

## **Prediction of geological condition ahead of tunnel face utilizing Electrical resistivity survey**

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### **ABSTRACT**

Anomalies which are not detected by the surface geophysical and geological survey performed during design stage may cause problems when tunnel is excavated. So, it is essential to predict the ground condition ahead of a tunnel face during tunnel excavation in order to prevent collapse of tunnel.

Various studies on tunnel prediction method of the ground condition ahead of the tunnel face have already been done and applied to in-situ tunnelling job sites, for example, TSP (Tunnel Seismic Profiling), probe drilling and electro-magnetic survey etc. However, most of these methods need long time for data acquisition, processing and interpretation. Also, reliability of the prediction results is not high.

In this study, we attempted to develop a predict method of the ground condition ahead of the tunnel face that minimizes the exploration time and can be easily interpreted. All the methods used in conventional tunnelling to predict ground conditions ahead of the tunnel face are reviewed. It was appropriate to predict ground condition ahead of the tunnel face utilizing electric resistivity survey. We performed numerical modelling to consider when electric resistivity survey was performed in-situ tunnelling job sites.

In order to develop a method for predicting the ahead of tunnel face using electrical resistivity survey, an electrode suitable to be installed on the tunnel face was developed and a survey system was established. Laboratory tests and field tests were performed to verify the proposed prediction method. The prediction method was found to predict ground condition and location of anomaly reasonably well. In addition, the field application plan was proposed. The prediction method was found to predict ground condition and location of anomaly reasonably well.

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