Geometric Transformer for Fast and Robust Point Cloud Registration--CVPR'22

原文

简介

本文通过提取superpoint来对patch的特征进行总结，利用transformer实现高效且精确的registration。

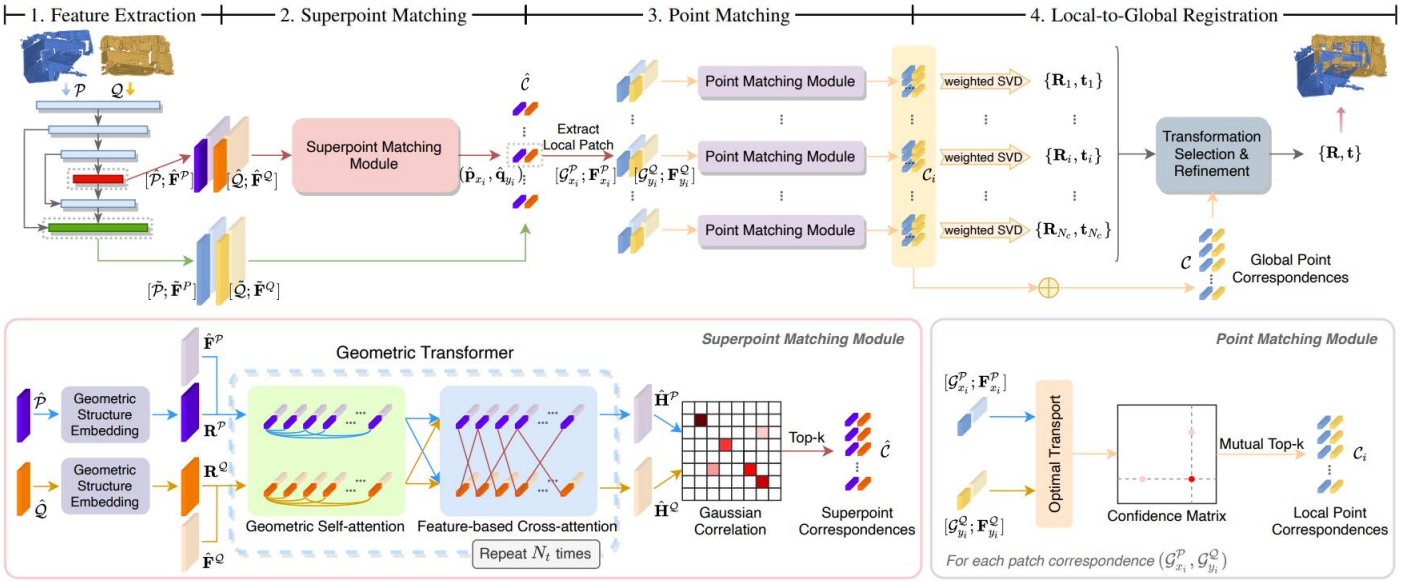

Figure 2. The backbone downsamples the input point clouds and learns features in multiple resolution levels. The Superpoint Matching Module extracts high-quality superpoint correspondences between $\hat{\mathcal{P}}$ and $\hat{\mathcal{Q}}$ using the Geometric Transformer which iteratively encodes intra-point-cloud geometric structures and inter-point-cloud geometric consistency. The superpoint correspondences are then propagated to dense points $\tilde{\mathcal{P}}$ and $\tilde{\mathcal{Q}}$ by the Point Matching Module. Finally, the transformation is computed with a local-to-global registration method.

superpoint采样和特征提取

原始点云通常太过稠密，因此以点为单位的匹配是冗余的并且有时太密集导致可用性下降。在这里，本文对稠密点云进行了降采样，采样使用体素滤波，即每个体素单元内的所有点被体素的重心取代，这些重心被作为superpoint进行特征提取。

superpoint匹配

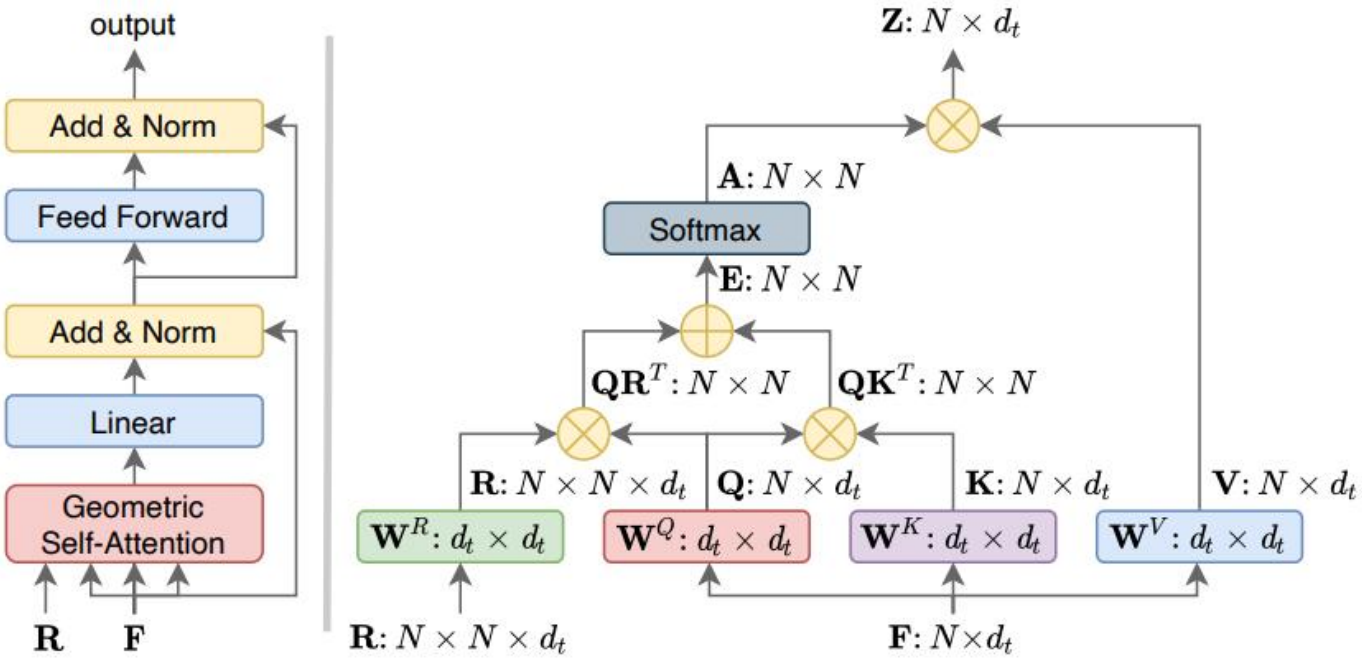

Figure 3. Left: The structure of geometric self-attention module. Right: The computation graph of geometric self-attention.

本文将几何信息和特征一起使用attention机制进行处理，几何信息经过geometric embedding。之后两帧的特征进行cross-attention，每一帧自身的特征作为query，另一帧的特征作为key和value。

点匹配

在superpoint匹配之后，每个patch对之间进行基于gnn的点特征匹配，生成最佳匹配点对。

local-to-global registration

对每个patch利用SVD可以生成一个变换，统计每个变换应用在全局的匹配对之间的误差小于τ_a的数目，取最高的变换作为全局的结果