SUPPLE: Extracting Hand Skeleton with Spherical Unwrapping Profiles

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Motivations

- Robotics
- AR / VR
- Animation

Operating Objects

Remote Interaction

Motion Editing

Challenges

- Scan-based skeleton extracting may suffer from noise and holes;
- Geometric similarities among fingers;
- Extracting skeleton from 3D data is computationally expensive;

Contributions

- A novel representation is proposed to unwrap a 3D surface into image-like data effectively;
- A deep CNN architecture consuming our representation is designed to extract skeleton from hand scans and artist-designed models;
- A series of mesh data augmentation strategies are provided to significantly increase the size of the available training dataset.

Overview

1. Mesh-SUPPLE Conversion

(a) The input mesh is normalized into the unit sphere;
(b) Three different profiles were generated through intersecting tests;
(c) SUPPLE is converted back to a dense point cloud by querying pixels.

2. Skeleton Extraction

(a) An input mesh is converted as a SUPPLE image;
(b) This profile combination is then processed through an encoder-decoder network;
(c) The three heatmaps corresponding to each joint are transformed into the joint coordinates by voting.

For more details about this work and other recent work of our group, please scan the QR code on the right. (www.yangangwang.com)

Results

1. Skeleton extraction from online meshes

2. Skeleton extraction from scans

3. Accuracy for skeleton extraction

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Motivations

Noise

Similarities

Inefficiency