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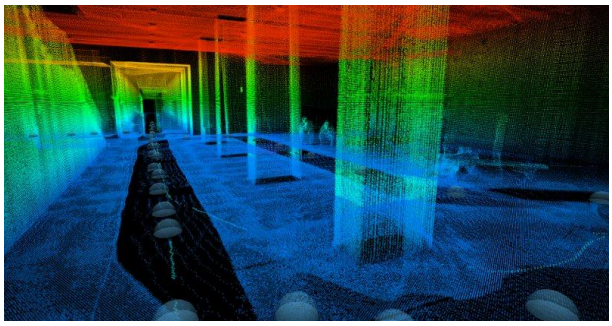
Reconstruction of 3D Indoor Space from observed Point Clouds

3D models of indoor space are required by a range of emerging applications such as indoor routing and navigation, guiding services for handicapped persons, indoor robotics, Computer Aided Facility Management and building energy simulations.
A method to obtain 3D models of indoor space is to reconstruct them from point clouds which are derived from laser scanning.



The goal of the project proposed here is to develop an integrated process for reconstructing a semantically classified virtual indoor environment according to the CityGML [1] data model by interpreting the observed point cloud. The challenge is to interpret the large-scale point cloud, to extract homogeneous enveloping surfaces of indoor space and to describe those surfaces using the boundary representation geometry model. The surfaces shall be generalized in order to separate the building structure from building installation such as cable ducts and from furniture. The surfaces shall then be aggregated in such a way that they build topologically correct solid geometry objects as defined by ISO 19107 [2]. In a next step, the extracted surfaces have to be classified semantically into wall, ground, ceiling, door and window surfaces. Finally, the data shall be stored using the CityGML format which is XML based.
For surface reconstruction from point clouds a range of algorithms and software is available. For semantic classification of surfaces, for validating geometries and for writing CityGML data either the commercial software FME [3] can be used or the members of the project team may implement their own solution.
The point cloud data for this project is provided by the navvis [4] project team and covers parts of TUM downtown campus.

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References

[1] Kolbe, T. H. (2009): Representing and Exchanging 3D City Models with CityGML. In: Jiyeong Lee und Sisi Zlatanova (Hg.): 3D Geo-Information Sciences: Springer Berlin Heidelberg (Lecture Notes in Geoinformation and Cartography).
[2] ISO 19107:2003 Geographic Information – Spatial Schema.
[3] http://www.safe.com
[4] http://navvis.de