

Keynote Paper

Long infrastructure tunnels – future trends and challenges

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ABSTRACT

Digitalization will change the way of gathering geological data, the methods of rock classification as well as the application of design analyses in the field of tunneling. Tunnel construction processes and tunnel maintenance will be influenced by this digital transformation as well.

The paper at hand takes the experiences with the recent (long) base tunnel projects through the European Alps into account. In the last years a rapid increase in the successful application of digital techniques (Building Information Modelling – BIM and Machine Learning - ML) for a variety of challenging tasks can be observed. Potential for ML is seen in the automatic rock mass behavior classification utilizing tunnel boring machine (TBM) advance-data, in the update of geological prognosis ahead of the tunnel face and in the way of interpretation of monitoring results as well as in the way of inspecting and maintaining existing tunnels.

Design optimizations of tunnel linings, especially the use of single shell linings instead of double shell linings, aim to reduce construction time and costs. The thermal use of the tunnel environment (air, water, ground), the reduction of construction material (concrete and steel) required for the tunnel support as well as less transportation volume all eventually result in increased sustainable benefits and in lower carbon footprints.

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