3D Modelling of a Chinese Gold Mine Using Laser Scanning

A gold mine in China's Shandong Province is the country's first underground mine to use 3D laser scanning. During a one-year project, 20km of major tunnels were scanned and the point clouds processed. The resulting 'digital mine' enables better planning and designing, checking of production quantities and monitoring of tunnelling and mining machines, as well as improved safety.

China's key gold deposits are located in Shandong Province, where the region's largest producing mine is operated by the Shandong Gold Group (SGG), a state-owned enterprise of the Shandong provincial government. Underground mining is done under difficult working conditions, often at remote locations, and the profit margins are narrow.

Conventional Surveying

Surveying is used throughout a mine's lifecycle, including planning and construction, operations, production, monitoring and reclamation. However, underground mines are demanding places for surveying and mapping. Cramped spaces and tough environmental conditions make it difficult to install and preserve survey marks; the long, narrow tunnels and drifts prevent the use of optimal techniques for precise control while the mine's layout and high operating costs demand high accuracy and efficient data capture. Total stations, gyros and levelling have limited applicability beneath the surface. Such equipment is good for control work, for layout and checking of tunnels and collecting individual points to build triangular irregular networks (TIN) for the creation of simple 3D models. However, it is virtually impossible to generate detailed 3D models of tunnels, drifts and ore bodies using conventional surveying. The Shandong Gold Group recognised the need for improved underground data collection to create a digital mine. 3D laser scanning could provide the required accuracy and completeness while reducing the time and effort involved in data capture.

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