Decoding Humans through a Robotic Lawnmowers Eyes

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

The emergence of new automated tools in our everyday lives, such as robotic lawnmowers, improves maintenance efforts, precision, and efficiency and reduces human effort and involvement. However, developing appropriate interactive behaviours in such systems requires an in-depth understanding of human intention and movement. This study focuses on decoding humans' intentions when approaching or interacting with a lawnmower by collecting data and developing dedicated machine learning algorithms to find behavioural patterns. We are particularly interested in understanding humans from the robot's eyes with its low-height visual cue. The research can leverage the current state-of-the-art research in the field of human-robot interaction and extend it to the topic of group dynamics where behavioural changes might occur as humans approach the robot alone or in group [2, 1]. The project involves using currently existing datasets or collecting data using lawnmower robots, analysing the data to detect patterns and intentions through machine learning algorithms, categorising human behaviours and developing adaptive robot behaviours that could address them.

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:
- high level of expertise in machine learning
- 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] Mannini, A. and Sabatini, A. M. (2010). Machine learning methods for classifying human physical activity from on-body accelerometers. *Sensors*, 10(2):1154–1175.

[2] Sebo, S., Stoll, B., Scassellati, B., and Jung, M. F. (2020). Robots in groups and teams: a literature review. *Proceedings of the ACM on Human-Computer Interaction*, 4(CSCW2):1–36.