

Outdoor and Indoor Mapping of a Mining Site by Indoor Mobile Mapping and Geo Referenced Ground Control Scans

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SUMMARY

The paper describes the surveying methodologies implemented to carry out a survey of an underground mine, in its indoor and outdoor components. The external part of the mine, localized in a valley in North Italy, is subject to several collapses which are affecting some houses built near the mine. A global three-dimensional survey was therefore necessary to connect the underground internal part of the mine to the external part, and to carry out a geotechnical and geological study of the global site behavior. Indoor Mobile mapping SLAM based technology has been chosen as the most appropriate technology to survey the underground section of the mining site. In fact the iMMS technology guarantees the required accuracy of 3-4 cm, with the required timing. Unfortunately the disused mine was difficult to access, because the two main entrances have been closed with ground to avoid illegal entrances; the dimension of the entrances have made impossible to realize a classic topographic network with total station, to measure control points inside the mine and to connect the outside environment to the indoor one. The only way found to connect the three-dimensional model of the indoor part of the mine, measured with iMMS, with the outside one, was to apply the innovative approach of using Ground Control Scans (GCS). Several static scans have been taken so to assure an outside/inside connection and the static scans acquired in the open air part of the two mine entrances, have been geo-referenced thanks to control points measured with total station connected to vertices measured with GNSS in RTK. In this way the 3D model acquired by iMMS have been connected with external part of the mine. The use of GCSs is possible inside the SLAM post processing software, before the generation of the final point cloud model. The use of GCSs it is also useful to correct the drift effects often present in the SLAM approach. Altimetric drifts, in the part of the underground mine farthest from its entrances, have been reduced thanks to the transport of the external environment to the internal share of the mine, thanks to an inspection hole realized for inspection purposes. The experience shows an interesting integration between different surveying technologies.

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