



POLITECNICO  
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# Honors thesis

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COURSE OF  
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*Abstract*

**Automatic detection experimentation of parametric  
elements (BIM) from point clouds (LIDAR) for finite  
element analysis (FEM)**

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Over the last years, we are seeing a growing interest from the scientific community in the development of specialized software in the identification of elements, both CAD and BIM, directly from laser scans from LIDAR instrumentation. It depends on the technology progress of survey tools and development of software specialized in post-elaboration of point cloud. Therefore, best integration between software LIDAR and system BIM is fundamental.

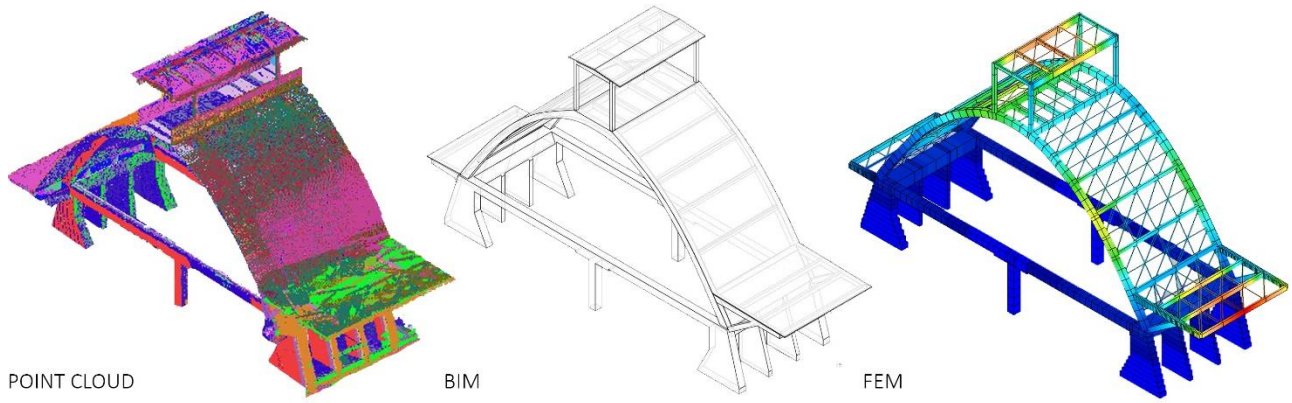
However, such integration is far from obvious, the use of extremely complex modelling procedures can be managed exclusively by highly qualified staff. This problem depends on the complex shapes of buildings that characterize the historical heritage, which are not suitable to parametric modelling.

On this basis, has been born the experimentation methodology proposed, with purpose to join both application sectors – acquisition and management of the point clouds through methods of Geomatics and BIM – adopting workflow characterized by use of interoperability software, that through procedure based on interpolation of points algorithms it allows automatic extraction of BIM elements from point clouds.

The first chapter of this work analyzed state of art, describing tools, procedures and studies in this sector. After examining the research considered important part of our aim, we advance with experimentation of methodology proposed on case study. The chosen case study is Paraboloide of Casale Monferrato. It is symbol of engineering innovation of '900 and it's particularly suitable for this research because it allows to verify the validity of the procedure purpose even in the presence of structural elements characterized by complex shapes. For these reasons, the study is focalized on modeling of limited portion of building, identifying each structural element – because the purpose of this research isn't the modeling of all the building but individuation of methodology procedure, with description and illustration of steps taken, and it can be replaced later.

Various reasons have encouraged to use the approach BIM: in addition to the known advantages which entails this type of modeling, is necessary consider the European directive that requires, starting from January 2014, to the use of BIM software in public construction projects. Therefore, is necessary ensuring a workflow finalized to modeling of BIM parametric elements, considered as "intelligent" objects to be able to store geometric and numerical building information.

Lastly, second part of this work is focalized to structural analysis of case study: over to verify interoperability between parametric software and analysis structural software, have been done analysis finite elements on model, considering it in three different configurations (3D, 2D, 1D). In this way, further to verify elaboration times need to each analysis – static analysis and dynamic analysis with reference to the existing legislation – have been assessed the results obtained from comparative analysis, checking the existence of structural analogy between models examined.



*Fig. 1 Workflow from point cloud to BIM to FEM*

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