Human-robot collaborative carrying using visual and force sensing

Xinbo Yu

Institute of Artificial Intelligence, University of Science and Technology Beijing

Bio

Xinbo Yu received his B.Eng. degree in control technology and instrument and Ph.D. degree in control science and engineering from the School of Automation and Electrical Engineering, University of Science and Technology Beijing, Beijing, China, in 2013 and 2020, respectively. He is currently working as an associate professor in Institute of Artificial Intelligence, University of Science and Technology Beijing, Beijing, China. He is IEEE student member and Chinese Association of Automation member, and he is serving as the reviewer of IEEE Transactions on Fuzzy Systems, IEEE Transactions on Cybernetics, IEEE Transactions on Systems, Man, and Cybernetics: Systems, Assembly Automation, Science China Information Sciences, etc.

His current research interests include adaptive neural networks control, impedance control, robotics and human-robot interaction.

Abstract

Physical interaction of human and robot (pHRI) in shared environments and joint tasks poses many challenges. Collaborative carrying tasks, which rely on complementary advantages of human and robot, cannot be accomplished individually by a single human or robot. In this talk, we will introduce a hybrid framework using visual and force sensing for human-robot co-carrying tasks. Further, an adaptive neural network impedance-based control strategy will be presented. Motion synchronization can be achieved, and this approach yields a stable and efficient interaction behavior between human and robot, decreases human control effort and avoids interference to human during the interaction. Finally, co-carrying tasks in simulations and experiments will be illustrated to verify our proposed method.

List of References

[1] Xinbo Yu, Wei He*, Yanan Li, Chengqian Xue, Jianqiang Li, Jianxiao Zou and Chenguang Yang, "Bayesian estimation of human impedance and motion intention for human-robot collaboration", ***IEEE Transactions on Cybernetics***, DOI: 10.1109/TCYB.2019.2940276, in press, 2019. (Q1, IF: 10.387)
[2] Xinbo Yu, Wei He*, Hongyi Li and Jian Sun, "Adaptive fuzzy full-state and output feedback control for uncertain robots with output constraint", ***IEEE Transactions on Systems, Man, and***

Cybernetics: Systems, DOI: 10.1109/TSMC.2019.2963072, in press, 2020. (Q1, IF: 7.351)
[3] Xinbo Yu, Yanan Li, Shuang Zhang*, Chengqian Xue and Yu Wang, "Estimation of human impedance and motion intention for constrained human-robot interaction", ***Neurocomputing***, DOI: 10.1016/j.neucom.2019.07.104, in press, 2019. (Q1, IF: 4.072)
[4] Xinbo Yu, Wei He*, Chengqian Xue, Bin Li, Long Cheng and Chenguang Yang, "Adaptive neural admittance control for collision avoidance in human-robot collaborative tasks", ***2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2019)***, 7574-7579, 2019. (Presentation)
[5] Wei He*, Chengqian Xue, Xinbo Yu, Zhijun Li and Chenguang Yang, "Admittance-based controller design for physical human-robot interaction in the constrained task space", ***IEEE Transactions on Automation Science and Engineering***, DOI: 10.1109/TASE.2020.2983225, in press, 2020. (Q1, IF: 5.224)