Laser mapping Lincoln Cathedral to uncover its architectural secrets

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Lincoln Cathedral Chapter House. Credit: Christian Rivera Soto

A powerful laser scanner has been used by experts at The University of Nottingham to capture a detailed, virtual record of the interior of Lincoln Cathedral and reveal clues to its architectural past.

Existing floor plans for the historic monument are in excess of a century-old and do not accurately represent the building as it stands today.

The scan results will act as a digital blueprint to work from if any part of

the building is ever damaged, helping to future-proof the cathedral for generations to come.

The completed scans also tie in with the £16m Lincoln Cathedral Connected project, which aims to tell the stories of the building in new ways and transform the site with a new visitor centre.

Furthermore, the scan result could lead to the creation of a virtual tour of the cathedral, incorporating augmented reality, to allow visitors to see areas that are normally out of reach or have changed over the years.

Dr Lukasz Bonenberg, senior experimental officer at Nottingham Geospatial Institude, part of University Of Nottingham, led the scans at the cathedral in November to help build up a picture of the cathedral's architectural history.

John Chilton, professor of architecture and tectonics at the University, and Dr Chantelle Niblock, director of MArch Digital Architecture and Tectonics, were also on site with MArch architecture students who have been collecting data for a theoretical project to design a new transportable building, intended to enhance the visitor experience at Lincoln Cathedral.

Scans of the nave were taken, as it has no existing floor plan, along with the Chapter house interior and its 20-metre high roof, which has been changed at least three times in its 700-year history.

Experts know that the eighteenth-century domed roof was eventually altered, but there is no information on the original wooden structure and whether it was modified or rebuilt completely.

The £70,000 Leica P20 laser scanning technology that was used measures how any surface in its field of view reflects the laser light back

to create colour-coded images that render the scene in 3D.

The scanner can record up to half a million individual 3D measurement points on surfaces per second and can rotate 360 degrees in six minutes.

"It would be almost impossible to use conventional methods to collect data on the same scale—something that would take weeks, if not months took the scanner only a few hours to record."

University of Nottingham architecture students explore the hidden spaces in the Cathedral roof. Credit: Christian Rivera Soto

The scanner generated 300 million measurement points for the Chapter House alone, which is more than most software programmes can cope with. However, Lukasz used the latest Cyclone 9.0 software, which not only processes scan data very fast by conventional standards, but also generates detailed virtual models of the cathedral interior and roof space.

Architecture students will also use Rhino software to create 2D and 3D drawings of the cathedral floor plans, using the scan data collated.

"From the computer model we hope to eventually develop a 3D-printed model of the Chapter House roof, which will help experts to answer questions about the roof's construction and how and why it has changed over the centuries without having to revisit the monument," added Dr Bonenberg.

Provided by University of Nottingham