DEEP POINT CLOUD NORMAL ESTIMATION VIA TRIPLET LEARNING (DEMONSTRATION)

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Fig. 1. The overall architecture of our method, where N is set to 500. Please refer to our main paper for the symbols’ definition.

Fig. 2. Demonstration of triplet learning.

Fig. 3. Shapes for (a) training; (b) validation and (c) testing.

ABSTRACT

In this demonstration paper, we show the technical details of our proposed triplet learning-based point cloud normal estimation method. Our network architecture consists of two phases: (a) feature encoding to learn representations of local patches, and (b) normal estimation that takes the learned representations as input to regress normals. We are motivated that local patches on isotropic and anisotropic surfaces respectively have similar and distinct normals, and these separable representations can be learned to facilitate normal estimation. Experiments show that our method preserves sharp features and achieves good normal estimation results especially on computer-aided design (CAD) shapes.

Index Terms— 3D Point Clouds, Normal Estimation

1. INTRODUCTION

This demonstration paper is associated with Deep Point Cloud Normal Estimation via Triplet Learning [1], which is accepted by ICME 2022 main program. The remainder of this paper provides descriptions on the technologies being involved. A supplementary video is also included in this submission.

Network Architecture. The network architecture is demonstrated in Fig. 1. Our feature encoding network adopts triplet learning, which brings representations of similar patches close to each other, and pushes apart representations of dissimilar patches. This process is shown in Fig. 2, and more training details are provided in our video.

Implementation Details and Datasets. We implement our networks using PyTorch 1.8.0, train and test them on an NVIDIA GeForce RTX 3080 GPU with CUDA 11.3. Our training dataset contains 11 CAD and 11 non-CAD shapes respectively (Fig. 3(a)) for balanced training. The shapes of our validation set and synthetic test set are shown in Fig. 3(b) and Fig. 3(c) respectively. Our video shows some test results.

2. REFERENCES

[1] Weijia Wang, Xuequan Lu, Dasith de Silva Edirimuni, Xiao Liu, and Antonio Robles-Kelly, “Deep point cloud normal estimation via triplet learning,” CoRR, vol. abs/2110.10494, 2021.