2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
October 25-29, 2020, Las Vegas, NV, USA (Virtual)

Why Robots Fail to Grasp?

Failure ca(u)ses in robot manipulation

Joao Bimbo[1], Kensuke Harada[2], Giulia Vezzani[3], and Dimitrios Kanoulas[4]

Failures are an essential part of every innovation and development process. The road that leads to most successful human undertakings is usually paved by a large amount of mistakes, failed experiments and incorrect assumptions. This reality is even more remarkable in scientific research, since making new discoveries can sometimes be seen as a *leap in the dark*, where the methods to be used and even the outcomes to achieve typically cannot be known a priori, which makes trial-and-error approaches a constituent part of the scientific method. Despite their importance, failures are often overlooked in the research process. This might be due to the research community's unwillingness to admit and discuss failure, as well as problems that arise from the refusal of publishing negative results. This produces an environment where little time is devoted to reasoning and reporting unsuccessful trials. The complexity of robotic systems presents a number of challenges in identifying failure cases and addressing their causes. First because the number of different components present in a robotic system translates into a multitude of possible failures (e.g. the vision might fail because of lighting, the IMU because of magnetic interference, etc.). Troubleshooting these complex systems becomes a difficult and time-consuming task. Besides, there are usually a multitude of single points of failure, which are the components of a system where a failure will stop the entire system from working. Another distinguishing feature of robotics research is that a researcher may feel tempted to tailor his/her experiments to avoid particular failure cases without mentioning it, in an attempt to bypass further scrutiny when submitting an article for review.

[1] Yale University joao.bimbo@yale.edu
[2] Osaka University
[3] DeepMind
[4] University College London

This workshop aims to serve as a discussion forum where the participants will have the opportunity to:

- Learn from the experience of other participants, finding explanations for problems that they encounter in their work, as well as possible solutions. They may also avoid repeating the same mistakes, when an approach is proven to be ineffective.
- Share their own unsuccessful ideas, hypotheses, and experiments, gaining some insights and possible solutions from participants working on similar problems.
- Network with other participants, joining efforts to address common problems or employing one's know-how to solve another's persistent failure case.
- Create new research problems, based on the discussions during the workshop, finding the underlying causes and solutions for common failure cases.

By narrowing down the topics of the workshop to failures in the context of robot grasping and manipulation, the workshop will focus on the problems and obstacles that are shared by the community working in the field. We intend to have a truly interactive workshop, using different channels to engage the audience, such as twitter, real-time feedback and questions, and break-out sessions. Participants will be encouraged to share their own stories of failure, and present suggestions to others when they feel they might have encountered similar situations. We will also take input from both the speakers and the audience during the workshop, to define a standardised taxonomy for classifying different types of failures in robot grasping and manipulation.

The invited talks include academics with vast experience in grasping and manipulation, robotic startuppers and engineers, who will also be involved in the round-table discussions. These diverse backgrounds will allow the participants to have a perspective on how failures are addressed in different settings: from research labs and small companies where failure is an everyday part of the innovation process to settings where a failure can have catastrophic consequences. The talks and panels will allow younger researchers to engage with more experienced roboticists, helping them to formulate new research ideas, and find novel directions to explore.