

3rd Workshop on Ergonomic Human-Robot Collaboration: Opportunities and Challenges

Wansoo Kim, Luka Peternel, Arash Ajoudani, and Eiichi Yoshida

Abstract

In many industrial countries, work-related musculoskeletal disorders (WMSD) are associated with high costs to employers such as lost productivity, worker's compensation costs, and so on. WMSD risk factors include awkward posture, repetition, mechanical compression, vibration, etc. To tackle such risk factor, a workplace ergonomics assessment comprises of intervention descriptions for WMSD and the intervention strategy for reducing, eliminating, or controlling worker exposure to the WMSD risk factor. These measures aim to ensure workers' health and safety. Human-Robot Collaboration (HRC) a promising concept that can potentially help with maintaining and improving ergonomics and working conditions of human co-workers. However, the traditional HRC technologies mostly focus safety in terms of collision avoidance and impact safety, while ergonomics potential is largely under-exploited. Therefore some of the major challenges and opportunities to exploit such potential are: collaborative robots have to be aware of co-worker's state and predict his/her actions; the interactive motion has to be able to reconfigure the human working conditions; the methods must operate online.

The above-mentioned challenges and opportunities present a novel research topic for the community. We previously organized two successful workshops to establish the field and to discuss this topic. First, we held a workshop at ICRA 2018[1] to introduce and discuss the concept in terms of collaborative robotics. Then we held a continuation workshop at IROS 2019[2] to review the initial research progress based on the goals set at the first workshop and identify major ongoing research problems. Now it is time to discuss those problems and come up with solutions to make progress towards robust and applicable methods for ergonomic human-robot collaboration.

The proposed workshop will first review the progress of the research and development in the new field that was achieved since the last workshop at IROS 2019. Next, we will focus on how to solve the problems that emerged during the research and development based on the goals that were set at the previous workshop. In addition, we will discuss potential novel research directions, ergonomic metric and robot control methods. Finally, we will discuss and design new validation methods that can be used for objective benchmarking within the field. Such an approach requires experts from various research fields and interdisciplinary discussion. For this purpose, we assemble a diverse set of organizers and speakers, who are leading experts in their respective areas that are highly relevant to this workshop topic.

Index Terms

Physical Human-Robot Collaboration, Ergonomics, Human Modelling, Adaptation and Learning, Industrial Robots, Exoskeleton Robots, Physical Interaction Control, Wearable Sensors, Feedback Devices, Shared Control.

REFERENCES

- [1] 2018 ICRA Workshop on Ergonomic Physical Human-Robot Collaboration, May 2018, Australia, <https://hri.iit.it/news/organizations/icra-2018-workshop>
- [2] 2019 IROS Workshop on Progress in Ergonomic Physical Human-Robot Collaboration, November 2019, Macau, China, <https://hri.iit.it/news/organizations/iros-2019-workshop>