Humanoid vs. Robotoid: The Past of the Future

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***Brief*—Artificial intelligence and robotics (AIR) have entered a pivotal stage, highlighted by the 2025 World Artificial Intelligence Conference and the World Humanoid Robot Games in China. These events showcased advances in humanoid robotics, parallel intelligence, and digital-twin experimentation, while also exposing hardware limits and governance challenges. Beyond competition, they underscored scenario-driven deployment in manufacturing, healthcare, and services, redirecting capital toward real-world applications. At the same time, AIR reframed public perception, positioning robots as partners rather than replacements, and raised urgent questions on ethics, policy, and social inclusion. The AIR era thus represents not just technological convergence but the emergence of a knowledge-driven industrial ecosystem that must remain human-centered and globally collaborative.**

***Index Terms*—Artificial intelligence, humanoid robotics, scenario-driven deployment, parallel intelligence, robotoid**

Right after Shanghai's 2025 World Artificial Intelligence Conference and High-Level Meeting on Global AI Governance (26–28 July 2025, Fig. 1), earlier this month, Beijing once again took center stage by hosting the World Robot Conference and the World Humanoid Robot Games. These events offered the world a vivid demonstration of China's technological vitality, innovative drive, and strategic vision in the new era of "AIR", that is, AI plus robotics.

From AI to embodied intelligence, these technologies are not just tools but also engines set to transform our world. Open, collaborative global development is one of the best ways intelligent science and technology can benefit humanity and help countries achieve sustainable growth.

Tesla and SpaceX founder Elon Musk recently said: "The path to solving hunger, disease, and poverty is AI and robotics." But he was only half-right, because AIR not only represents a bold new paradigm for sustainable human survival but also constitutes a pervasive form of "intelligent air" indispensable to all sentient life.

The real showstopper is the humanoid robot. This was reflected at the World Humanoid Robot Games, which featured 26 events and 487 matches, with more than 500 humanoid robots from 127 brands.

Teams from 16 countries across five continents, including 192 university squads and 88 corporate teams, competed in the games. According to the International Federation of Robotics' report on 14 August 2025, "Vision and Reality", humanoid robots are on track to become "the next big thing in robotics".

China, as the world's largest industrial robotics market, has laid out concrete plans and targets, and begun large-scale production and application. The goals are clear: transformation of manufacturing, embedding robotic intelligence in society, and accelerating the rise of a knowledge-driven, intelligent industrial ecosystem.

But behind the glittering spectacle lies serious engineering. Participants tested hardware platforms, multimodal perceptions, decision-making, execution control, communications, and energy management. The arena featured a mix of jaw-dropping leaps, awkward tumbles, and occasionally comical missteps. They reminded us that humanoid robotics remains a frontier field, full of experimentation and rapid evolution.

Fig. 1 Visitors interact with a robot dog at the 2025 World Artificial Intelligence Conference in East China's Shanghai, 29 July 2025. [Photo/Xinhua].

The competition highlighted both the performance limits of individual machines and the immense promise of collaboration. To fully realize this potential, open, shared data, and model coordination, cross-platform interaction and multi-robot collective intelligence are essential. And with the end of the games, these skills must migrate from the stadium to the real world, factories, hospitals, and homes, where robots can continuously improve safety, adaptability, and intelligence.

The games were more than a tournament; they were parallel experiments in motion, bringing together AI computational experiments and embodied agents' prescriptive intelligence. The goal was not merely winning medals but also practical, scenario-driven deployment in the real world for real benefit to the humanity. Robotics divorced from real-world application risks stagnating in low-level, repetitive development.

By testing humanoids under extremely challenging situations, the games publicly assessed motion control, environmental perception, and autonomous navigation, embodying the ACP methodology of parallel intelligence: artificial societies (A), computational experiments (C), and parallel

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execution (P). Every physical robot has a digital twin in the virtual world. Pre-game algorithm optimization essentially counts as C stage, allowing researchers to validate and refine control policies before any physical deployment. Each graceful jump or spectacular fall during the competition then feeds back priceless real-world data, offering a rich source of empirical evidence. This continuous cycle of trial and feedback forms the basis of prescriptive intelligence, guiding every subsequent iteration toward smarter decisions and more effective actions in the P stage, all of which remain firmly grounded in the A and C stages that define the ACP paradigm.

The games also acted as a prism, reflecting the broader ecosystem, economic dynamics, and social impact of humanoid robotics. First, they showed that intense competition can expose the industry's Achilles' heel. When a robot falters due to the limit of a gearbox or servo motor, the failure is far more visceral than any report.

Second, the games helped reassure investors, redirecting capital from abstract hype to tangible applications, and making sure that enterprises clear core technical bottlenecks and increase real-world deployment.

Third, they proved that robots on the field are athletes, not science fiction villains. They assuaged the fear that "machines would replace humans" and instead helped many realize the fact that robots will liberate humans from repetitive or dangerous tasks while creating new value and employment opportunities. One minute a robot nails a flawless kick, the next, it trips spectacularly—both moments teach us the importance of persistence, learning, and continuous technological development. And fourth, the games raised a fundamental question: What does AIR really stand for? As scientists like Geoffrey Hinton caution, without careful guidance, AIR could serve capital rather than humanity. Beyond showcasing the "hard power" of robotics, the games provoke reflection on its soft power—policies, ethics, and rules shaping its development. True intelligence is not measured by how fast a robot runs but by our ability to craft a safe, inclusive, and sustainable path through the parallel interaction of virtual and physical worlds.

In this sense, the World Humanoid Robot Games are far more than a competition. They are a thought experiment in real-world action, blending spectacle, strategy, and social insight. They demonstrate China's leadership in shaping an AIR era that is not only technologically advanced but also ethically grounded, economically rational, and socially beneficial—a world where robots will not replace humans but rather empower them, and where intelligent machines which I would like to call them in a new term for justification, robotoids, the human-like generalized machines. This is an issue I have also explored in detail in my previous reports (see Fig. 2).

Fig. 2 AI's three fundamental questions presented at the PEC AI Innovators Conference in Beijing, 13 September 2025.

The future defines the past and prescribes the history, that is the circular causality of parallel intelligence, the mission of this new AI moment is to ensure its defined history to be the reality of our present days so that humanoids, the machine-like generalized humans, will serve our humanity, not making humans into robotoids, the human-like generalized machines.

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