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F O R S C H U N G S P R A X I S
for
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Hand pose estimation for hand-object interaction cases

Problem description:

Hand pose estimation plays an important role in some human-robot interaction tasks, such as gesture recognition and learning grasping capability by human demonstration. Since emergence of consumer-level depth sensing device, a lot of depth image based hand pose estimation methods appeared. For learning based methods, a large dataset for training is required to obtain good performance [2, 1]. Existing hand pose datasets usually only contain clean hand samples, where the hand is not in contact with other objects [3, 4]. This constrains the trained models to be applied on hand-object interaction scenarios.

In this Forschungspraxis, the student will add artificial objects to existing dataset [4], in order to simulate hand-object interaction cases. The student will then use the augmented dataset to train a point cloud based neural network, and test the performance in real hand-object interaction scenario.

Work schedule:

- Create augmented dataset.
- Training using augmented dataset.
- Migration of trained Tensorflow model to a ROS service node.
- Test performance on real captured data.

Bibliography:

- [1] Liuhaio Ge, Yujun Cai, Junwu Weng, and Junsong Yuan. Hand pointnet: 3d hand pose estimation using point sets. In *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*, pages 8417–8426, 2018.
- [2] Markus Oberweger, Paul Wohlhart, and Vincent Lepetit. Hands deep in deep learning for hand pose estimation. *arXiv preprint arXiv:1502.06807*, 2015.
- [3] Jonathan Tompson, Murphy Stein, Yann Lecun, and Ken Perlin. Real-time continuous pose recovery of human hands using convolutional networks. *ACM Transactions on Graphics*, 33, August 2014.
- [4] Shanxin Yuan, Qi Ye, Guillermo Garcia-Hernando, and Tae-Kyun Kim. The 2017 hands in the million challenge on 3d hand pose estimation. *arXiv:1707.02237*, 2017.

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