

# Tunnel Face Stability Prediction System "TFS-learning"

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In the construction of mountain tunnel, loading of explosives into blast holes and construction of steel support are fraught with hazards such as falling rocks and collapse from the working face. Therefore, it is crucial to grasp the stability of the tunnel face and take appropriate safety measures. TFS-learning (Tunnel Face Stability calculation system by machine learning) was developed in 2016 to predict the stability of the exposed face after blasting (Fig.1). In this system, the stability of the exposed face is predicted by using perforation data (drilling speed, attack pressure, rotational pressure and feed pressure) collected from blast holes drilled on tunnel faces by hydraulic rock drills, drilling logging etc. Face assessment scores are used as evaluation index of tunnel face stability, making the prediction quantitative and highly accurate. In addition, the predicted tunnel face stability is displayed on the screen shown in Fig. 1 in a color contour diagram with the unstable parts in warm colors and the stable parts in cold colors. This technology has been applied to many mountain-tunnel sites in our company as a technology to visually confirm the safety of tunnel face operations. In 2018, new functions were added to the system, including the one to predict the face assessment scores in front of the tunnel face and to judge the grade of bedrock by using long drilling data (Fig. 2) such as long face bolts and drilling logging. The system is expected to be useful in the future for the selection of the optimum support pattern and auxiliary method for excavation sites.

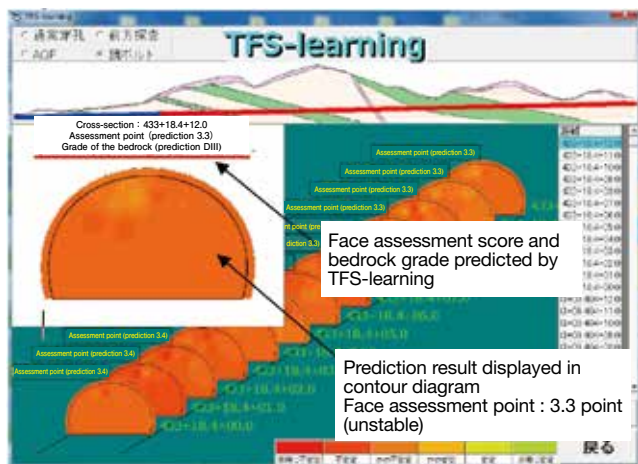


Fig. 1 The screen of TFS-learning system

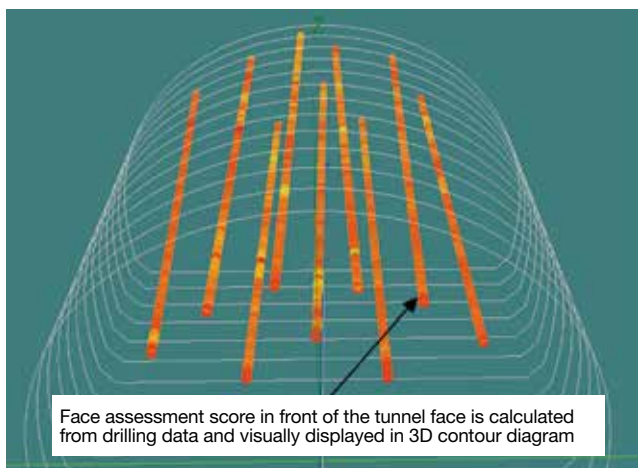


Fig. 2 An example of long face bolt drilling data