

Technology and Intellectual Property HQ

Pioneer in Creating Innovation Driven by Social Needs

Executive Officer, Senior General Manager, Technology and Intellectual Property HQ, OMRON Corporation; President and CEO, OMRON SCINIC X Corporation

Masaki Suwa

Direction of Evolution of Core Technologies to be Continuously Refined

Our core technologies “Sensing & Control + Think” are the source of our unceasing “innovation driven by social needs.” At the launch of SF2030, we set “Robotics,” “Sensing,” “Power Electronics,” and “AI and Data Analysis” as core technology areas of focus, and are promoting technological development for social implementation based on “near-future design.” Moreover, we have formulated a policy on the direction in which we will seek to advance as we continue to refine and evolve our core technologies in pursuit of technological development. In SF2030, from the “essential value perspective,” we set the direction of evolution of core technologies that we will

continuously refine in order to evolve the business. This involves “On-site edge sensing & local distributed autonomous control technology” and “Data and signal management technology for data analysis,” and close linkage of these two themes.

For example, regarding “extension of healthy life expectancy,” the sensing of diverse vital data of individuals in their daily lives is becoming increasingly important in the healthcare business. This is because vital data in daily life is the key to prevention of disease, including presymptomatic disease. However, opportunities to obtain vital data with medical device-level accuracy are few and infrequent. A major reason for this is that sensors that allow vital data to be easily obtained anytime, anywhere have yet to be fully realized. For example, if a sensor that captures vital data is a wearable, in practice it is difficult to obtain the necessary vital data because they are buried in a flood of information (“noise” in vital data sensing)

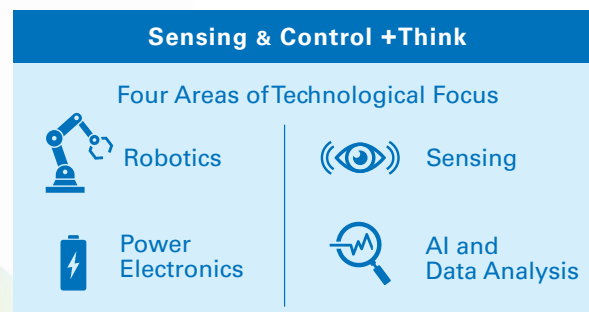
generated by the activities of daily life. Therefore, we are tackling the challenge of developing technology to efficiently extract only necessary vital data from sensor data buried among the noise of daily life by integrating sensing technology with AI and data analysis technology. Evolution of on-site edge sensing technology is the direction in which evolution of core technologies is heading.

However, the ability to obtain large amounts of vital data is in and of itself insufficient to create value. In order to agilely detect changes from diverse and ever-changing data by monitoring indicators linked to expert knowledge and to discover causal structures that human experts would not notice, we need to continue refining our data and signal management technology, including through smarter collection and analysis of data and signals and their translation into customer value. This is the second direction in which core technologies are evolving. By closely linking on-site edge sensing and data and signal management technology, we intend to facilitate innovation driven by social needs to achieve the “extension of healthy life expectancy.”

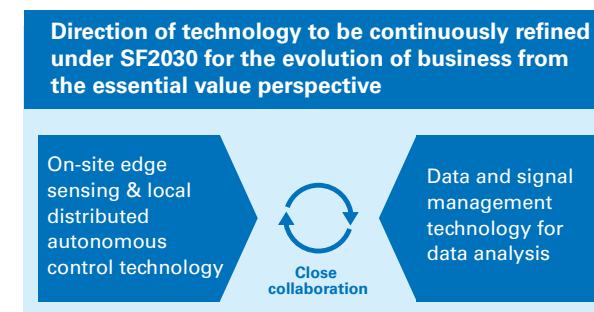
Our initiatives for “realization of a digital society” include the development of a next-generation lab automation system with Chugai Pharmaceutical Co., Ltd. announced in July 2023. The aim is to automate a



<OMRON's Core Technologies and Four Areas of Technological Focus>



<Direction of Evolution of Core Technologies>



series of lab experiments conducted in drug discovery research, thereby freeing up time for researchers to conduct more creative research. In order to automate lab tasks, robots are needed that can flexibly and autonomously perform atypical tasks previously performed by researchers, such as preparing chemicals and operating analytical equipment. Then, based on the data obtained from each successive experiment, data analysis needs to be managed and a plan for the next experiment formulated. Chugai, OMRON, and OMRON SINIC X (OSX) are tackling the great challenge of achieving lab automation through co-creation. The examples introduced here indicate how we are continuing to evolve our core technologies. To address the three social issues as a pioneer in creating innovation driven by social needs, we are working on various themes, including the following.

▶ **“Achievement of carbon neutrality**

- Technology for miniaturization of power conditioners in Vehicle to Home (V2H) that realizes a hybrid energy network
- High efficiency and miniaturization technology for industrial power supplies

▶ **“Realization of a digital society”**

- Lab automation technology to automate drug discovery experiments, etc. through innovation in robotics

- Data analysis technology at development sites and head office divisions that support the OMRON Group’s DX
- ▶ **“Extension of healthy life expectancy”**
- Biometric sensing technology to support personalized healthcare

Initiatives to Further Evolve Core Technologies

In order to pioneer the creation of innovation driven by social needs, it is essential to look beyond the boundaries of existing businesses and technological development. Five years have passed since we established OMRON SINIC X Corporation (OSX) as a new approach to “near-future design” from such a broad perspective. OSX is a research subsidiary that develops innovative technologies from a scientific perspective by focusing on society and technology. Since its establishment, OSX has been attracting superior researchers in robotics and AI technologies who empathize with the OMRON Principles and OMRON’s vision of the future. More than 40 papers have been accepted for publication at major international conferences, and OSX has gained recognition both in Japan and internationally as a unique corporate research institute. In 2022, “AI & Robots that Harmonize with Humans to Create Knowledge and Cross Its Borders” (Yoshitaka Ushiku, Project Manager, OSX) was selected as an R&D

project for the Moonshot R&D Program promoted by the Japan Science and Technology Agency (JST). The theme envisages the realization by 2050 of a world where humans (researchers) and machines (AI robots) interact harmoniously to produce Nobel Prize-level research outcomes. Synergy between OSX and technological development at OMRON Corporation is also beginning to emerge. The lab automation theme transpired as result of a challenge at World Robot Challenge (WRC), in which OSX participated, and developed into joint research. Collaboration with the Technology and Intellectual Property HQ is also underway in areas such as autonomous mobility robot technology and AI technology.

Comments from Our Partner

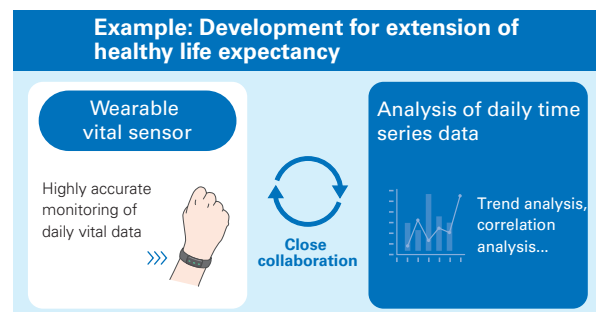
Chugai’s co-creation with OMRON and OSX on the next-generation lab automation system was prompted by an OSX researcher’s presentation on the product assembly challenge at World Robot Challenge held in 2020. We were impressed by OSX’s technology and the concept of developing a robot capable of working flexibly appealed to us and so we developed a relationship with OSX. By automating complex, non-routine tasks previously doable only by humans, and enabling experiments to continue without interruption throughout the night, on holidays, and at other times when researchers are not in the lab, we aim to liberate researchers so that they can enhance their productivity and unleash their creativity. I am pleased that we are able to promote co-creation activities based on empathy for the targeted technological development.

Biological Technology Dept.
Research Division, Chugai
Pharmaceutical Co., Ltd.

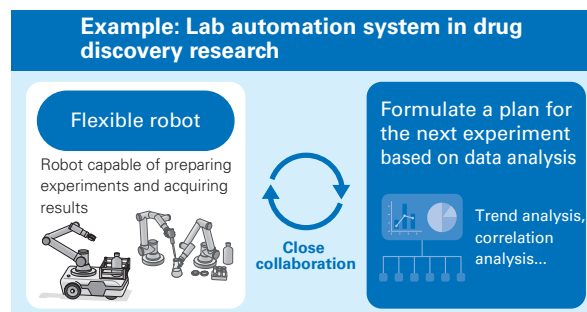
Shogo Kamikawaji



<Development for “Extension of Healthy Life Expectancy”>



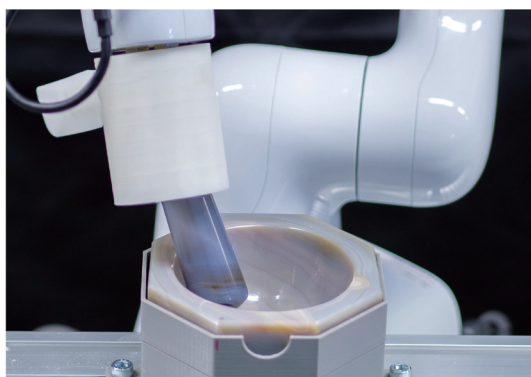
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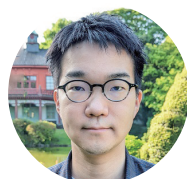
Case 1 **Realization of a Robot to Automate Experiments in Materials Science**

For materials science experiments, it is typically necessary to grind powder into finer textures, which is a time-consuming process as it is generally performed manually. Therefore, we are developing a robot that can automate the process of grinding powder for experimental use. The robot equipped with a camera recognizes the state of the powder inside the mortar and automatically determines whether to gather the powder or proceed with further grinding. Furthermore, we are developing a robot with a soft jig that can perform powder grinding using simple position control. We are conducting this research in collaboration with Osaka University, and presented a paper at IROS2022*, a major conference in the field of robotics.

* IEEE/RSJ International Conference on Intelligent Robots and Systems

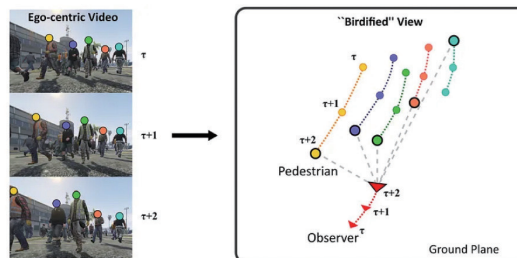


Senior Researcher
OMRON SINIC X Corporation
Masashi Hamaya



Case 2 **Realization of an Autonomous Mobility Robot capable of Moving through Crowds**

For robots to move autonomously in environments where people come and go freely, such as airports, train stations, and event venues, they require technology to accurately estimate their own location. With conventional technology, a robot estimates its own position based on surrounding objects such as buildings, but this is difficult in crowded areas because people in the vicinity are also constantly moving. Therefore, we are developing a technology that enables a robot to estimate its own position by converting the robot's viewpoint into a bird's-eye view (view birdification), just like a bird watching from the sky, based on the robot's own movements and the movements of people around it. This development was conducted in collaboration with Kyoto University, and the results have been published in the International Journal of Computer Vision (IJCV), the foremost journal for computer vision.



Senior Researcher
OMRON SINIC X Corporation
Mai Nishimura



Evolution of Intellectual Property/Intangible Assets Initiatives

In recent years, intellectual property and intangible assets have accounted for an increasing proportion of corporate value and become increasingly important management resources as a source of competitiveness. The governance of intellectual property and intangible assets is overseen by the Intellectual Property Center of the Technology and Intellectual Property HQ, which is responsible for formulating, implementing, and supervising intellectual property strategies for OMRON's technology development, new business creation, and existing businesses. In fiscal 2022, in order to accomplish SF2030, our policy was to promote concretization of business models as a value creation story linked to the utilization of intellectual property and intangible assets, and to execute "ambidextrous IP activities" by combining "monopolistic exclusive type" and "sharing and inclusion type" in an optimal balance.

In execution, we regard IP/intangible assets initiatives as a value driver for enhancing corporate value, and are pursuing IP/intangible assets initiatives whose scope has been widened from conventional IP activities centering on patents to include technological know-how and human resources capabilities. For example, we are adopting the perspective of "advanced technology development efficiency," that is, how efficiently R&D investments are converted into competitive technologies; the perspective of "social implementation rate," that is, to what extent the intellectual property and intangible assets created are linked to OMRON's business growth and business advantages; and the perspective of "human resources capability," that is, to what extent human resources capabilities are improved as a result of development activities. Within the framework of these considerations, the Intellectual Property Center is promoting intellectual property and intangible assets

initiatives as a pioneer in the continuous creation of innovation driven by social needs to achieve sustainable enhancement of corporate value.

Implementing the Mission and Vision of the Intellectual Property Center

The Intellectual Property Center has established a mission and vision for the creation and delivery of new value through intellectual property to set OMRON on a path of sustainable growth. Below are examples of IP activities to achieve our mission. Firstly, we have introduced "IP landscaping."* Based on "near-future design," using IP information, we analyze the needs of prospective customers and structure technological issues, formulate business hypotheses, and establish development themes. In this way, we are efficiently running a cycle of hypothesis testing. Moreover, we verify the synergy between IP owned by co-creation partners and IP owned by OMRON and the feasibility of new applications and businesses through citation analysis, etc., and formulate IP strategy from the perspectives of exclusivity and partnering strategies. Furthermore, the perception of value in business is changing from a product value perspective to an essential value

perspective and the base of inventors is expanding. Therefore, we are encouraging not only engineers but also people in non-development divisions, such as planning divisions, to invent essential value businesses capable of resolving customer issues and social issues. Secondly, as the business environment and social environment continue to change, the scope of use of the "OMRON" trademark, the heart of our corporate brand, continues to expand. The Intellectual Property Center, in cooperation with IP departments and local subsidiaries in the U.S., Europe, China, and Asia-Pacific, files applications for the OMRON trademark in various countries around the world, monitors brand infringement by third parties, detects infringement cases early, and implements countermeasures in view of the circumstances, laws, and systems in each country. The cases to be dealt with range from unauthorized use of company names to fake accounts on social media. In particular, there has been a marked increase in the sale of counterfeit products via the Internet, and we are working with e-commerce sites and the customs authorities of various countries to address this issue. We are also implementing a strategy-driven "IP cycle" that seamlessly links application to utilization. We do

not tolerate infringement of IP rights and issue warnings and file lawsuits against companies that infringe our patents and other IP rights, whether in Japan or overseas. As business divisions propose new solutions to customers, they also communicate that OMRON's products and services are protected by rights to intellectual property and intangible assets, and work to ensure that customers understand that only OMRON can create greater value added through co-creation with them. In recognition of these IP activities, OMRON has been selected as one of the "Top 100 Global Innovators" by Clarivate, which selects the world's most innovative companies and research institutions, for seven consecutive years. In this way, the Technology and Intellectual Property HQ will pioneer the creation of innovation driven by social needs based on the areas of technology focus identified for the core technologies, the direction of evolution of core technologies to be continuously refined, and the evolution of IP/intangible assets initiatives.

* IP landscaping: A method involving analyzing IP information such as patents, non-IP information, and internal information from a bird's-eye view, utilizing such information as strategic information for management decision-making, and feeding it back to business and technology strategies to promote strategy formulation and execution.

OMRON Intellectual Property Center Mission

We deliver unique value for people around the world by leveraging our core assets of intellectual property.

We develop and deepen appealing ideas.

We deliver peace of mind and confidence to customers.

We enhance our presence to our competitors offensively and defensively.

OMRON Intellectual Property Center Vision

We bring the IP specialists together from diverse fields and continue to create innovation.

We defy stereotypes.

We create a new paradigm of connections.

We strive to increase the trust from the management team.



Top 100 Global Innovators award ceremony