State of the Art Point cloud registration algorithms are normally classified into two major categories: global (coars
For the purpose of this work we can classify point cloud registration algorithms into two major categories: point-to-
The approaches that do not work with point cloud data or 3D models, but are still related to the registration probl
[H] [width=]images/Classification.jpg Classification of the State of the Art.
Figure **??** shows an overview of the papers reviewed.
Point-to-point registration
Global methods
RANSAC [**?**] can also be used to perform the registration task but is time-consuming due to the randomness of the
Following the same line, S. Quan and J. Yang [**?**] propose a method that helps the RANSAC algorithm sampling th
Another less common approach for coarse registration is proposed by Sakakubara et al. [**?**]. This coarse registration
Others have proposed the use of neural networks to attempt to solve the global registration problem. This is the ca
Sarode et. al [**?**] present a registration framework that also use the PointNet to extract feature from the point clou
Ding and Feng [**?**] present another deep learning method called DeepMapping, whose main structure is constituted
More recently, Huang et al. [**?**] propose a learning method that can be trained in a semi-supervised or unsupervised
Local methods
Besl and N. D. McKay [**?**] propose the Iterative Closest Point (ICP) algorithm to perform registration between poi
According to Segal et al. [**?**], the ICP algorithm can be summarized in two main steps: the computation of corresp
ICP and its variants are still the standard algorithms for point cloud registration because of their simplicity.
Hybrid methods
The results of the global methods can be refined with the use of a local method, most of the time a variation of the
Go-ICP is a branch-and-bound (BnB) based approach proposed by Yang et al. [**?**] to address the susceptibility of I
The approach proposed by Jun Lu et al. [**?**] obtains a consistent four-point set by using Super4PCS [**?**], then it cre
Because of the increasing success of Deep Learning in 2D applications, there have been attempts to use deep neural
Another approaches does not use a neural network to solve the complete point cloud registration problem but a pa
Point-to-model registration
Sampling methods
In order to register a 3D model with a point cloud, the simpliest idea is to sample points from the 3D model to ge
Kim et al. [**?**] register a 3D CAD model of a construction site with a point cloud by sampling points from the 3D m
Kim et al. [**?**] is an extension of their previous work [**?**] In this approach, they just add a noise filter step to the pr
Local methods
Other approaches work directly with the information provided in the 3D models to perform the registration task.
Li and Song [**?**] propose two extensions to the most popular local registration method, the ICP algorithm, to be ab
In the specific case of CityGML, Goebbels et al. [**?**] propose an extension of the well-known ICP to perform point-t
Another approach by Goebbels et al. [**?**] explores the possibility to find features that help to perform the registrati
An extension of the work in [**?**] has been made by Goebbels et al. [**?**], where the steps to perform the registration a
Others There are other approaches that attempt to solve different matching problems with or without corresponde
Breuel [**?**] proposes the use of matchlist-based BnB techniques to solve geometric matching problems without corre
Bazin et. al [**?**] present an approach that combines Linear Programming and BnB procedures to achieve global opti
Brown et. al [**?**] extend the idea of the two previous approaches and present a 2D-3D registration method that doe
Windheuser et al. [**?**] propose the use of Integer Linear Programming to find correspondences between non-rigid 3D
Limitations of previous work ICP and its variants provide simple and easily-implemented iterative methods, but th
RANSAC and its variations cannot guarantee any global optimality in their final results [**?**]. According to [**?**], RAN
The globally optimal methods such as Linear programming and BnB based methods are very time-consuming. The
In the last years, there has been a boom in the use of neural networks and deep neural networks to solve 2D proble
In general, one thing that can be noticed is that none of this methods offers a direct solution for the coarse registra