



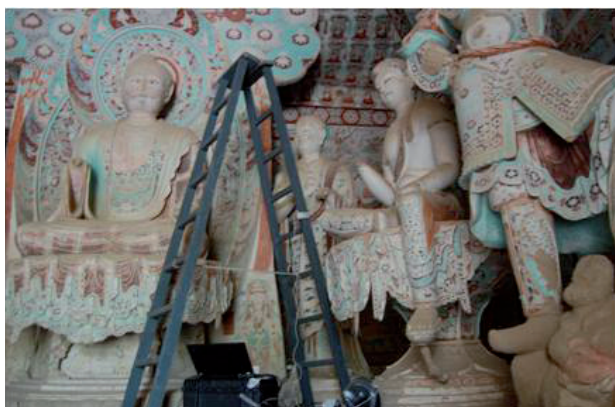
The Handyscan 3D Technology Goes Underground

In 2008, the Wuhan University launched a project to digitize the Mogao Caves and Grottoes, a system of 492 temples located 25 km (15.5 miles) southeast of the center of Dunhuang. The Mogao Caves are the most famous Chinese Buddhist grottoes and, along with Longmen Grottoes and Yungang Grottoes, are one of the 3 major ancient sculptural sites of China. The site is an oasis strategically located at a religious and cultural crossroad on the Silk Road, in the province of Gansu. The caves contain some of the finest samples of Buddhist art, and the construction of the Buddhist cave shrines – first used as storage rooms for scriptures and art – began in 366 AD, which makes the first shrines about 1,600 years old.



SCANNING MAJOR ART WORK IN TINY SPACES

The team led by professor Huang of Wuhan University (comprised of 4 doctors from Wuhan University and 2 experts from the local Dunhuang Institute) first tried various scanning systems such as Faro, Atos and Next Engine to scan the Mogao Grottoes' Buddha statues. In addition to being a real challenge to set up in such limited space (no space for tripods!), they all failed at generating scanning data of acceptable accuracy. The team had to face the hard truth: they needed to find a different kind of 3D scanning technology, or they would have to abort the project.



NON CONTACT, HANDHELD TECHNOLOGY TO SAVE THE DAY

The burden of finding a suitable scanning device was complicated by another requirement: **it had to be non contact, because of cultural heritage preservation rules strictly prohibiting any contact with the Buddha statues' surface.**

This is when Shanghai Blue Creativity Industry Co. Ltd (SBC) came into play. SBC is a Chinese company doing business in the Yangzi river area (the most developed one in China). Distributor of the Handyscan 3D handheld and self-positioning laser scanners, it introduced the technology to the Wuhan University team.

The very **small size** and **portability** of the **Handyscan 3D laser scanners** came as a revelation for the scanning team: this meant that they could bring the scanner in all the caves and that it could even fit in the narrowest spaces left between the statues and the caves' walls!

One question remained though: how could the non-contact requirement be addressed?

Indeed, the **Handyscan 3D scanners** are usually used in conjunction with reflective positioning targets that are applied directly on the part to be scanned to create a reference model. But in this particular case, sticking targets onto the statues was out of the question.

Luckily enough, Creaform's R&D team had already thought about this constraint and developed a tool to get round this difficulty: the **Handyscan 3D target net**.



Used in conjunction with small magnetic plastic posts, this 9x3 foot polyurethane net can be set up in front of or around the object to scan without touching it at all. The target net turned out to be key in this whole project: Professor Huang and his team (comprised at that point of two additional applications engineers from Shanghai Blue Creativity) were able to bring it into the caves, hang it around the Buddha statues' surface and scan them with accuracy without touching them at any moment.

The complete course of action included two main scanning phases of the Buddha statues: a global scanning phase with a Leica scanner, and a more complete and detailed scanning phase with the **Handyscan 3D scanner**.

Ultimately, the resulting Handyscan 3D scans were best fitted with the Leica scans using a post-treatment software from Geomagic.

Thanks to its **handheld, lightweight** and **portability** features, the **Handyscan 3D** technology allowed the operators to move freely around the Buddhas, and capture even the most secluded and hard-to-reach surfaces.

The team worked for 3 whole days, and was able to acquire the digital measurements of 17 Buddha statues, in 3 different caves, in addition to some scanning work outside of the Mogao Grottoes.



HANDYSCAN 3D: THE 9TH MEMBER OF THE TEAM

Without the **Handyscan 3D non contact laser scanning technology** and the **target net**, it would have been flat out impossible to carry out the Mogao Caves and Grottoes heritage preservation project. All the other scanning systems used had failed at generating the level of accuracy required, in addition to being very heavy, bulky and difficult – if not merely impossible - to set up in the very constricted environment of the grottoes.

Thankfully, the whole preservation project was saved by the **small size, high accuracy** and true portability of the **Handyscan 3D handheld laser scanners technology**, but above all, by its compliance with the Chinese government heritage preservation strict requirements for non-contact solutions. Bonus, the **ease of use** and high compatibility of the technology with the reverse engineering process enabled the team to maximize its working time and efforts.

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