The "Tilburg Hand": a low-cost platform for Deep Reinforcement Learning for Robotics

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Objective

Low-cost platform designed specifically to enable research in robotic dexterous manipulation with Deep Reinforcement Learning (including sim2real and imitation learning).

(Andrychowicz, et al., 2018)

Why

- Existing robot hands are very expensive, which limits the number of research groups that can do research on the topic.
- Examples:
    - Shadow Hand (~$300.000)
    - Allegro Hand (~$15.000)

- Most of their features are not really required for DRL-based approaches! Using simpler robots can lower costs by a significant margin.
- Examples:
    - Force control is generally not used (yet)
    - CAN-bus is not strictly required here
    - Control-rate is not critical: Andrychowicz et al. send updates every 80ms.

Strong hypothesis (untested): *"DRL in robotics is harder than traditional approaches, but it will scale to complex tasks more easily."*

watch me!
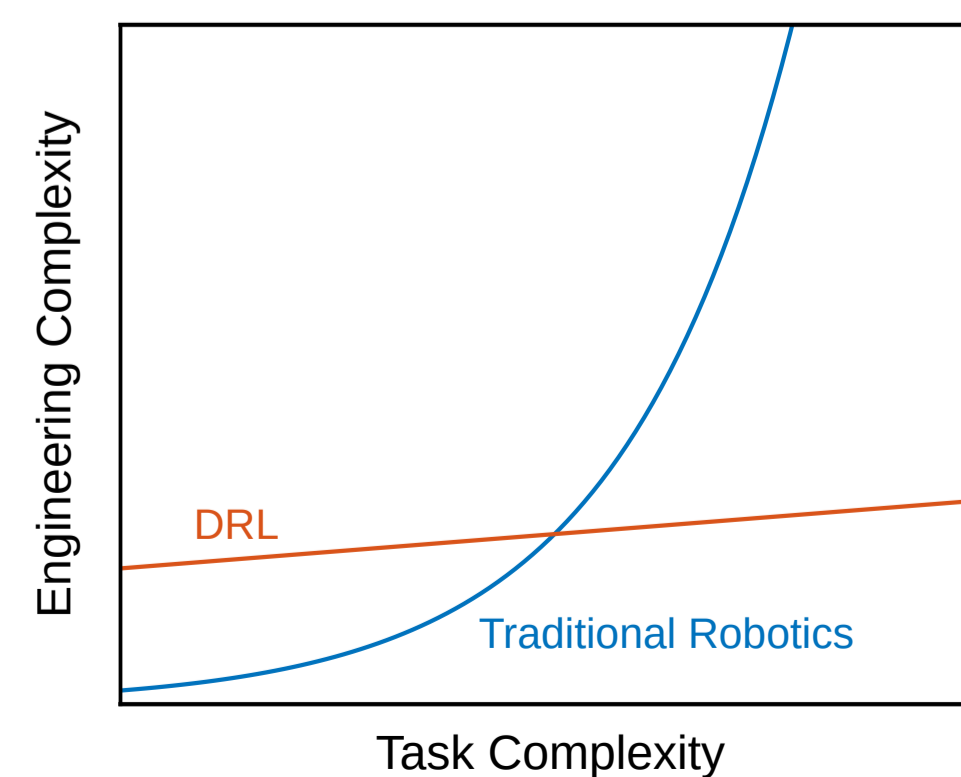
Specifications

- 16 actuated Degrees of Freedom

- Dynamixel XL330-M288 (0.52 Nm @ 5V, 60 deg in 97ms)

- Load capacity (to be determined, but at least 1-2kg)

- 2x size of a human hand: designed for *research* on dexterous manipulation; to be used with 2x scaled-up objects. High densities of touch sensors can be achieved at low cost, as coarse and cheap sensors can be used.

Current projects

Hand fully operational since Spring 2022.

We are starting new projects, in collaboration with Tilburg University students:

- In-hand cube reorientation, in simulation and then on the real hand via sim2real

- Smart, dexterous tele-operation with hand tracking

- Dexterous manipulation via imitation learning

Contacts

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https://www.tilburg-hand.eu (coming up July 2022)