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Scan registration using planar features

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Abstract. Point cloud acquisition by using laser scanners provides an efficient way for 3D as-built modelling of indoor/outdoor urban environments. In the case of large structures, multiple scans may be required to cover the entire scene and registration is needed to merge them together. In general, the identification of corresponding geometric features among a series of scans can be used to compute the 3D rigid-body transformation useful for the registration of each scan into the reference system of the final point cloud. Different automatic or semi-automatic methods have been developed to this purpose. Several solutions based on artificial targets are available, which however may not be suitable in any situations. Methods based on surface matching (like ICP and LS3D) can be applied if the scans to align have a proper geometry and surface texture. In the case of urban and architectural scenes that present the prevalence of a few basic geometric shapes ("Legoland" scenes) the availability of many planar features is exploited here for registration. The presented technique does not require artificial targets to be added to the scanned scene. In addition, unlike other surface-based techniques (like ICP) the planar feature-based registration technique is not limited to work in a pairwise manner but it can handle the simultaneous alignment of multiple scans. Finally, some applications are presented and discussed to show how this technique can achieve accuracy comparable to a consolidated registration method.

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