PhD Lecture

In partial fulfillment of the terms for obtaining the PhD degree, Eike Schneiders will give a lecture on the following subject:

**Non-Dyadic Collaboration in Human-Robot Interaction**

on Thursday 27th of October 2022, 13:00, in room 0.2.13 at Selma Lagerlöfs Vej 300

**Abstract:**

With the ever-increasing number of domains in which we encounter robots - be it in industry, airports, or the home - the opportunity to interact and collaborate with these grows. And while an abundance of Human-Robot Interaction (HRI) literature has investigated dyadic interaction, non-dyadic HRI research, i.e., more than one human and one robot, has just recently begun to receive increasing attention. In this dissertation, I investigate characteristics of non-dyadic Human-Robot Interaction and collaboration. Specifically, I investigate two research questions focusing on i) the identification of existing characteristics of non-dyadic Human-Robot Interaction research and ii) the influence robots have on non-dyadic collaborative efforts.

This dissertation's contribution is based on five research papers. Paper I presents an empirical investigation of existing research on non-dyadic HRI over the last 15 years. Paper II to IV present qualitative field studies in the domestic and industrial contexts. Lastly, Paper V presents a mixed-methods lab-based study investigating human group collaboration and identifies design considerations to improve non-dyadic human-robot collaboration. Based on these five papers, this dissertation presents two primary contributions.

Firstly, I identify characteristics of non-dyadic HRI through an investigation of 164 research papers. These characteristics include the ongoing paradigm shift from a dyadic focus towards a non-dyadic focus, three non-dyadic configurations within HRI (one-to-many, many-to-one, and many-to-many) and an imbalance emphasising research involving one human interacting with multiple digital artefacts (one-to-many), a classification framework for non-dyadic Human-Robot Interaction, as well as empirical evidence showing the focus of non-dyadic HRI research on simultaneous over sequential interaction.

Secondly, I present several ways in which robots influence collaboration during non-dyadic Human-Robot Interaction. I highlight how introducing robots in both the domestic and industrial contexts into non-dyadic settings can lead to a fragmentation of previously coherent tasks while only some of the sub-tasks are automated. Furthermore, I show how the robot's presence, as previously hypothesised—can lead to a spatial restructuring resulting in a positive change in interpersonal relationships amongst collaborators. Lastly, I argue for the robot's capacity to alter, remove, and create roles and responsibilities within the non-dyadic collaborative Human-Robot Interaction.

Future work includes the investigation of i) robots as pro-active collaborators, ii) increase of transparency during robot introduction to counter unintended negative side-effects, and iii) a reconsideration of what a collaborative robot and collaboration with robots means.
Members of the assessment committee are Associate Professor John Stouby Persson (Chairman), Aalborg University (Denmark), Professor Lynne Baillie, Heriot-Watt University (Scotland), and Professor Torkil Clemmensen, Copenhagen Business School (Denmark).

Supervisor for the thesis has been Professor Mikael B. Skov, Aalborg University. Co-supervisor for the thesis has been Professor Jesper Kjeldskov, Aalborg University, and Associate Professor Niels van Berkel, Aalborg University.

All interested parties are welcome. After the defence the department will be hosting a small reception in cluster 5.