Development of an "Excavation Cycle Evaluation System" using Artificial Intelligence that Automatically Recognizes Tunnel Face Works

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■ Overview

Recently, issues are increasing regarding shortage of labor and succession of skills to younger generations, due to the natural decrease in population. Many construction works in mountain tunnels are based on experience and instinct, and the impact of these issues are significant. Automation of construction work resulting in increased productivity and safety is anticipated as well. This is the background of developing the "Excavation Cycle Evaluation System" using Artificial Intelligence (AI) that automatically recognizes tunnel face works, as the basis of automation of construction.

■ System Features (Fig.1)

Configuration: network camera (Fig. 2), a cloud server, and a personal computer terminal.
Realtime evaluation of the tunnel face works by AI using the live footage from the network camera.
The AI can continue learning by itself using its teaching data construction function.
Data including images and AI evaluation results are stored on a cloud server, which allows headquarters and other branch offices supporting the project to view the data using a web browser.
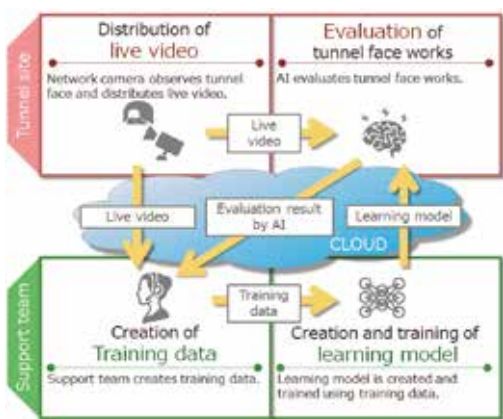

Fig. 1 "Excavation Cycle Evaluation System" diagram

■ Expected Results

Increased productivity by improving drill cycle through learning and analyzing tunnel face cycle time.
Promoting automation of construction works by using the evaluation data to control heavy machinery and ventilation systems.

Fig. 2 Installed network camera

Fig. 3 Example of real time evaluation display