. In other words, it is a space where they can estimate their cognitive/physical abilities and extract necessary support while having fun through activities in the living lab. It is an epoch-making space that can realize micro-analysis (movement and eye movement measurement, muscle activity estimation), meso-analysis (object manipulation and human behavior analysis), and macro-analysis (task execution evaluation).

Based on the analysis results in the living lab, we also conducted a cooperative planning simulation of AI robots and constructed a IoT based control framework for multiple robots/sensors using a common OS that enables the coordination of robots, sensors, interfaces, and other devices. We conducted demonstration experiments using this framework in the living lab and rehabilitation room at the National Center for Geriatrics and Gerontology.

In addition, to construct a privacy-conscious activity dataset for nursing homes, the actual activities of people are represented by a virtual environment and avatars. In addition, we are developing elemental technologies to measure biometric and physiological information such as eye gaze and heart rate, and to provide the data set together with synthetic voice and daily life sounds.



3. Future plans

- From the viewpoint of social implementation, develop support scenarios using nursing care robots, and specify necessary support actions and tasks derived from the scenarios.
- Development of simulation technology to automatically determine which AI robots should support when, where, who, what, and how.
- Development of operation scenarios for social implementation of Robotic Nimbus, evaluation of functions and ethics, and standardization of AI robots for nursing care.