3D Convolutional Neural Networks for Efficient and Robust Hand Pose Estimation from Single Depth Images

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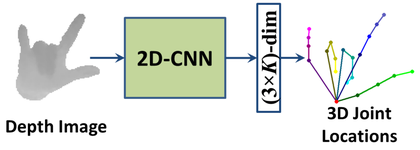
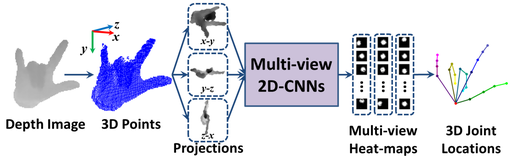
Introduction

- **Objective**: to estimate 3D hand pose in real-time from single depth images.
- **Motivation**: image based features extracted by 2D CNNs are not directly suitable for 3D hand pose estimation due to the lack of 3D spatial information.
- **2D CNN**:



- **Multi-view CNNs [1]**: still cannot effectively exploit 3D spatial information in the depth image; the computational complexity will be increased when using more views.



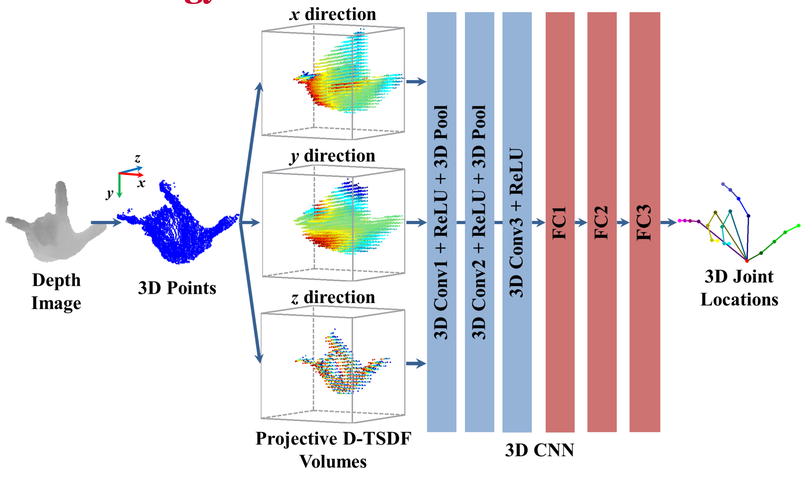
- **Our Approach**: we propose a 3D CNN-based approach that can capture the 3D spatial structure of the input and accurately regress full 3D hand pose in a single pass.

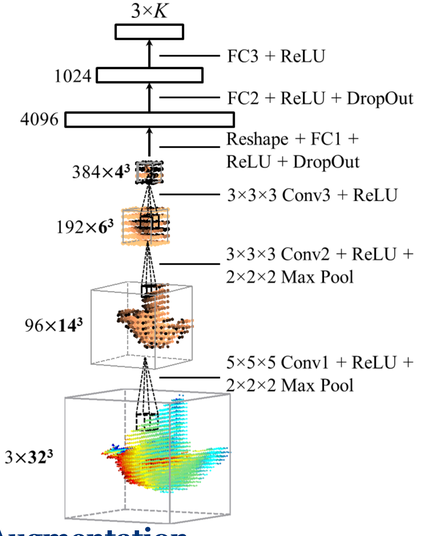
References

[1] L. Ge, H. Liang, J. Yuan, and D. Thalmann. Robust 3D hand pose estimation in single depth images: from single-view CNN to multi-view CNNs. In *CVPR*, 2016.

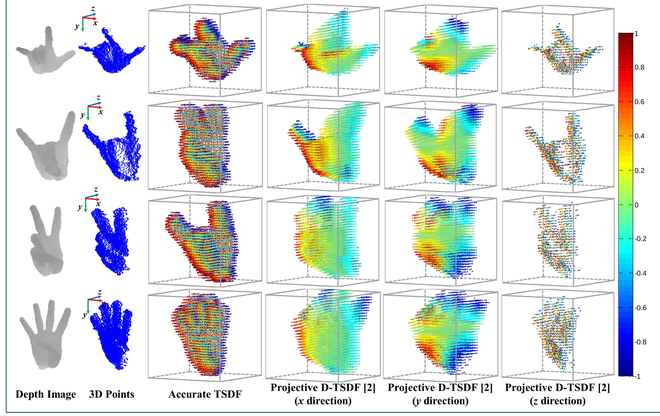
[2] S. Song and J. Xiao. Deep Sliding Shapes for amodal 3D object detection in RGB-D images. In *CVPR*, 2016.

Methodology

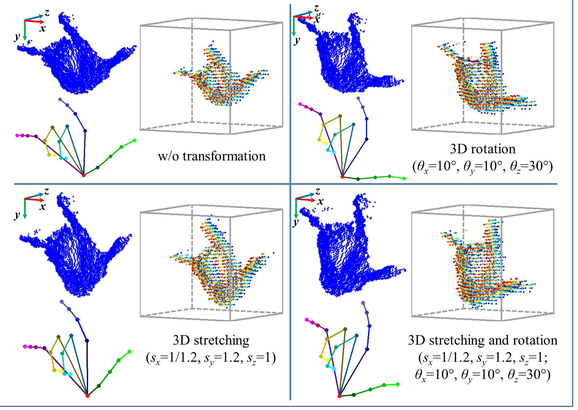




Volumetric Representation



3D Data Augmentation



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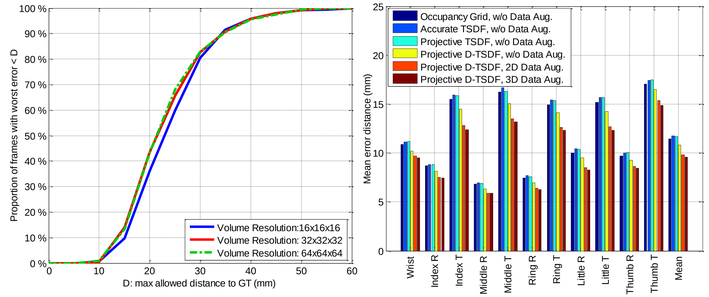
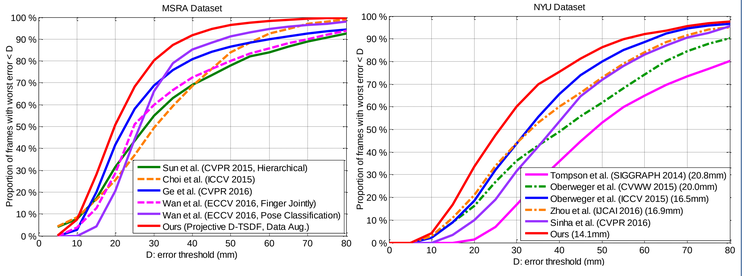
Experiments

Self-comparisons



Comparisons with State-of-the-art



Qualitative Results