InternShip Proposal 2012/2013 (Master Level)

Evaluation of 3D registration algorithms with challenging datasets

Supervisors/Contacts:
Paul Checchin (Associate Prof., HdR) : paul.checchin@univ-bpclermont.fr
Ahmad K. Aijazi (PhD Student) : kamalaijazi@gmail.com

Overview of the project:
The number of registration solutions in the literature has blossomed recently. The Iterative Closest Point algorithm (ICP), for example, could be considered as the backbone of many laser-based localization and mapping systems. Although they are widely used, it is a common challenge to compare registration solutions on a fair base. The main limitation is to overcome the lack of accurate ground truth in current data sets, which usually cover environments only over a small range of organization levels. In the field of computer vision, high-quality scanned objects with precise localization were captured and made available for the community by providing the Stanford 3D Scanning Repository. It was a key-step in order to push forward point cloud registration algorithms and object modeling fields. Similar high-quality working data but with sceneries instead of objects are now available for the robotic and computer vision communities. Point cloud sequences were acquired in locations covering the environment diversity that modern robots are susceptible to encounter, ranging from inside an apartment to a woodland area. The core of the data sets consists of 3D laser point clouds for which supporting data (Gravity, Magnetic North and GPS) are given for each pose. Global positioning of the scanner has been recorded within mm-range precision and independent of environmental conditions.

We propose to use these sequences in order to evaluate, develop and/or compare registration algorithms when mapping challenging environments, such as those found in real-world situations.

References

Skills required:
High skills in computer programming and in programming languages (C, C++, Matlab).
Mathematical toolkits (matrix computing, optimization, graph theory)

Gratification: 4,000 euros
Duration: 4 to 6 months
Location: Institut Pascal, site Montluçon, antenne IP-ISPR, UMR 6602 CNRS-UBP
Possibility of continuation with a PhD Thesis