



中国科学技术协会
China Association for Science and Technology

No.45
October 2024

CAST Newsletter

Special Issue

World Robot Conference 2024 fosters
new quality productive forces for a
shared intelligent future



Headlines

Past World Robot Conferences / 01

World Robot Conference 2024 fosters
new quality productive forces for a shared
intelligent future / 05

European robotics: Entering the AI era / 06

Trends in Japan's robot technology and industry / 06

High-precision microrobotics for industrial
application / 07

Cover Story

Past World Robot Conferences

WRC 2015

Official Name World Robot Conference 2015

Dates November 23-25, 2015

Location Beijing

Theme Innovation and Collaboration to Create Intelligent Society

Attendance 100+ scientists from 10+ countries

Highlights Launch of the *Beijing Consensus on Robot Innovation Cooperation*
Launch of two new Books: *A Brief History of Robots* and *Towards the Robot Era—China's Choice*
Launch of a Platform for Robotic Innovation and Application



Opening ceremony of WRC 2015
Photo credit: news.cn

WRC 2016

Official Name World Robot Conference 2016

Dates October 21-25, 2016

Location Beijing

Theme Win-Win Collaborative Innovation Towards Building an Intelligent Society

Attendance 300+ top experts from 11 countries

Highlights Release of six industry standards, including:
Grinding and Polishing Robots System-Safety Requirements and Rating Method
Grinding and Polishing Robots System-General Specification
Glossary for Educational Robots
Glossary for Delivery Robots
Test Methods of Guided Motion Performance for Wheeled Mobile Robot
Semantic Analysis Based on Knowledge Base: Functional Requirements for System Interface



Opening ceremony of WRC 2016
Photo credit: news.cn

WRC 2017

Official Name World Robot Conference 2017

Dates August 23-27, 2017

Location Beijing

Theme Win-Win Collaborative Innovation Towards Building an Intelligent Society

Attendance 300+ scientists representing top universities, research institutions, and robotics companies worldwide

Highlights Launch of *Initiative on Global Cooperation and Development of Intelligent Robot*
Release of *Outlook on Top 10 Most Promising Robotic Technologies (2017-2018)*
Launch of seven industry robotics standards



Closing ceremony of WRC 2017

Photo credit: Official website of the Ministry of Industry and Information Technology of China

WRC 2018

Official Name World Robot Conference 2018

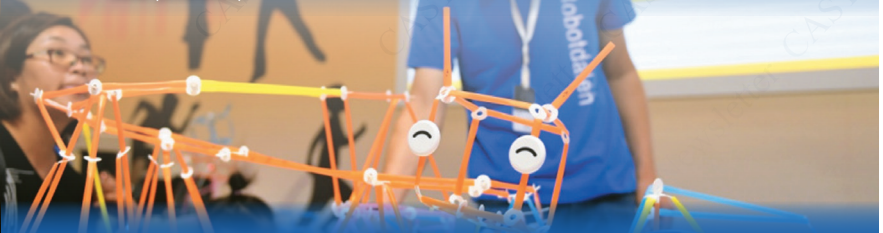
Dates August 15-19, 2018

Location Beijing

Theme Creating Intelligent Momentum for a New Era of Openness and Shared Benefits

Attendance 300+ industry experts and business leaders from countries including the United States, Russia, Germany, Japan, and South Korea

Highlights Release of *Industry Development Report on Robotics in China (2018)*, *Outlook on the Top 10 Most Promising Next-Generation AI Technologies (2018-2019)*, and *Top 10 Emerging Robotic Applications (2018-2019)*



A robotic educational toy on display

Photo credit: news.cn

WRC 2019

Official Name World Robot Conference 2019

Dates August 20-25, 2019

Location Beijing

Theme Intelligent Ecosystem for a New Open Era

Attendance 300+ top industry experts and business leaders from China, Russia, the United States, Germany, Japan, Italy, Canada, South Korea, Sweden, and Israel

Highlights Release of the *Industry Development Report on Robotics in China (2019)*
Announcement of new records in brain-controlled typing
Presentation of the WRC 2019 Innovation & Investment Stars Award



Opening ceremony of WRC 2019
Photo credit: Official WeChat account of VOC

WRC 2021

Official Name World Robot Conference 2021

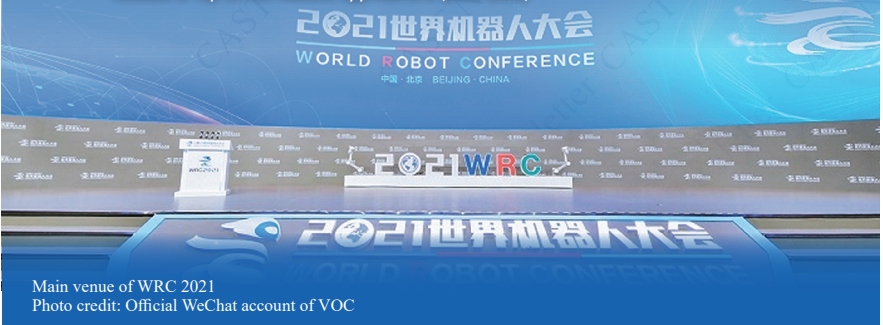
Dates September 10-13, 2021

Location Beijing

Theme Share New Achievements, Inject New Dynamics

Attendance 300+ leading scientists and industry representatives worldwide

Highlights Release of *Industry Development Report on Robotics in China (2021)*
Release of *Top 10 Hot Robotic Applications (2012-2022)*



Main venue of WRC 2021
Photo credit: Official WeChat account of VOC

WRC 2022

Official Name World Robot Conference 2022

Dates August 18-21, 2022

Location Beijing

Theme Innovation, Sharing, and Joint Consultation for Win-Win Results

Attendance 300+ participants including ACM A. M. Turing Award laureates, members of the Chinese Academy of Sciences and the Chinese Academy of Engineering, renowned experts, and industry representatives

Highlights Release of *Industry Development Report on Robotics in China (2022)*
Release of *Top 10 Frontier Robotic Technologies (2022-2023)*
Release of *Top 10 Hot Robotic Applications (2022-2023)*



Venue of WRC 2022

Photo credit: Official website of WRC

WRC 2023

Official Name World Robot Conference 2023

Dates August 16-22, 2023

Location Beijing

Theme Spurring Innovation for the Future

Attendance 320+ participants including representatives from international organizations, top scientists, and business leaders

Highlights Release of the *Top 10 Frontier Robotic Technologies (2023-2024)*
Announcement of the results of the Brain-Computer Interface (BCI) Robot Contest
Presentation of the Best Student Paper Award, the Best Conference Paper Award, the Top 10 Innovation & Investment Stars Award, and the Top 5 Popular Short Videos Award



Display of an artificial heart made of flexible materials

Photo credit: *The Beijing News*

World Robot Conference 2024 fosters new quality productive forces for a shared intelligent future



Venue of WRC 2024
Photo credit: *The Beijing News*

From August 21 to 25, the World Robot Conference 2024 was held in Beijing under the theme “Co-Fostering New Quality Productive Forces for a Shared Intelligent Future.” Co-hosted by the Chinese Institute of Electronics (CIE) and the World Robot Cooperation Organization (WRCO), the conference brought cutting-edge technologies, industry trends, and innovative achievements together in a single space. It conducted in-depth exploration of the

emerging trends and opportunities brought by the integration of artificial intelligence and robotics. Over 1,000 participants attended the opening ceremony including CAST President Wan Gang and Executive Vice President Meng Qinghai as well as leaders of relevant international organizations, experts, scholars, and industry representatives from China and abroad.

At the opening ceremony, Xin Guobin, Vice Minister of Industry and

Information Technology of China, Jin Wei, Vice Mayor of Beijing, Marina Bill, President of the International Federation of Robotics (IFR), and Alois C. Knoll, Professor at the Technical University of Munich, delivered speeches. Qiao Hong, President of the World Robot Cooperation Organization (WRCO), presented a report outlining the 10 trends of humanoid robots.

(Sources: *The Beijing News* and the official WeChat account of CIE)

Dialogues with Scientists

European robotics: Entering the AI era



Juha Rönig during his presentation
Photo credit: Official website of WRC 2024

On August 22, 2024, Juha Rönig, cuRobotics' Vice President of Research, delivered a keynote speech titled "European Robotics: Entering the Era of AI." He shared insights on the ongoing challenges faced by robotic systems. From a mechanical engineering perspective, the field has achieved a high level of standardization. However, in terms of modern systems and software architecture, seamless "plug-and-play" integration is still far from reality. In contrast to mechanical engineering, computer science has a much lower degree of standardization, and simply combining functional components seldom works. In artificial intelligence, standardization is even more limited. However, large-scale initiatives are already underway to address this issue. As we strive to create machines that are both safe and reliable, it is crucial to define the necessary standards and explore how to ensure efficient and reliable system operation. This includes testing, validation, and research into system quality metrics—all of which are essential tasks that must be addressed in the near future.

Trends in Japan's robot technology and industry

On August 22, 2024, Shigeki Sugano, President of the Robotics Society of Japan (RSJ), delivered a speech titled "Current Situation and Trends of Japanese Robot Technology and Industry." He emphasized that many experts believe that artificial intelligence is key to developing the next generation of general-purpose robots. By integrating AI with hardware and various types of public information, intelligent hardware entities can foster a symbiotic relationship between humans and machines. A crucial point is that humans are always the end users, making safety and high performance essential concerns. While humanoid robots are already on the market, most are unable to effectively support human activities due to insufficient performance. In the future, robots will



Shigeki Sugano during his presentation
Photo credit: Official website of WRC 2024

need to be able to support humans, which requires them to have higher performance while ensuring safety.

High-precision microrobotics for industrial application



Sergej Fatikow during his presentation
Photo credit: Official website of WRC 2024

On August 22, 2024, Sergej Fatikow, Professor at the University of Oldenburg and Chair of the Micro/Nano Robotics and Automation Technical Committee of the IEEE Robotics and Automation Society

(IEEE RAS), gave a talk titled “High-Precision Microrobotics for Industrial Applications.” He emphasized that the primary goal of high-precision microrobots is to achieve extremely accurate actuation, sensing, and manufacturing at the nanoscale level. The size of these robots is a critical factor in driving research into nanomaterials, biomaterials, membranes, and other related components. These microrobots are sometimes used in bioengineering or cellular surgery, using ultra-miniature surgical tools. In this regard, China has demonstrated significant potential, with over 50 laboratories now conducting research in this field. Fatikow expressed pleasure at witnessing such progress, noting that such studies tend to make significant contributions to society.

(Source: Official website of WRC 2024)

Event Highlights

WTC 2024 releases *10 Trends of Humanoid Robots Report*



Announcement of the 10 trends of humanoid robots
Photo credit: cnr.cn

On August 21, 2024, Qiao Hong, President of the World Robot Cooperation Organization (WRCO) and member of the Chinese Academy of Sciences (CAS), unveiled the *10 Trends of Humanoid Robots Report* at the conference. The report provided a forward-looking perspective on the future of humanoid robots through insights based on an in-depth analysis and forecast of current technologies, applications, and ecosystems. It covered ten key areas: specialized components and materials for humanoid robots, AI-powered humanoid robot design, motion intelligence, large-scale multimodal models, large-scale datasets, embodied intelligence, humanoid robots inspired by human anatomy and neural mechanisms, open-source communities, large-scale manufacturing, and the ethical and safety considerations surrounding humanoid robots.

The report emphasized that humanoid robots already wield the versatility and intelligence to seamless-

ly use human tools. Leveraging this development will ensure the continuous expansion and deepening of their application scenarios, profoundly transforming human production and lifestyles. As a result, society will enter a new stage of intelligent development, bringing disruptive changes to various industries.

(Sources: Official website of WRC 2024 and cnr.cn)

Hundreds of robots unveiled to showcase future living

WTC 2024 brought nearly 170 robotics companies from around the world together and the global debut of 27 humanoid robots. This grand showcase of robotics technology allowed visitors to experience firsthand a variety of lifestyle scenarios, humanoid robot solutions, and real-world applications of medical robots.

COFE+ Robot coffee kiosk: A cozy corner of smart living



COFE+ 5.5G robot coffee kiosk
Photo credit: thepaper.cn

Inside the exhibition hall, the COFE+ robot coffee kiosk was one of the first eye catchers. These sleek and powerful robots make a wide range of specialty drinks from Western-style milk tea and Japanese matcha to French cafe au lait, Italian lattes, and even Middle Eastern mochaccinos—all in an average of just 50 seconds, customized to the customer's preferences. Remarkably, these robots have been exported to over 20 countries. A single employee can manage 5 to 10 of these robots, significantly reducing daily operating costs. And all of this is accomplished in a compact space of just 2.35 square meters. During the brewing process, the robots execute each step with precision—from grinding the beans and brewing to creating intricate latte art—much like a seasoned barista.

This innovation not only demonstrates the immense potential of robots in the service industry, but also provides a convenient and efficient solution for smart cafes and office break areas of the future.

Expanding the scope of medical robots



AI+ROBOT orthopedic surgery robot
ROPA
Photo credit: thepaper.cn

Inside the exhibition hall, it became increasingly clear that medical robots are becoming more and more specialized in their roles.

The AI+ROBOT orthopedic surgery robot, ROPA, has achieved millimeter-level surgical precision, addressing traditional challenges such as reducing surgery time, lowering risks, and minimizing patient discomfort. ROPA consists of three key components: “Smart Brain,” “Smart Hands,” and “Smart Eyes.” The “Smart Brain” acts as a super assistant to the surgeon, using only the patient's CT scan to accurately create a personalized 3D surgical plan just

5 to 10 minutes before the procedure.

In the field of dental surgery, another robot can complete 3D simulations and reconstructions based on CT scan data to help doctors determine the optimal position for dental implants. A staff member explained that this robot not only improves surgical efficiency but also maintains high precision.

Physiotherapy and massage robots are also gaining popularity in beauty salons and therapy centers. Equipped with 3D vision systems, these robots can collect real-time information on the user's meridians and acupoints, providing therapeutic effectiveness that rivals that of a skilled massage therapist.

(Sources: *Beijing Daily* and thepaper.cn)

WRC 2024 Agricultural Robotics Thematic Forum highlights digitalization and high-quality agricultural development



WRC 2024 Agricultural Robotics Thematic Forum
Photo credit: *Farmers' Daily*

On August 24, the WRC 2024 Agricultural Robotics Thematic Forum and the Forum on Digitalization and High-Quality Development of the Agricultural Industry were held together in Beijing. Co-hosted by the Beijing Academy of Agriculture and Forest-

ry Sciences and the Chinese Society for Agricultural Machinery (CSAM), the event aimed to create a global platform for communication, collaboration, and open exchange in the field of agricultural artificial intelligence and promote accelerated innovation in the agricultural AI industry. The forum attracted over 230 prominent experts and scholars from countries such as China, the United States, Australia, and South Korea.

During a session focused on young professionals from China and abroad, speakers such as Jeffrey M. Sadler, Assistant Professor at Oklahoma State University, Han Wei, Chairman of AIForce Technology, Shirin Ghatrehmani, Assistant Professor at Pennsylvania State University, Xiong Ya, Research Fellow at the National Engineering Research Center for Informatization Technology in Agriculture

(NERCITA), and Gan Yuening, Deputy Director of the FPF (Future Pig Farm) Platform at Guangxi Yangxiang Co., Ltd., led discussions on “Data-Driven Agricultural Intelligence: Practices and Reflections.” They explored global challenges and solutions that could shape the future development of agricultural robotics.

(Source: *Farmers' Daily*)

World Robot Contest Championships 2024 concludes in Beijing



MakeX Challenge
Photo credit: GMW.cn

On August 22, the World Robot Contest Championships 2024 (WRCC 2024), an important part of WRC, took place in Beijing. The event featured four main competitions: the Coexisting-Cooperative-Cognitive (Tri-Co) Robot Contest, the Brain-Computer Interface (BCI) Robot Contest, the Space Robot Contest, and the Youth Robot Design Contest. Over 7,000 teams and 13,000 participants from more than 10 countries competed in exciting and visually stunning “robot showdowns.”

One of the highlights was the “MakeX Challenge,” where four teams were paired up, each leading

robots to pick up disc-shaped “bullets” and hit designated targets. On the field, Xu Shuming, a high school student from Zhenjiang, Jiangsu Province, and his teammate sat on the ground reviewing their performance from the previous round. “We’ve learned a lot by seeing other outstanding creations and their smooth operations,” Xu said. “We’re confident that we will build even better robots next time.”

The challenge also introduced a new rule requiring teams to work with unfamiliar teams, adding an element of unpredictability. Despite being experienced participants, Chen Jinxuan and Tang Ziye, middle school students from Shenzhen, admitted to overcoming nerves. “We don’t know much about our allies’ skill levels, and unexpected things can happen during the competition, like robots colliding or projectiles hitting our robot,” Chen said.

By incorporating youth activities, WRC provided a platform for children to envision the future. They witnessed the skills of top teams from different

regions, saw cutting-edge products from leading tech companies, and caught a glimpse of the future direction of robotics. This experience might

plant a seed in some, inspiring the participants and builders of tomorrow.

(Sources: GMW.cn and ce.cn)

♥ Introducing VOC – Your gateway to China’s science and technology news

📌 VOC (Voice of CAST) seeks to share innovative, collaborative, eco-friendly, inclusive, and globally accessible developments with science enthusiasts and professionals worldwide. It is your go-to platform for academic forums, cutting-edge research, popular science resources, English journal abstracts, and international science and tech conferences happening in China.

📌 Subscribe now by scanning the QR code for VOC’s official WeChat account or clicking this link: <https://voc-gj.cast.org.cn/>.



Editor: Ying Wenqi
Proofreader: Wei Yumeng
Designer: Zhang Shan

CAST is the largest non-governmental organization of scientific and technological professionals in the world. Through its 215 member societies and local branches all over the country, CAST maintains close ties with millions of Chinese scientists, engineers, and other professionals working in fields of science and technology.

<http://english.cast.org.cn/>
newsletter@cast.org.cn