Location
Vauquois,
France

Scanned
Battlefield
Tunnels

Scan size
Several
Kilometres

Scan time
Three times
faster than
terrestrial
scanners

Industry
Education

Bringing WW1 tunnels to life through laser scanning

The Vauquois battlefield in France tells a little-known story of mining warfare during World War I. Through 4 years of combat which saw the hilltop village of Vauquois completely destroyed, French and German troops dug miles of tunnels under each other's positions to plant explosive mines that would 'bomb' the enemy from below.

Vauquois must be experienced first-hand to understand the difficulties – and despair – of living deep underground in wet, cold and cramped conditions for days at a time. Of course, not everyone can travel to France and crawl through the remaining tunnels in person. A group of researchers at Virginia Tech brought the battlefield to classrooms and museums with the help of reality capture and virtual reality (VR) technologies.

Combining efforts of the University Libraries, the Department of Visual Arts and numerous other disciplines, the Visualising History team travelled to Vauquois with funding from a federal grant in 2016. Over 10 days, they used traditional static scanning methods to capture details of the battlefield terrain.

However, when they attempted to scan inside the tunnels, their progress slowed down considerably as there were tight spaces that their scanners couldn't get into, which made the data capture process extremely time-consuming.

Before their next trip to France, the team acquired a 3D handheld laser scanner, GeoSLAM's ZEB Horizon, with the hopes of making their time on-site more time efficient.

Scanning with the **ZEB Horizon**

Due to the ZEB Horizon's ease of use and speed of capture, the team collected scan data inside the tunnels more than three times faster than with the traditional stationary scanner. The time it took to scan the tunnels was crucial, as they were working on a budget, and the ZEB Horizon enabled them to do more with the time and money they had available. They also used the ZEB Horizon above ground, scanning the narrow trenches, wide bomb craters, and a church foundation.

The ZEB Horizon also proved to be more efficient as its software processes the data into a point cloud quickly. This meant that the team where able to see where data was missing, and go back and collect it, whilst still on-site. This created a much more accurate and complete virtual environment.

The Virginia Tech team engaged the expertise of students and faculty from numerous departments – Visual Arts, History, Education, Computer Science, Mining Engineering, and Cinema – to build a life-size model of a tunnel and generate the virtual environment of the battlefield. This allows students wearing VR headsets to 'walk' through the scene, experiencing it with both sight and touch.

The speed and accuracy of the ZEB Horizon are game changers for educational and historic preservation VR projects like this because of time and budgetary restraints. VR data processing is extremely time consuming, which means time saved scanning in the field makes grant money go farther in the computer lab. The result is a more realistic and believable experience.

The Virginia Tech Visualizing History team isn't stopping with creating educational experiences from their 3D data collection. They are beginning to apply their VR capabilities to other commercial applications of mobile laser scanning.