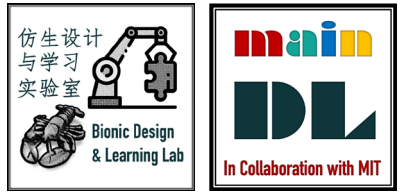
# Multi-view self-supervised deep learning framework for solving 6D pose estimation problem

Ren Shize 12012818 | Li Zhidong 12011506
Jiang Meng 12011603 | Zeng Yuqi 12011811
Zhao Xuda 12010325







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# Proposed Project Title Summary

*(300~400 words)*

- The question we're looking into is(1) picking an instance of a given a product ID out of a populated shelf and place it into a tote; and (2) stowing a tote full of products into a populated shelf， It can solve practical problems. We examine to provide context and background by reading 1) Zeng, A., Yu, K.T., Song, S., Suo, D., Walker, E., Rodriguez, A. and Xiao, J., 2017, May. Multi-view self-supervised deep learning for 6d pose estimation in the amazon picking challenge. In 2017 IEEE international conference on robotics and automation (ICRA) (pp. 1386-1383). IEEE. 2) H. Zhang, P. Long, D. Zhou, Z. Qian, Z. Wang, W. Wan, D. Manocha, C. Park, T. Hu, C. Cao, Y. Chen, M. Chow, and J. Pan, “Dorapicker: An autonomous picking system for general objects,” arXiv: 1603.06317, 2016. [Online]. Available: http://arxiv.org/abs/1603.06317. Zeng's paper provides the entire data set used by their article, which is from Amazon Picking Challenge (131.4GB), including its selected sample (93.5MB). We could use the robotic arm and the camera in the laboratory for data acquisition with the help of TA. In the meantime, we need a certain workspace for data collection, like a certain shelf.  The method or algorithm we are proposing Full convolutional neural network(FCN), Faster R-CNN+Iterative Closest Point(ICP), PLICP\NICP. If there are existing implementations, We will use existing implementations like FCN and ICP. The first is the full convolutional neural network (FCN) for the whole data processing, which can be replaced by Faster R-CNN or other algorithms. Then, the iterative nearest point (ICP) method of post-processing can be improved by PLICP\NICP and other methods. For these alternatives or improvements, we will compare and evaluate methods by statistical accuracy according to Zeng's paper. We plan to improve or modify such implementations such as:Full convolutional neural network(FCN) --> Faster R-CNN; Iterative Closest Point(ICP) --> PLICP\NICP. We use the data provided to evaluate the pros and cons of the two methods. Use our own data (provisional) for training to assess the differences between different usage scenarios.

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# What is the problem that you will be investigating?

*Why is it interesting?*

- picking an instance of a given a product ID out of a populated shelf and place it into a tote and (2) stowing a tote full of products into a populated shelf.

- It can solve practical problems.

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# What reading will you examine?

*To provide context and background*

- 1) Zeng, A., Yu, K.T., Song, S., Suo, D., Walker, E., Rodriguez, A. and Xiao, J., 2017, May. Multi-view self-supervised deep learning for 6d pose estimation in the amazon picking challenge. In 2017 IEEE international conference on robotics and automation (ICRA) (pp. 1386-1383). IEEE.
- 2) H. Zhang, P. Long, D. Zhou, Z. Qian, Z. Wang, W. Wan, D. Manocha, C. Park, T. Hu, C. Cao, Y. Chen, M. Chow, and J. Pan, "Dorapicker: An autonomous picking system for general objects," arXiv: 1603.06317, 2016. [Online]. Available: http://arxiv.org/abs/1603.06317

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# What data will you use?

*If you are collecting new data, how will you do it?*

- (1)What data: Zeng's paper provides the entire data set used by their article, which is from Amazon Picking Challenge (131.4GB), including its selected sample (93.5MB).
- (2)How we do: We could use the robotic arm and the camera in the laboratory for data acquisition with the help of TA. In the meantime, we need a certain workspace for data collection, like a certain shelf.

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# What method or algorithm are you proposing?

*If there are existing implementations, will you use them, and how? How do you plan to improve or modify such implementations? You don't have to have an exact answer at this point, but you should have a general sense of how you will approach the problem you are working on.*

- (1)Method or algorithm: Full convolutional neural network(FCN), Faster R-CNN+Iterative Closest Point(ICP), PLICP\NICP
- (2)We will use existing implementations like FCN and ICP.
- (3)How we use: The first is the full convolutional neural network (FCN) for the whole data processing, which can be replaced by Faster R-CNN or other algorithms.
- Then, the iterative nearest point (ICP) method of post-processing can be improved by PLICP\NICP and other methods.
- For these alternatives or improvements, we will compare and evaluate methods by statistical accuracy according to Zeng's paper.
- (4)Plan to improve:  Full convolutional neural network(FCN) --> Faster R-CNN
- Iterative Closest Point(ICP) --> PLICP\NICP

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# How will you evaluate your results?

*Qualitatively, what kind of results do you expect (e.g., plots or figures)? Quantitatively, what kind of analysis will you use to evaluate and/or compare your results (e.g., what performance metrics or statistical tests)?*

- Use the data provided to evaluate the pros and cons of the two methods.
- Use our own data (provisional) for training to assess the differences between different usage scenarios.

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# Thank you

Reporters:  Ren Shize; Li Zhidong; Jiang Meng; Zeng Yuqi; Zhao Xuda

Supervisor: Song Chaoyang