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Humanoid Robots Attracting Attention with Advances in Physical AI

Can Japan leverage its robotics expertise to establish a presence in the AI field?

Economic Research Dept.
Miho Tanabe

Summary

- Interest in “Physical AI”—AI that operates in the real world—is growing. The Japanese government is also focusing on societal transformation through the integration of AI and robotics, with heightened policy interest evident through mentions at the Prime Minister's AI Strategy Council meetings. Physical AI refers to AI technology that flexibly performs tasks while directly interacting with the physical environment. Its application areas are classified into four categories: “mobility-integrated,” “industrial-use,” “service/life support,” and “humanoid/general-purpose.” Diverse real-world applications are anticipated, including robots and autonomous vehicles.
- The growing attention to Physical AI stems from both technological advancements and increasing societal needs. Physical AI is gaining attention as the next frontier for generative AI applications, with the emergence of robot foundation models significantly advancing its capabilities to operate and adapt in physical environments. Socially, expectations are rising for new services in healthcare, education, and tourism, alongside addressing labor shortages, an aging population, and the need for alternatives to hazardous tasks like disaster response and high-altitude work.
- Of the various forms of physical AI, humanoid robots are receiving particular attention. Their human-like form and movements give them high compatibility with existing human-centric environments. Furthermore, advances in generative AI and robot foundation models are enabling them to handle flexible and versatile tasks. These characteristics make them promising as a means of reducing implementation costs and allowing flexible operation, making them easier to deploy in society compared to other robot forms.
- Physical AI has the potential to transform not only technological innovation but also employment structures and societal frameworks. While Japan excels in industrial robotics, it lags behind the US and China in AI. Physical AI is seen as a promising field to bridge this technological gap and is also expected to serve as an opportunity to enhance Japan's international presence. Strategic

action is essential to translate technological capabilities into societal implementation. Delayed response risks talent outflow, loss of technological leadership, and relegation to merely adopting AI technologies. Comprehensive efforts are required, including public-private partnerships for institutional development, talent cultivation, and startup support.

Attention

This report is a summary translation. The official document is only in Japanese.