

Use Case 4c: Safety visualization

Purpose

The visualization is an important task in the safety field of tunnelling, in all project phases. The underlying exchange scenario that IFC-Tunnel is to support is the exchange of models from the BIM solution to virtual/augmented reality solutions. It must ensure the following goals:

- To simulate and analyse different scenarios through the visualisation of the tunnel from a driver/user perspective (e.g. analyse behavioural response in accidents and evacuation scenarios);
- Training and planning for drivers or maintenance personnel;
- To facilitate the design phase with simulations of tunnel evacuation plans with Virtual and Augmented Reality applications;
- To improve the design phase investigating, for example, the visibility to signs and exits (such as signage, guide lights and loudspeakers) with VR technologies;
- To facilitate the maintenance phase consulting on site the properties of safety elements with Augmented Reality;
- To simulate the working conditions in order to improve the safety.



Figure 1. Example of the emergency exit portal view in the VR environment. Source: Ronchi E., Nilsson D., Kojić K., Eriksson J., Lovreglio R., Modig

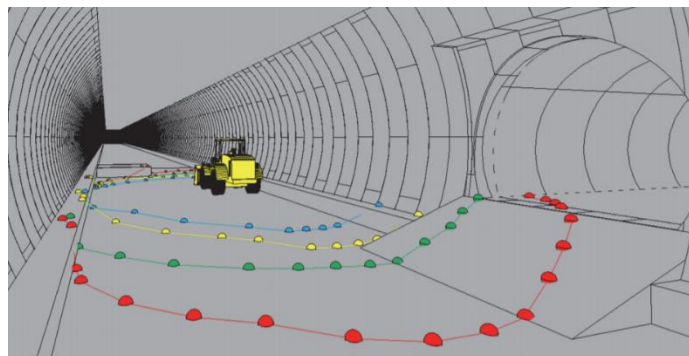


Figure 2. Model-supported planning of working safety (protection zones). Source: DAUB 2018 Recommendation BIM in Tunneling

The Use Cases 4a and 4b, related to Technical and Realistic Visualization, provide an important basis for this use case.

Requirements for IFC-Tunnel:

- Visualizations with real materials and lights
- Realistic behavior on doors and escape routes
- Location of rescue facilities (fire extinguishers, first aid stations, helicopter pad, assembly points, rescue container, ...)

Geometry:

It can be assumed that the geometry can be represented by explicit geometry representations (such as triangulated face sets). It is necessary that the definition of the specific safety spaces (IfcSpace) is also included.

The safety components must be characterised by an appropriate Level of Detail in order to ensure a useful visualization of them.

Semantics:

The safety visualization requires the connection of specific properties to safety components. In particular, the maintenance parameters are necessary to optimize the visualization tools the in the O&M phase.