

Reassessing Italian Renaissance church interiors through non-invasive survey

Donal Cooper ¹, Stephen Kay ^{2*}, Elena Pomar ²

¹ Faculty of Architecture & History of Art, University of Cambridge, Cambridge, United Kingdom

² British School at Rome, Italy

* Corresponding author: E-mail: s.kay@bsrome.it

Abstract

The study shows the investigation of an Italian Renaissance church with combined laser scanning and ground penetrating radar. The survey discovered through GPR multiple unknown tombs and remains of a lost chapel. The full dataset was merged as a point-cloud in Leica Cyclone for a holistic view of the standing architecture and sub-surface remains.

Keywords

churches; ground penetrating radar; laser scanning; Renaissance

Introduction

Church interiors in Renaissance Italy were the most significant settings for viewing art. Recent research has emphasized how closely integrated artworks, like altarpieces, were with their architectural and liturgical settings. However, these interiors have invariably been radically transformed over later centuries. Conventional scholarship in art history focuses on building analysis and documentation to reconstruct historical viewing conditions. This project took a fresh approach, drawing upon ground penetrating radar (GPR) to investigate elements now hidden beneath church pavements, and laser scanning to combine the building architecture with the sub-surface features.

The project took as an initial case-study the Church of Sant'Agostino (San Gimignano) to assess the possible existence of a rood screen - a monumental structure removed in the Counter Reformation that once dominated church interiors and determined the visibility of artworks inside (Cooper 2017). GPR was also used to investigate the exterior of the church with the aim of locating a side chapel, destroyed in later centuries.

The Church of Sant'Agostino was built just before 1300 and by the end of the 14th century it was a prestigious ecclesiastical centre (Razzi 2014). The church has numerous burials in the floor of the nave and cloister, as well

as an apparent cemetery alongside the building. The interior walls of the church are decorated with magnificent frescoes of the 14th and 15th centuries. Of importance to the research project is an altarpiece by the Sienese artist Simone Martini, three sections of which are preserved at the Fitzwilliam Museum, Cambridge University. One of Martini's earliest works (c. 1317) the polyptych has been little studied and its precise original position within the church is unknown, its format suggesting that the panels were for a side altar.

Materials and methods

The methodology developed to record the Church of Sant'Agostino was to combine different non-invasive techniques which would permit the integration of sub-surface features and standing architecture. A number of different techniques were used including GPR (GSSI 400 MHz), laser scanning (Leica RTC360) and targeted photogrammetry.

In order to merge the results into a shared environment, the data collection was underpinned by a topographical survey. Following processing in GPR-Slice, time-slices were added into a Geographic Information System (ESRI Arc-



Fig. 1: Church of Sant'Agostino. GPR survey results and interpretation.

Map) for 2D visualization and analysis, and high iso-amplitude features were extracted from GPR-Slice as point clouds to be analyzed in a 3D environment (Cyclone 3DR).

Results

The GPR survey in the nave of the church revealed a distribution of tombs greater than is visible in the pavement (Fig. 1). The survey identified 15 previously unknown tombs, whilst several known tombs were shown to no longer be in their original position (with no cavities or disturbance beneath the marble tombstones). The form of burial also varied as some tombstones had cavities recorded below that are too small for an inhumation. It is therefore feasible that small ossuaries were inserted into the pavement.

The presence of a rood screen in the early phase of the church could not be determined by the GPR survey, as few traces of a linear feature, as expected for traces of a foun-

ation, were recorded across the church. However, the survey alongside the southern exterior wall of the church revealed several regular high amplitude anomalies that appear to confirm the presence of a small chapel, recorded in historical documentation as the brotherhood chapel of San Martino (Fig. 2).

Discussion

The case-study of the Church of Sant'Agostino illustrates the suitability of the methodological approach for the investigation and documentation of churches of Renaissance Italy. The GPR survey provided valuable information regarding previously unknown features, such as numerous unmarked tombs in the nave of the church, as well as relocating the San Martino chapel against the exterior southern wall (Fig. 2).

The integration of the GPR data with the 3D point cloud recorded by the laser scanning of the standing building, as

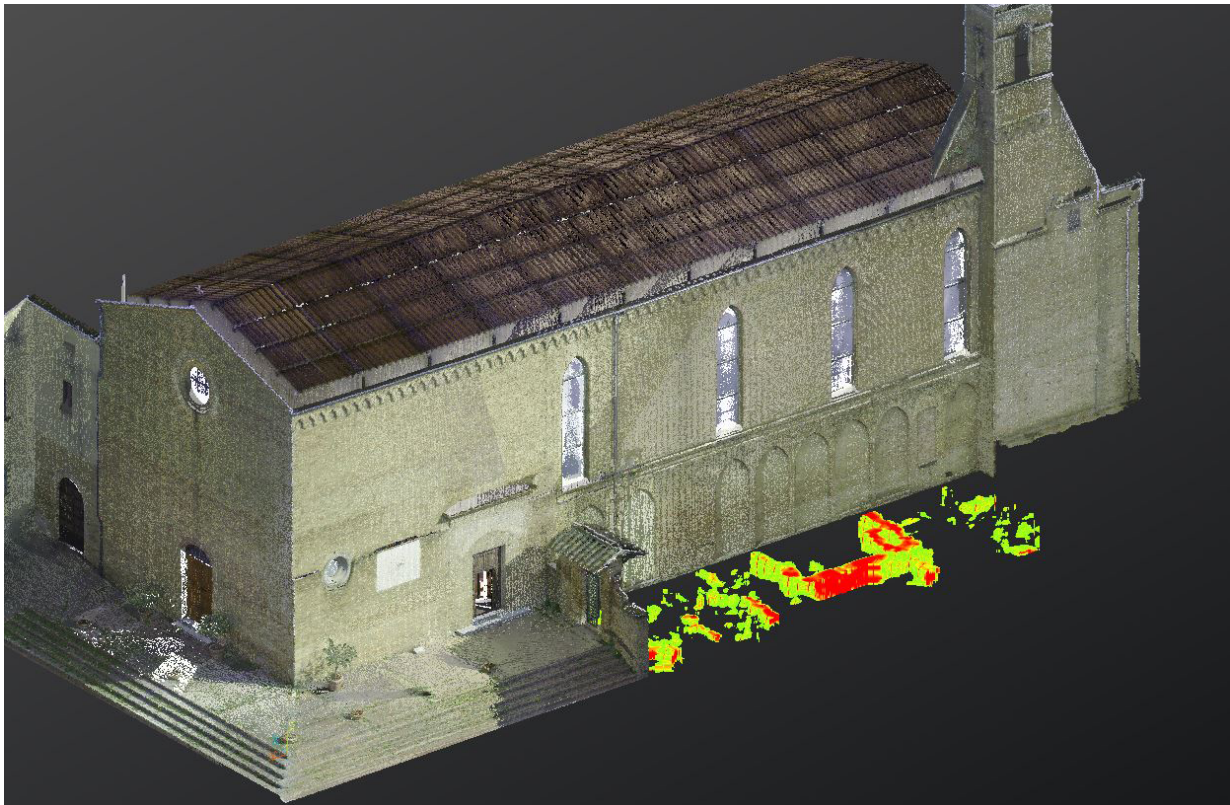


Fig. 2: Church of Sant'Agostino. Point cloud data of the laser scan of the church and GPR survey of the exterior area.

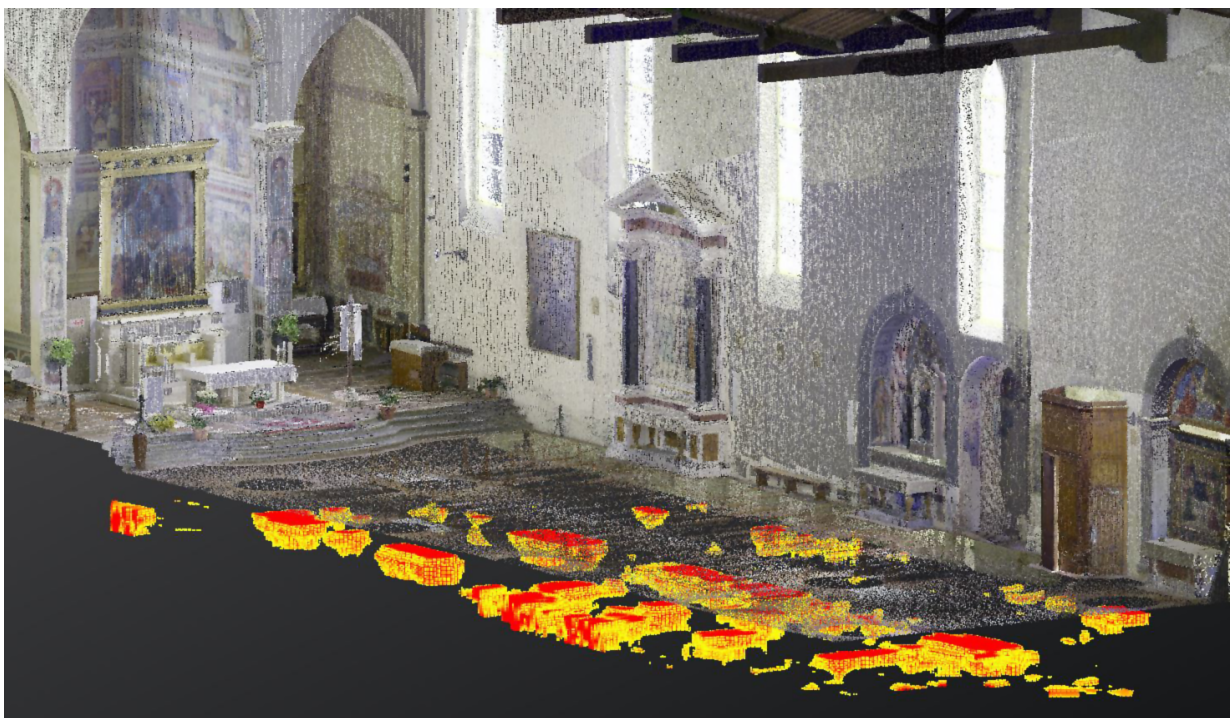


Fig. 3: Church of Sant'Agostino. Point cloud data of the laser scan of the church interior and the location of tombs recorded by the GPR survey.

well as detailed photogrammetry of the tombstones, provided a unified representation of the visible and hidden reality, as well as a direct comparison between different chronological phases of the building. Through the integration of the high amplitude features as a point cloud into Cyclone 3DR, an examination can be made of sub-surface features with the position of architectural elements in 3D (Fig. 3). Furthermore, the accurate recording of all tombs within the nave will also assist in a better understanding of the internal layout and potential viewing positions of artworks, as tombs were placed in correspondence to altars and entrances into the church. The 3D model generated of the church now allows the testing of the repositioning of the Martini polyptych at different locations in the church, also in consideration of the newly discovered tombs and altar bases.

Conclusion

The combination of laser scanning and GPR point clouds offers a holistic perspective for the consideration of the original layout of buildings and how artworks may have been viewed. Through the combination of building analysis and the study of historical documentation with the non-invasive techniques, a much greater understanding has been achieved of the church of Sant'Agostino.

The methodology implemented at the Church of Sant'Agostino in San Gimignano will be further tested at other Renaissance churches in central Italy. The combination of structural building survey and geophysical prospection has shown how church interiors, where architectural structures that have been removed, may have affected the interaction with artworks.

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