ISRM

International Society for Rock Mechanics and Rock Engineering

ISRM YOUNG MEMBERS' SEMINAR SERIES

Deformation analysis and monitoring in underground constructions: automatic systems to measure convergence and preconvergence effects

Dr. Alessandro Valletta (University of Parma, Italy)

Introducing CSM2020 –Discrete Event Simulation Model for Predicting TBM Utilization

Dr Anuradha Khetwal (Consultant Geotechnical Engineer, WSP USA)

30th September 2022 (2:00pm GMT)

Free subscription under:

Free subscription under:
https://us06web.zoom.us/meeting/register/tZYuduuqpzsjEtaTWsXHpmzwTTYCASw3VAdj

Also available on ISRM YMs' YouTube Channel:
https://www.youtube.com/channel/UCN8FiYOH6LvUMBd9t5uLOyg

Broadcasted:

ISRM Young Members Channel

Next session:

October 2022

Application of recent fracture mechanics criteria to notched rock fracture analyses
Dr. Jon Justo Urrutia, SENER, Spain

Differentiating cratering mechanisms in rock blasting based on geomechanical characterization
Dr. Jonathan Aubertin, Université du Québec, Canada

This event is in collaboration with:

AGI Associazione Geotecnica Italiana

SEMR

e-mail contact: isrm.ym.seminar@gmail.com

ISRM
International Society for Rock Mechanics and Rock Engineering

Deformation analysis and monitoring in underground constructions: automatic systems to measure convergence and preconvergence effects

Abstract

Due to the complexity that characterize the execution of underground constructions, it is fundamental to acquire reliable and detailed information concerning the rock mass behavior and its interaction with the excavation works. In particular, the study of the advance core together with the monitoring of the tunnel cavity represent a key factor in the identification of instability phenomena, such as lining cracks or unforeseen deformations of the cavity arising during the construction phase. In this context, a continuous monitoring system is the most effective approach to reduce the risk connected to the design and to the advance in the project. This presentation will focus on the experimental data obtained through an automatic monitoring system composed of two devices, developed for the direct monitoring of pre-convergence ahead of the excavation front, and the convergence of the tunnel profile in a specific section. In particular, the structure and working principles of the monitoring system will be described, focusing both on the sensors integrated in each device, and the control unit designed to perform the automatic data acquisition process. Moreover, the presentation will also report some observations regarding the monitoring data elaboration and visualization procedures, intended to provide a reliable and complete description of the rock mass behavior.

Speaker

Dr. **Alessandro Valletta** is a postdoctoral research fellow at the University of Parma, Italy. After obtaining his MSc in Environmental Engineering at the Polytechnic University of Milan, he attended a Postgraduate II-Level Master Course focused on the analysis and mitigation of hydrogeological risks, held by the CERI Research Centre (Sapienza University of Rome). He obtained his PhD in 2022 from the University of Parma, with a thesis focused on the automatic identification of landslide events for risk management and early warning procedures. His research interests include the application of automatic instrumentation for geotechnical monitoring activities, and the development of data elaboration algorithms for early warning systems.

ISRM
International Society for Rock Mechanics and Rock Engineering

Introducing CSM2020 –Discrete Event Simulation Model for Predicting TBM Utilization

Abstract

Tunnel Boring Machines (TBM) is perhaps the most efficient method for tunnel excavation, as they have become the dominant mode and method of tunneling worldwide. The primary performance indicator for TBMs is the average daily advance rate (AR) which is a product of the rate of penetration (ROP) and utilization (U). While there are various models for estimation of machine ROP with acceptable levels of accuracy and reliability, the models for prediction of machine utilization are often not sufficiently accurate as they do not include many of the critical input information.Simulation of tunnel activities considering TBM to be a tunneling factory can be a reliable method for estimation of TBM utilization factor. In this study, CSM2020 is developed to model tunneling activities and downtimes using a discrete event simulation approach. The results of the CSM2020 model were verified by comparing the estimated utilization with that of the recorded TBM utilization at the job sites, broken down by formations and reaches of the tunnel. The impact of interdependencies of various tunneling activities on machine utilization was assessed to identify the critical activities that might act as bottlenecks in the excavation process. The model proved to be a promising approach with the capability to incorporate site-specific conditions. The model can be used as a quantitative approach for the optimization of tunneling operation and selection of TBMs.

Speaker

Dr. **Anuradha Khetwal** is a geotechnical engineer at WSP, USA. Previously, she was employed for almost six years as a tunnel engineer with a subsidiary of Lombardi Engineering Limited in India. She was involved in the design of various tunneling projects in the Himalayas, Beruit, Switzerland, and other parts of the world. She did her Ph.D. at the Colorado School of Mines. The topic of her research was the implementation of discrete event simulation approach for the prediction of TBM performances for a direct implementation in the industry.