

CIVIL INFRASTRUCTURE MONITORING WITH DISTRIBUTED FIBER OPTIC SENSING

Yuichi Yoshimura¹

¹ Kajima Technical Research Institute,
2-19-1 Tobitakyu, Chofu-shi, Tokyo, Japan
E-mail: yoshyuic@kajima.com



In response to social issues such as aging infrastructure, increasing natural disaster risks, and a declining working-age population, advanced technology and cross-field collaboration are becoming essential. Currently, efforts are underway to automate construction processes, implement sensing technologies for infrastructure systems, and develop concrete materials with lower CO₂ emissions in the construction industry.

At this Multi-Spectral Radiation Analysis for Materials Innovation Symposium, I introduce civil infrastructure monitoring with distributed optical fiber sensing (DFOS) as a solution. DFOS, which enables health monitoring of large-scale civil structures, is a sensing technology that measures strain and temperature distribution by installing optical fibers as sensors in the target object. It is widely applied for long-term, wide-area monitoring of civil engineering structures such as tunnels, dams, and bridges. Recently, the sensing performance of DFOS has improved dramatically, and its application in construction management has expanded significantly with high-precision measurements and real-time data visualization. Additionally, a novel DFOS technology called mid-range OFDR has been developed in our research project, and the sensing system is currently being utilized at construction sites.

Advanced fiber sensing technology is also expected to support the maintenance management of existing structures and create new value for infrastructure. I report various civil infrastructure monitoring by DFOS and discuss future developments.

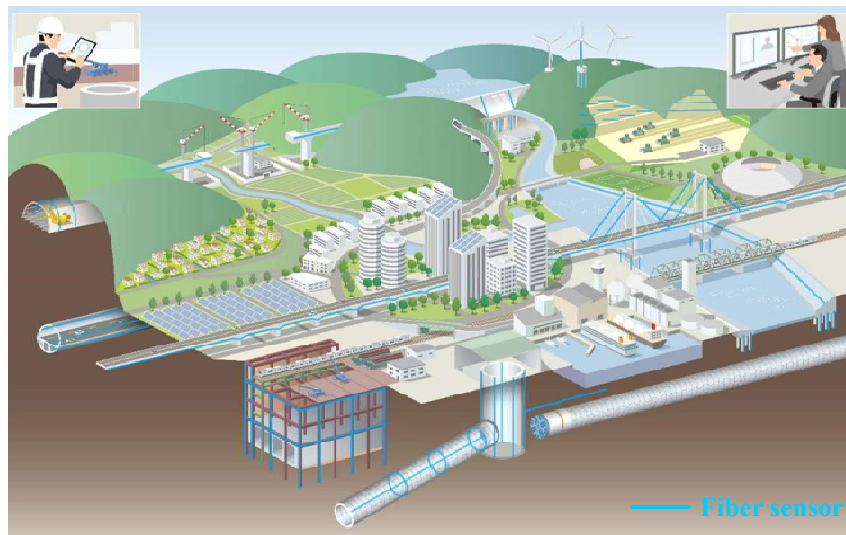


Fig. 1. Construction and maintenance management utilizing distributed fiber optic sensing

References

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