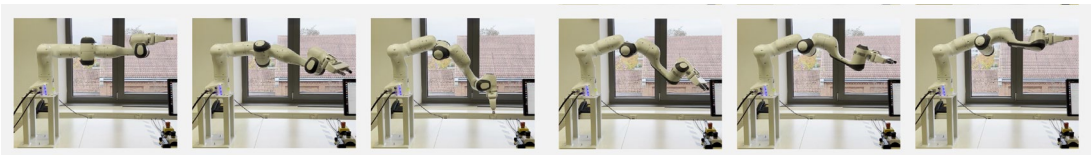
Friedrich-Alexander-Universität
Institute of Autonomous Systems and Mechatronics | ASM

24.03.2025

Master thesis

Evaluation of human-likeness of robot arm motion trajectories.



Motion sequence of a robot arm performing a task.

In robot arm applications involving human-robot interaction, ensuring safe and predictable robot motions is of critical importance. These qualities can be enhanced by designing motions that resemble human movements (Lauretti et al., 2019). Previous work at ASM has focused on creating trajectories derived from human motion data and analyzing how human muscles produce movements. This work should build upon these existing methods to further improve the generation of robot trajectories. For both approaches, scenarios are to be defined where the robot arm interacts with objects or the environment. Experiments should then be conducted to implement these methods and compare their performance. Furthermore, a study involving human observers should be carried out, using questionnaires to evaluate the human-likeness of the robot's motions (Bartneck et al., 2009).

Task description

1. Conceptualization
    a. Define robot tasks and interaction scenarios.
    b. Plan motion trajectories using different methods.
2. Experimental setup
    a. Setup real-world robot arm and environment.
    b. Implement and test robot arm motions.
3. Evaluation
    a. Carry out user study.
    b. Statistical analysis.
4. Documentation and presentation of results.

Prerequisites

- Studying mechatronics, medical engineering, computational engineering, electrical engineering, autonomy technologies, or similar
- Good Python skills and knowledge of robotics

References

Bartneck, C., Kulić, D., Croft, E. et al. (2009). Measurement Instruments for the Anthropomorphism, Animacy, Likeability, Perceived Intelligence, and Perceived Safety of Robots. *Int J of Soc Rob.*

Lauretti, C., Cordella, F., Zollo, L. (2019). A Hybrid Joint/Cartesian DMP-Based Approach for Obstacle Avoidance of Anthropomorphic Assistive Robots. *International Journal of Social Robotics*.

Begin: tbd **End:** tbd

Examiner: Prof. Dr.-Ing. habil. Philipp Beckerle **Assistance:** M.Sc. Martin Rohrmüller