

<p><b>Topic</b></p>	<p><b>Markerless Hand and Gesture Detection</b></p>
<p><b>Abstract</b></p>  <p>(<a href="https://github.com/Hzzone/py-torch-openpose">https://github.com/Hzzone/py-torch-openpose</a>)</p>	<p>An important aspect of having robots physically interact with humans in close proximity is understanding the intent of a human user for the interaction, which can be captured by hand poses. For example, whether a human is asking for an object, initiating a handshake/high five or indicating some numbers or giving a feedback. In order for a more natural interaction, the robot should be able to detect the human's hand and the intent without requiring the human to wear special gloves or use specialized hardware.</p>
<p><b>Language</b></p>	<p>English</p>
<p><b>Exemplary Issues</b></p>	<p>The main focus of this thesis is to investigate works that use developments in computer vision and AI to efficiently detect human hands and gestures. It would involve looking into existing state-of-the-art methods and developing a real-time hand and gesture detection method, which can be easily integrating with existing Human-Robot Interaction (HRI) methods. This thesis would involve:</p> <ul style="list-style-type: none"> <li>• Surveying and benchmarking existing hand and gesture detection works.</li> <li>• Developing a framework to learn new gestures in a light-weight manner.</li> <li>• Exploring the efficiency of the proposed method both in terms of difficulty of learning new gestures and having a real-time response.</li> </ul>
<p><b>Key References</b></p>	<p>[1] Cao, Z., Hidalgo, G., Simon, T., Wei, S.E. and Sheikh, Y., 2019. OpenPose: realtime multi-person 2D pose estimation using Part Affinity Fields. <i>IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)</i>.</p> <p>[2] Wang, J., Mueller, F., Bernard, F., Sorli, S., Sotnychenko, O., Qian, N., Otaduy, M.A., Casas, D. and Theobalt, C., 2020. RGB2Hands: real-time tracking of 3D hand interactions from monocular RGB video. <i>ACM Transactions on Graphics (TOG)</i>.</p> <p>[3] Mueller, F., Bernard, F., Sotnychenko, O., Mehta, D., Sridhar, S., Casas, D. and Theobalt, C., 2018. Gnerated hands for real-time 3d hand tracking from monocular rgb. In <i>Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)</i>.</p>

<b>Additional Information</b>	Start: as soon as possible  Kind of thesis: Master/Bachelor thesis or Studienarbeit  Requirements: Programming knowledge (Python/C++), Knowledge of AI or Machine Learning or Deep Learning.  Publication options: High quality work would be submitted to international conferences.
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