

## Kawada Technologies Accelerates Development of Full-Body Humanoid Robots that Work Alongside Humans

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Kawada Technologies, Inc.

Kawada Technologies, Inc. (Head Office: Tokyo, Japan; President: Tadahiro Kawada) is accelerating the development of *full-body humanoid robots that work alongside humans* in factories and construction sites, leveraging over 25 years of expertise cultivated through humanoid robot research, development, and social implementation. Aiming to solve social challenges such as labor shortages in an aging society, the company has commenced operational trials at its group's facilities.



Operational trial at the Construction Equipment Center (Kawada Construction)

## Development Background

Japan and other developed countries face urgent social challenges such as a declining working population due to an aging society, a shortage of skilled technicians, and difficulties in technical succession. Our group has been developing the full-body humanoid robot *HRP* series to contribute to solving these challenges, starting with our participation in *Humanoid Robotics Project* by Japanese Ministry of Economy, Trade and Industry (FY1998-FY2002). Subsequently, in 2011, we released the upper-body model *NEXTAGE* series, designed to work alongside humans in factories, boasting over 1,000 cumulative installations. In recent years, humanoid robots have achieved remarkable advancements driven by the evolution of various technologies, including AI. However, the social implementation of practical *full-body humanoid robots that work alongside humans* still faces numerous challenges, such as highly functional hardware, practical and user-friendly systems, and adaptability to diverse environments. We view this as a long-term project and will proceed with development by building broad collaborative relationships both internally and externally, while prioritizing feedback from the field.



HRP-2

HRP-3

HRP-4R

NEXTAGE working in a factory

## Development Highlights

### 1. Strengthening Collaboration with Leading Robotics Researchers and Institutions

We have initiated joint research with laboratories below:

**Professor Atsushi Konno**, Intelligent Robots and Systems Lab., Faculty of Information Science and Technology Systems Science and Informatics System Synthesis, Hokkaido University

**Professor Kensuke Harada**, Harada Lab., Department of Systems Innovation, Graduate School of Engineering Science, The University of Osaka

**Professor Yohei Kakiuchi**, Information Robotic Systems Lab., Department of Computer Science and Engineering, Toyohashi University of Technology

**Associate Professor Shunsuke Komizunai**, Komizunai Lab., Mechanical Systems Course, Faculty of Engineering and Design, Kagawa University

**Senior Assistant Professor Satoki Tsuchihara**, Interactive Robotics Laboratory, Division of Engineering Human and Artificial Intelligent Systems, Faculty of Engineering, University of Fukui

By combining new AI-driven approaches with our traditional model-based thinking, we aim to solve the technical challenges necessary for practical humanoid robots.

## 2. Developing Practical Humanoid Robots for On-Site Work

Leveraging the hardware achievements cultivated with the *HRP* series and the on-site implementation know-how from *NEXTAGE*, we have begun developing robots that can flexibly adapt to use existing tools in human work environments and various work objects. We aim to realize humanoid robots that can move on unstable construction site terrain, are resistant to damage from falling over, and simultaneously achieve practical work performance.

## 3. Refreshing In-House Developed Robot's Internal Systems and Commencing On-Site Operational Trials

We have refreshed the internal systems of our previously developed humanoid robot *HRP-2* and commenced operational trials at Kawada Construction Co., Ltd.'s Construction Equipment Center. By replacing sensors, cameras, batteries, communication systems, introducing GPUs, and updating OS and software, we are establishing an environment to introduce and evaluate the latest AI x Robotics research outcomes.

### Future Outlook

While on-site operations have just begun, we aim to develop a versatile robot capable of handling tasks such as sorting, organizing, and transporting reusable parts for bridge construction, as well as assisting with indoor work and site inspections at Construction Equipment Center. These tasks, individually, do not warrant automation by specialized machinery due to their limited volume. We will address these challenges one by one through necessary technical partnerships, joint research, and proactive talent acquisition. We will also advance system development that combines AI x Robotics technology with the expertise gained from our dual-arm robot *NEXTAGE* for tasks requiring high precision, yield, and reduced working hours. Going forward, we will expand our testing sites from indoor factories to semi-outdoor factories and eventually to construction sites, repeatedly extracting, improving, and verifying technical challenges in real environments to enhance versatility and reliability.

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