

## Application of Wearable Devices for Efficient Maintenance Work of Transmission Lines

**Kenichiro YAO**

**Researcher, Electric Power R&D Center, Chubu Electric Power Co., Inc.  
Nagoya, Japan**

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### **Abstract**

Transmission lines pass through a variety of topography such as mountainous, coastal or urban areas. The maintenance data carried to towers in mountainous areas is limited. When a natural disaster or an electric breakdown occurs, the maintenance workers must travel to the site as rapidly as possible. They need to accurately assess the on-site situation and report it to the maintenance office. In addition, they may become lost because the patrol routes of transmission lines in mountainous areas often involve crossing rough terrain.

Therefore, we have paid attention to wearable devices actively developed in recent years and have studied their application. The wearable device allows hands-free operation and can handle a large amount of data. By applying Augmented Reality (AR) technology, an actual view and any information needed for patrolling can be overlapped on the glasses of a see-through type wearable device. In this study, three types of systems with wearable devices (smart glasses) are examined.

For the first system, we have verified the data-transmission system between the site and the maintenance office involving not only voice data but also video data. A work administrator at the office can understand the on-site situation and offer advice on appropriate procedures by talking with the on-site worker equipped with a camera. The second system superimposes maintenance data on the glasses. Because the workers can browse a large amount of data hands-free on the smart glasses, it easily enables them to verify the actual facility and past photo data or maintenance data, and so on. The third system indicates the patrol routes of transmission line towers in mountainous areas and shows the results visually on the smart glasses. The worker location is always known by a Global Positioning System (GPS), and the system overlays a preset patrol route in the field of view by applying AR technology. We have constructed an easy-to-use navigation system for the foot patrolling of a transmission line. In a verification test in a mountainous area, a worker wearing smart glasses was guided for two hours with no problems along a patrol route of some 1.5 km.

From the results of a variety of verification on-site tests, it is confirmed that smart glasses are useful for the maintenance work of transmission lines.