Overview

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Sustainable Development of Transport Technology in 2025
-with the Rapid Spread of Artificial Intelligence-

In 2022, the 150th anniversary of Japan's railway system, I had the opportunity to listen to the technological perspectives of many experts, as well as express my views. What I found was a common awareness related to reliable public transport, responding to the digital society and how to improve transport technology in the information society. This was underpinned by a discussion on how mobility should contribute to a sustainable society in the midst of an ageing and rapidly shrinking population as well as a sense of urgency about pandemic preparedness and the dramatic changes in the way we live and work as a result of such experiences.

This special issue on transport technology, planned just after the 150th anniversary, is also a collection of articles that specifically describe Mitsubishi Electric Corporation's technical research on transport systems in response to important development issues, such as sustainable management, energy-saving technology that consider carbon neutrality, automation and efficiency of operation and maintenance, application of wireless technology, and automatic train operation in the post-Corona era. These are up-to-date summaries of current technologies.

In a series of discussions during the 150th anniversary, I introduced the idea of "SF prototypes" and made a rather bizarre suggestion that it would be worthwhile to focus on how the technology that will wipe out the rail system in the next 30 years is portrayed in science fiction in order to discuss sustainable development issues for rail. Less obvious at the time, but generative AI is currently attracting even more attention due to the impact of the pandemic.

How it will change the future is being discussed as an actual problem, not science fiction. As seen in dystopian science fiction films such as Terminator and Ex Machina, Western societies seem to be very concerned and wary of AI and the proliferation of robots in our living spaces. In fact, representatives of the artificial intelligence community, such as Sam Altman, CEO of OpenAI, and Dr. Demis Hassabis, CEO of Google DeepMind, as well as other scientists, have expressed strong concerns about the general public's use of the advanced AI they are promoting, and have surprisingly suggested that certain limits be placed on the pace of development.

In contrast, few engineers in Japan seem to share the serious concerns expressed above, as they focus on the positive aspects of using this technology to improve productivity and meet individual customer needs, and see the importance of pushing ahead with its progress without hesitation. A commentator on the radio said that this may be because our image of advanced technology is based on Astro Boy and Doraemon, the most famous Japanese cartoons that have depicted the bright future of a technological society. Although this is not an argument based on solid evidence, I feel that it is an intuitively correct view.

While we are cautious about looking beyond advanced technology to utopia, I think many of us have "Yamato-Damashii", the Japanese spirit of taking advantage of new technological achievements based on good intentions and having orderly and ethical behaviour, rather than misusing or deliberate interfering with the system. In fact, the application of machine learning to railway operations management is already making progress in some Japanese railways.

In the field of high-speed railways, China is increasing its presence in the international market with the "One Belt, One Road" initiative, based on the experience it has rapidly accumulated with its vast network. On the other hand, in the field of urban transport, although Japan pioneered fully automatic train operation in the 1980s with its "new transport system", i.e., urban elevated railways, it lags far behind other countries in the practical application of GOA-3/4 driverless automatic train operation in heavy rails, and there is a strong sense of urgency in Japan.

However, Japan is growing with technologies that have uniquely Japanese strengths, such as highly reliable and high-frequency operation of the Shinkansen; the Chuo Shinkansen, a long-distance intercity high-speed maglev train; GOA-2.5 driverless automatic operation based on advanced ATP with intermittent train localisation (with frontal crew); high-frequency operation combining wireless train control and automatic operation; train energy-saving operation technology with high accuracy and repeatability using automatic operation; and so on.

I hope that the articles in this special issue will give you a glimmer of hope for the future of our mobility.