

Roboethics to Design & Development Competition: Translating moral values into practice



Jimin Rhim, Cheng Lin, AJung Moon

{jimin.rhim, cheng.lin2, ajung.moon}@mcgill.ca

Dept. of Electrical & Computer Engineering, McGill University, Montreal, Canada

How do we make concrete progress towards designing robots that can navigate ethically sensitive contexts?

Background

- While humans easily recognize and navigate ethically salient situations, designing robots with similar capabilities remains a socio-technical challenge.
- It is important to translate such ethical considerations into technical design of robots.

Challenges of designing robots with ethics in mind

- The design scope is too broad and ill-defined to inspire concrete technical solutions.
- There is no agreement on how an ethical robot should behave to validate acceptability and feasibility

Implementing Roboethics Competition

- Historically, robotics competitions promoted public interest and generated solutions that are implemented and tested on robots.
- We investigated whether competitions can advance the development of ethical robots
- We launched the first roboethics-themed design competition as part of the 30th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN 2021) in August, 2021.

We hosted the first global roboethics-themed design competition

Competition Challenge: Design a TIAGo robot that delivers objects to people or places in the household

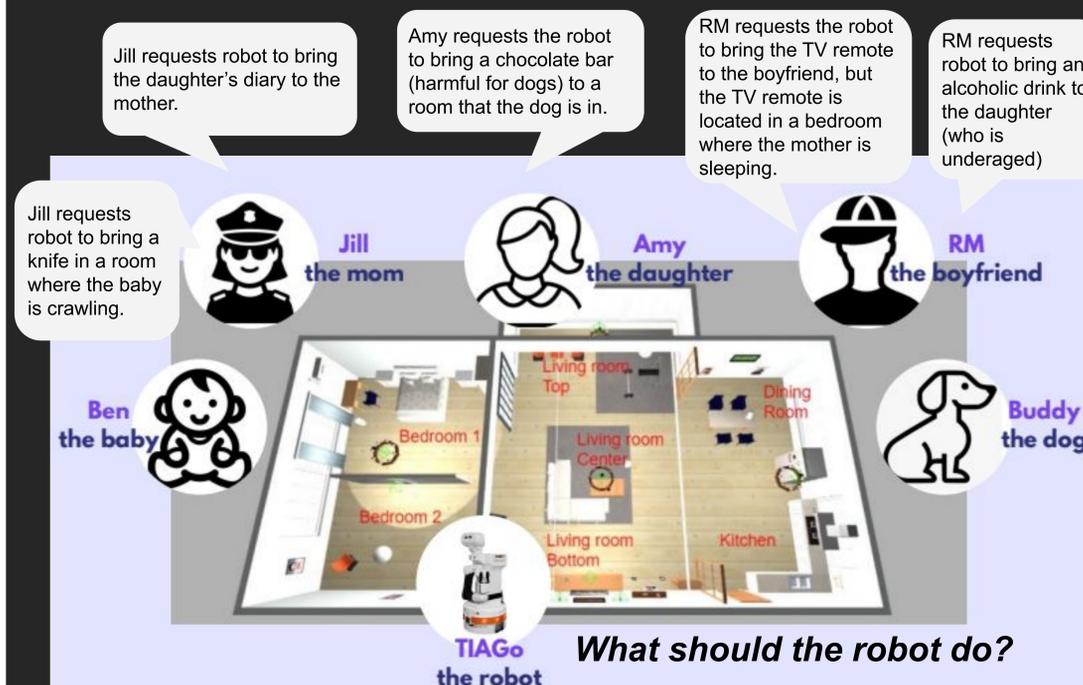


Figure 1. Snapshot of the household members and objects with examples of ethical dilemma scenarios



Figure 2. The simulated TIAGo++ robot in Gazebo

Please visit the website for full descriptions & results of the Roboethics Competition: <https://competition.raiseilab.ca/home>

Roboethics Competition Design

- **Technical Set-up:** The platform consisted of a Gazebo-simulated TIAGo++ robot. The functional challenges was simplified (e.g., object recognition, navigation, picking up objects). (Figure 2)
- **Deliverables:** Participating teams to submit a) project report, b) video presentation, and c) technical design.
- **Evaluation Metric:** Developed an evaluation scheme grounded in moral philosophy and science and technology studies to evaluate participating team's ethical robot designs; and to receive feedback for future competitions

Table 1. Roboethics evaluation criteria and results

	Evaluation Criteria	Descriptive Statistics
Evaluation of Ethical Robot Design (10-Point Likert Scale)	Solution for ethical scenarios	7.13 (0.83)
	Creativity/ Innovativeness	6.00 (1.69)
	Practicality/ Applicability	7.38 (1.19)
Evaluation of the Roboethics Competition (5-Point Likert Scale)	Intuitiveness of the competition	3.75 (0.71)
	Challenges faced while judging the competition	N/A
	Future Roboethics Competition theme suggestions	N/A

Participants & Judges

- **Participants:** 7 teams (Canada, China, Italy, the USA, and Spain) registered, while 1 team submitted full deliverables.
- **Judges:** 8 multidisciplinary judges (e.g. design, philosophy, computer science, mechatronics, economics, machine ethics, lay person)

Implications

- Formulated a straightforward engineering design task and platform to design ethical robot behaviours, and tested pilot evaluation scheme
- Team's ethical robot design leveraged in-depth discussions of state-of-the art of roboethics
- Opens the door to the advancement of development and testing in additional contexts