Physically Interactive Intelligence — A path towards autonomous embodied agents

Host: Brian Scassellati

Friday March 1, 2021
4:00 p.m.
Speaker: Roberto Martin-Martin

Zoom Presentation

Abstract: What is the role of physical interaction in intelligent behavior? When robots perform tasks in uncontrolled environments like homes or offices, physical interaction is often reduced to a minimum because it is considered difficult to plan, control and execute, has unpredictable effects and may be dangerous for the robot and anything or anyone around it. To compensate, we impose on them extremely high requirements on computation: perception, planning and control. However, when observing humans, we see that our autonomy to act "intelligently", to perform tasks in a versatile and robust manner, comes from rich and continuous interactions with the environment that relax the dependency on accurate computation and help us achieve our tasks.

In my research, I study a new balance between interaction and computation in fully integrated robotic systems. My goal is to increase their autonomy. To this end, I propose to promote physical interaction to foundational component of novel robotic solutions. I will present new methods to learn to control and exploit physical interactions that enable new levels of autonomy in robotics, even for tasks where interactions are traditionally not exploited such as perception and navigation. These methods support my overall research hypothesis: autonomous behavior and grounded understanding in embodied AI agents are achieved through an intelligent use of physical interaction with the environment, i.e. through physically interactive intelligence. I will also discuss next steps in my research agenda to study the role of physical interaction in intelligent autonomous behavior and endow robots with new interactive capabilities to achieve tasks in homes and offices.

Bio: Roberto Martin-Martin works as Postdoctoral scholar at the Stanford Vision and Learning Lab with Professors Silvio Savarese and Fei-Fei Li. There, he works with three groups: the People, AI & Robots (PAIR) team, where they study visuo-motor learning skills for manipulation and planning, and the iGibson team, where they research how humans and robots achieve everyday long-horizon interactive tasks, and the JackRabbot team, where they focus on mobility and manipulation in environments with humans. In his research, he incorporate interactions with the environment as part of novel perception and learning methods, evaluating his algorithms in fully integrated robotic systems. His research has been awarded with the RSS Best Systems Paper award, and as winner entry of the Amazon Picking Challenge. He received his PhD and Masters degree from Technische Universität Berlin (TUB) working with Professor Oliver Brock on interactive perception, and his BSc. degree from Universidad Politécnica de Madrid.

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