



Project Proposal for Digital Engineering Projects

-- Template --

Project Topic:	Automated Transformation of a point cloud to 3D objects
Project abbreviation:	<i>cloud2object</i>
Institute/ Chair/ Research Group:	Fraunhofer Institute of Factory Operation and Automation IFF, Logistics and Factory Systems
Advisor(s):	Thomas Dengler, Eyk Flechtner, Nicole Mencke, Stefanie Samtleben, Bastian Sander
Preferred group size:	<i>5 – 7</i>
Desired project period:	<i>Winter term 2019/ 2020</i>
Required/Desired knowledge:	Scripting: Python, Visual Basic for Applications (VBA), or Dynamo Programming: C# or C++ Presenting: Microsoft Power Point, Word (or equivalent software) Language: English or German (oral and written) Soft skills: independent and self-organized team work
<p>Is any external affiliation involved (e.g., industrial partner, affiliated institute)?</p> <p>yes <input type="checkbox"/> no <input checked="" type="checkbox"/></p> <p>Which one(s)?</p>	
<p>Project Description:</p> <p>There is currently no solution commercially available to automatically transform a recorded point cloud into 3D objects. However, this step is essential for modern techniques like Building Information Modelling (BIM) as being used by architects, designers, and engineers. At present, this step is done manually and is hence time-consuming, expensive, and error-prone. The 3D objects are to be interpreted by specific BIM software (e.g. Revit, Allplan, ArchiCAD).</p> <p>The students should investigate, compare, and implement algorithms that automatically identify connected structures in point clouds. Further, the students should identify and realize an automated way to generate 3D objects out of these structures such that they can be interpreted by a software like »Revit«.</p> <p>Project goals:</p> <ul style="list-style-type: none">- <i>Automated classification of points in a point cloud (so-called »snapping«).</i>- <i>Automated generation of 3D objects out of these classified points.</i>- <i>Add-on: A concept on how the generated 3D objects can be ported between different</i>	

software (e.g. Revit, Allplan, ArchiCAD).

- Note: See Figure 1 for the scope of project cloud2object with respect to the data flow.

Subtasks:

- Subtask 1:
 - o Investigate algorithms to classify points in a point cloud (so-called »snapping«).
 - o Perform a feasibility study on these algorithms.
 - o Select suited algorithms to be implemented using preferably C++.
- Subtask 2 (option 1):
 - o Investigate algorithms to generate 3D objects out of classified points.
 - o Perform a feasibility study on these algorithms.
 - o Select suited algorithms to be implemented using preferably C++.
- Subtask 2 (option 2):
 - o Generate an object library (using publicly available libraries like PlanOne or BIMObject) from which predefined objects can be imported once the point structure is identified (so-called »fitting«).
- Note 1: The generated 3D objects must be interpreted by the software »Revit«.
- Note 2: Develop and implement a concept to make the data flow (Figure 1) fully automated.
- Add-on:
 - o Investigate the requirements for 3D objects to be portable.
 - o Develop a strategy (theoretical concept, realization) to port objects between »Revit« and at least one different BIM software.

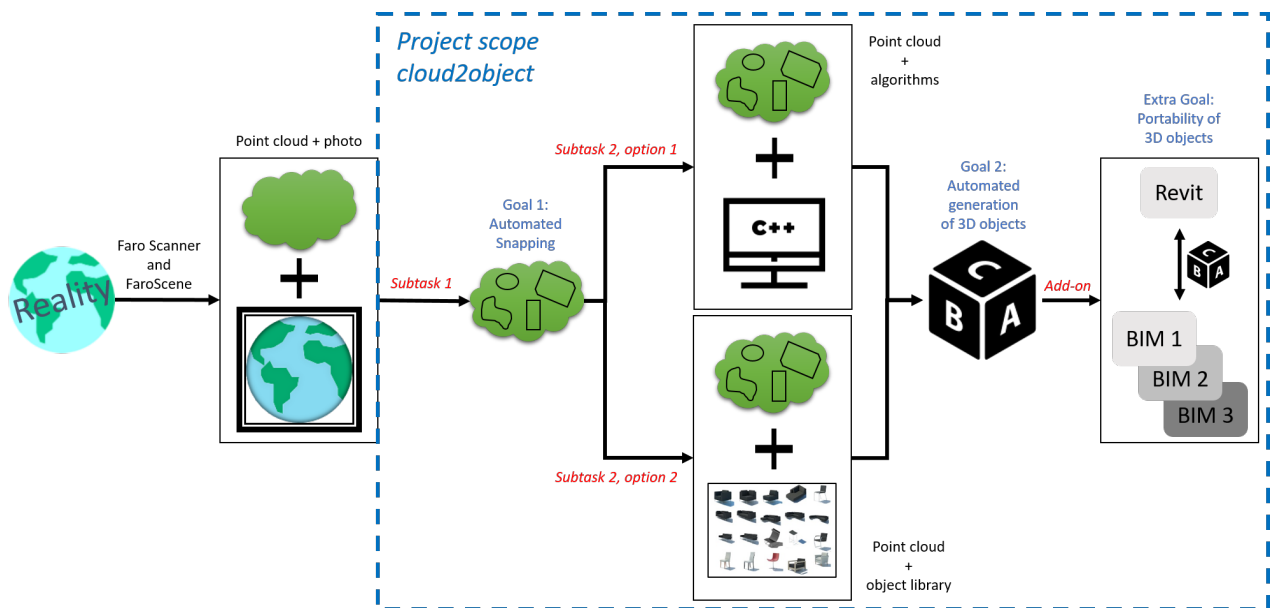


Figure 1: Sketch of project tasks.