

Tunnel Construction Site Monitoring and Digital Twin System

Wei CHENG*, Yuxing PAN**, Zhi MA*, Yincai CAI***, Yuan LI***, Ting PENG***

*Sichuan Chuanjiao Road and Bridge Co., LTD, Guanghan, Deyang, Sichuan, China

**Sichuan Chuanqian Expressway Co., LTD, Gulin, Luzhou, Sichuan, China

***Chang'an University, Xi'an, Shaanxi, China

13398199878@163.com, dovepeter@hotmail.com, 18780173807@163.com, 1304584578@qq.com,
liyuan_mm@chd.edu.cn, t.peng@ieee.org

Abstract—The digital twin is a new and important technology for digital transformation and intelligent updating. Using data and models, digital twins are capable of doing monitoring, modelling, prediction, optimization, and other activities. Digital twin modelling, in particular, is the key to correctly characterizing actual things, enabling digital twins to provide functional services, and meeting application requirements. In this work, a platform for supervising the building of tunnels using digital twins is suggested. Traditional tunnel construction management calls for skilled managers to conduct on-site inspections and recording, which takes time away from other crucial jobs and makes it easy for errors to occur due to the intricacy of the engineering. The digital twin visualization platform for tunnel construction can perform accurate real-time inspection, monitoring, and management of the construction process as well as complete overall management of the entire construction process when used in conjunction with other technologies like the Internet of Things, GNSS technology, 3D modeling, and others. It is a mix of engineering construction and contemporary digitalization that significantly reduces the amount of work and time required by obviating the requirement for skilled individuals to enter the site.

Keyword—Digital Twin, Tunnel Construction, Visualization, 3D Model, Management Platform



Wei CHENG is a technical personnel of Sichuan Chuanjiao Road and Bridge Co., LTD. In 2011, he graduated from Chongqing Jiaotong University, majoring in mechanical design, manufacturing and automation and engineering cost, with a double bachelor's degree. His current research interests are the highway civil construction and pavement technology.



Yuxing PAN is a technical personnel of Sichuan Chuanqian Expressway Co., LTD. He graduated from Central South University with a bachelor's degree in civil engineering. His current research interests are highway civil engineering and pavement technology.



Zhi MA is a technician of Sichuan Chuanjiao Road and Bridge Co., LTD. He graduated from Chengdu University of Technology in 2014, majoring in engineering management, with a bachelor's degree. His current research interests are the highway civil construction and pavement technology.



Yincai CAI is a graduate student in transportation of Highway School of Chang'an University. He received the B.S. degree at 2022 in road and bridges from Wuhan Polytechnic University. His current research interests are artificial intelligence and digital twin.



Yuan LI is a doctor from Xi 'an Jiaotong University with a doctorate degree in Mechanics. She is a lecturer at Chang' an University. Her main research interests are multi-scale destruction behavior of solid materials and multi-field coupled mechanics simulation analysis. She has presided over and participated in 4 national fund projects such as National Natural Science Foundation of China, Ministry of Education Foundation and Central University Foundation, and published many academic papers in domestic and foreign journals.



Ting PENG is an associate professor in the Highway School of Chang'an University. He received the B.S. degree at 1999 in highway and urban street engineering from Xi'an Highway University, the M.S. degree in road and railway engineering at 2004 from Chang'an University, the Ph.D. degree in Computer Science at 2010 from Xi'an Jiaotong University. His interests are infrastructure monitoring, big data mining for engineering, highway assets management system and artificial intelligence application.