Intelligent Knowledge Processing Infrastructure Integrating Cyber and Physical Domains

Intelligent Knowledge Processing Technology to Integrate Physical and Cyberspaces Leading to Society 5.0

Advanced cyber-physical system (CPS) is the key factor for Japan to realize Society 5.0 vision. They collect, process, and productivity. This project is designed to address and solve technical issues related to the establishment of CPS and create a common edge computing platform that facilitates developing IoT solutions without any special expertise. The dissemination and utilization of an edge computing platform will solve Japan's social issues and promote economic development, thereby leading to the realization of Society 5.0 vision.

Program Director

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Specially Appointed Professor,
Tokyo Institute of Technology (Tokyo Tech)

Profile

Dr. SASO joined Fujitsu in 1976. He became Corporate Senior Vice President in 2009 and was promoted to Corporate Executive Vice President in 2010, in charge of Fujitsu's ICT Business. He then was nominated as Corporate Senior Executive Vice President and Representative Director, CTO & CMO in 2012. After that, he took office as Chairman and Representative Director, Fujitsu Laboratories Ltd. in 2016.
He has also been serving as Program Director in Intelligent Knowledge Processing Infrastructure, integrating Physical and Virtual Domains, Japanese Government Public R & D Investment Expansion Program, Cabinet Office from 2017. He was appointed as a Specially Appointed Professor at Tokyo Institute of Technology.
Throughout his career, Dr. SASO led Fujitsu's ICT related R&D and business from personal computers and mobile phones to business servers, communi ation devices and the nation-level big project such as the development of supercomputer "KEI". Based on his experiences, he is very much familiar with technology, market and R&D trends in the fields. He took his current position in April 2018.
He has also served as Chairman of the Japan MOT Society and Chairman of the Japan Institute of Electronics Packaging.

Research and Development Topics

Sub Theme I: Common edge computing platform technology to develop IoT solutions

The research and development will be carried out to develop a common edge computing platform that facilitates the creation and operation of IoT solutions without IT expertise. The platform will include technologies that collect an extensive amount of data by controlling sensors in physical space, digitize the collected data utilizing advanced AI technology, and accurately control smart devices in physical space in accordance with instructions sent from cyberspace.

Sub Theme II: Technologies for innovative sensors and ultra-low-energy IoT chips

Innovative sensors and low power IoT chips will be developed and commercialized. The innovative sensors are expected to be small, and available at low cost with unprecedented data collection capability. As a result, data processing will become possible at a low power consumption rate.

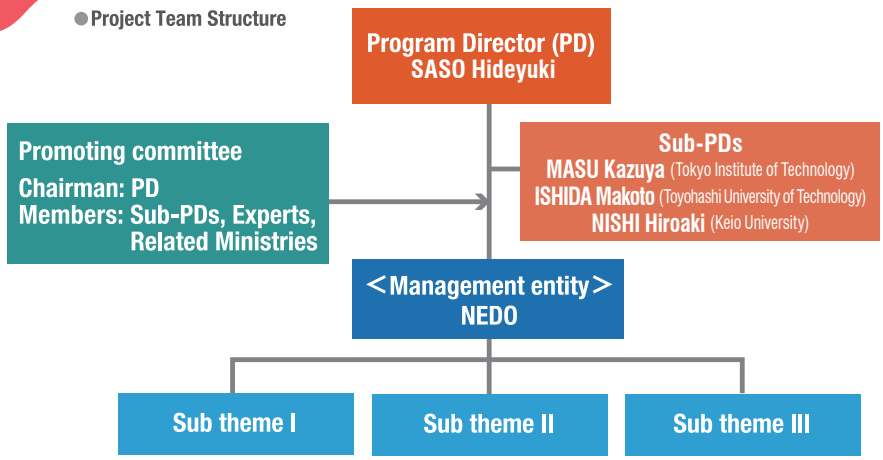
Sub Theme III: Social implementation technology for Society 5.0

Technologies to disseminate IoT devices in Society 5.0 will be developed. These technologies will promote the introduction and use of robots and other IoT devices in manufacturing, production, nursing care, transportation and other services where such devices have not yet been fully introduced.

Implementation Structure

In order to maximize the outcome of this project, researchers will develop technologies aiming for autonomous growth while collaborating with each other across the research subthemes. Moreover, with regard to the edge computing platform, we will discuss vertical integration and horizontal development and improve it to have international competitiveness.
In addition to that, PD will revise the direction of the program flexibly considering social trends.

● Project Team Structure



Exit Strategies

R&D promotion toward commercialization

By demonstrating the effectiveness of the common platform technology, innovative sensor technology, and sensor platform technology developed under this program in the production fields where social issues such as labor shortages are serious, and by showing to society multiple examples of successful solutions of these technologies for economic development and social problems, CPS should be disseminated in the real world.

Approach to technology dissemination

By developing and utilizing the common platform, this program will show how the important issue of advanced fusion of cyber/physical spaces can be solved with less effort, and will stimulate the IoT market by encouraging businesses into the market from a variety of industries, including small and medium-sized ventures which have been unable to introduce the IoT solutions due to high costs and shortage of IT professionals.

Past Milestones and Anticipated Outcomes

Development of edge platform technologies that SIP Physical aims at

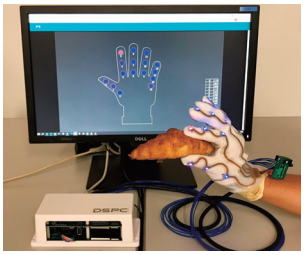
- The edge computing platform is being developed to integrate innovative sensor technology, multi-sensing control technology, and common platform technology for IoT construction.
- Researchers who carry out needs-driven technology development collaborate with each other to conduct R&D comprehensively from Sub-theme I to III.
- With My-IoT, SRF wireless PF and MSM-PF, the target of reducing the development cost to 1/10 is expected to be achieved.

Demonstration experiment (serving foods)

Key achievements on element technologies to reduce the cost of building and deploying IoT to less than 1/10

- Initiated the PoC for multi-sensing module (MSM) to construct a platform.
- Developed a cognitive glove to detect the grip force of a hard/soft or an indefinite object and verified coordinated behavior with MSM.
- Confirmed the heat quantity performance of 40-60 μW/K (1.5 x 1.5 cm2) for power generation at room temperatures.
- Established autonomous personal mobility technologies such as collision prevention/stopping and high-precision recognition.
- Initiated demonstration experiments for prototyped end-effectors in three fields related to the food industry.

A multi-sensing module (MSM)



A cognitive glove

Autonomous personal mobilities

Building an ecosystem to promote dissemination of IoT

- Established “My-IoT consortium” in October 2020 and launched activities on a full scale in April 2021. In realizing “democratization of IoT,” dissemination and support of My-IoT development platform, creation of IoT-related new businesses by collaboration among members, and establishment of an ecosystem for local communities/industries are being promoted.
- In collaboration with multiple existing consortiums which aim at dissemination of IoT, we are preparing for establishing the “Edge Consortium (a tentative name)” ideally by the end of FY2021 to advance end-to-end maintenance/construction from sensors, systems to applications, based on achievements of a physical data processing platform.