

MOLE-FMR (Field Mixed Reality) & FCM (Field Crack Mapping)

— MR Aided Tunnel Inspection System —

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1. Introduction

It requires a lot of inspectors to conduct a tunnel survey within a limited period, which is extremely inefficient. One of the major reasons is the difficulties of detecting cracks and defects on the weathered tunnel lining and measuring their shape and position. We have greatly improved the efficiency and accuracy of the tunnel inspection work by using MR (Mixed Reality) technology.

2. Tunnel survey guiding system: MOLE-FMR

We have accumulated the obtained survey data of the tunnel into a database with a data structure linked with location information (MOLE-LTR). A 3D-CG model of the cracks and defects can be automatically created from the database (MOLE-DMG). When the CG model is created and transferred to the MR device, the cracks and the defects are projected on the on-site tunnel surface in their original shape and position and it is easy to identify them. With the introduction of MOLE-FMR, the tunnel inspection work time has been reduced to less than 1/3 of its conventional time.

3. Digital crack sketching system: MOLE-FCM

By projecting a grid with known intersection coordinates onto MR space, the digital coordinates of arbitrary point inside the grid can be identified. MOLE-FMR is a system that measures the shape and the position of cracks and defects using this geometric relationship. The advantage of this system is to map the position and the shape of cracks as digital data simply by taking a wall image with the grid projected through the MR device. Moreover, it can detect crack growth with the accuracy of several centimeters.

The MR-assisted tunnel inspection system takes less than a quarter of the time required for tunnel surveys compared to conventional methods, allowing two people a day to survey small water tunnels of 150 m or more.

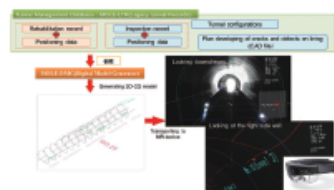


Fig. 1 System diagram of MOLE-FMR

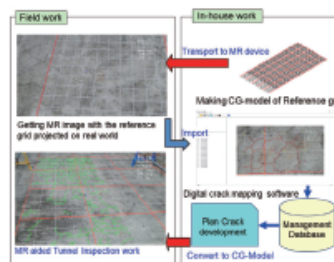


Fig. 2 System diagram of MOLE-FCM