Developing Adaptive Behaviors and Interactive Engagement into Robotic Lawnmowers

ABOUT HUSQVARNA

Husqvarna Group is a world-leading producer of outdoor power products for garden, park and forest care. Products include chainsaws, trimmers, robotic lawnmowers and ride-on lawnmowers. The Group is also the European leader in garden watering products and a world leader in cutting equipment and diamond tools for the construction and stone industries. Advanced Development & AI Lab consists of about 45 creative colleagues, all specialised within their fields: system engineering, embedded software, sensors and algorithm development, vision and machine learning, data engineering, system testing, and electrical and mechanical engineering. Some examples of technology originated from the team are:
- ADW robotic platform. A robotic mower that looks, behaves, and performs like no other.
- EPOS positioning system and boundary wire free robotic mower.
- A lot of new interesting functionality to be on the market in the near future.

THE PROJECT

Automated machines like robotic lawnmowers boost the efficiency and precision of the task while reducing human effort. However, the use of such robots underscores the need for enhanced adaptive behaviours that need to be communicated through multimodal channels. This project aims to equip robotic lawnmowers with multi-modal interaction capabilities and adaptive behaviours. The goal is to make the robot perceptively responsive to human presence, movements, and needs. The first step to achieving such goals is to evaluate the multi-modal communication channels needed to convey the robot's intentions and signals to the human [1]. In the next steps, these communication channels are tested in a user study with human participants and the robot, where their usability and acceptance are evaluated.

GOALS

- Conduct a rigorous literature review focusing on the interaction between human and robotic lawnmowers or robots with similar characteristics.
- Identify research gaps, especially those related to modes of interaction and human factors in human-machine interaction in uncontrolled environments
- Design and develop user studies using the methodologies in the literature
- Engage in collaborative brainstorming sessions with the team of researchers from Husqvarna and KTH to refine and integrate your findings

REQUIREMENTS

The project requires the following skills and interest:
- Strong mathematical and coding skills, similar to what you'd acquire in the ML or SCR programs at KTH
- Knowledge of Statistical analysis tools, preferably Python or R
- Interest in learning about the Husqvarna platform (add more details)

To apply, submit the following to Elmira Yadollahi (elmiray@kth.se) and Mattias Kamfors (mattias.kamfors@husqvarnagroup.com): CV, Cover letter, and Transcripts.

REFERENCES

[1] Wu, M.-H., Yu, J.-C., and Lin, Y.-C. (2022). Study of autonomous robotic lawn mower using multi-sensor fusion based simultaneous localization and mapping. In *2022 International Conference on Advanced Robotics and Intelligent Systems (ARIS)*, pages 1–4. IEEE.