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TLS and photogrammetry for the modeling of a historic wooden framework

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The building which is the object of the study is located in the center of Andlau, France. This mansion that was built in 1582 was the residence of the Lords of Andlau from the XVIth century until the French Revolution. Its architecture represents the Renaissance style of the XVIth century in particular by its volutes and its spiral staircase inside the polygonal turret. In January 2005, the municipality of Andlau became the owner of this Seigneury which is intended to welcome the future Heritage Interpretation Center (HIC), a museum is also going to be created there. Three levels of attic of this building are going to be restored and isolated, the historic framework will that way be masked and the last three levels will not be accessible any more.
In this context, our lab was asked to model the framework to allow to make diagnoses there, to learn to know and to consolidate the knowledge on this type of historic framework. Finally, next to a virtual visualization, we provided other applications in particular the creation of an accurate 3D model of the framework for animations, as well as for foundation of an historical information system and for supplying the future museum and HIC with digital data. The project contains different phases: the data acquisition, the model creation and data structuring, the creation of an interactive model and the integration in a historic information system.
All levels of the attic were acquired: a 3D Trimble GX scanner and partially a Trimble CX scanner were used in particular for the acquisition of data in the highest part of the framework. The various scans were directly georeferenced in the field thanks to control points, then merged together in an unique point cloud covering the whole structure. Several panoramic photos were also realized to create a virtual tour of the framework and the surroundings of the Seigneury.
The purpose of the project was to supply a 3D model allowing the creation of scenographies and interactive contents which will be integrated into an informative device. That way, the public can easily visualize the framework, manipulate the 3D model, discover the construction and the various parts of the historical wooden structure. The raw point cloud cannot be used for this kind of applications. It is thus necessary, from the data which it supplies, to create an exploitable model. Several parameters are to be taken into account: the level of detail of the 3D model, the necessary time to model all the beams, the weight of the final files and finally the type of applied texture. The idea was to implement a workflow to reconcile these various criteria, several methods were tested.
This project allowed to create a range of solutions (3D models of the complete framework, virtual tour, interactive 3D models, video animations) to allow an uninitiated public to take advantage of 3D material and software often reserved for the professionals. The work was completed by the comparison between a theoretical model of the framework and a more detailed model of the current state, which allowed to make diagnoses and to study the movements of the structure in the time and to supply important data for rehabilitation and renovation operations.