

The role of higher-order models in robotics, and its reasoning challenges

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Abstract

The expectations for modern robotic systems are towards more "smart" control and "autonomous" decision making. Even the simplest step in that direction involves the integration of multiple expertises: world modelling, perception, control, mechatronics, etc. As mainstream demonstration practice shows painfully every day, the software "digital twins" of all these aspects can not be developed and deployed without any coupling. This talk advocates that the approach to be followed by the robotics community is not to keep on building systems that hide these coupling behind opaque interfaces and lots of hand-tuned magic numbers inside the code. But to start the effort to model all these aspects in a decoupled way, with explicit extra models to represent the possible couplings. This approach has many challenges, such as getting a community behind standardization of these models. The presentation will discuss only technological challenges, with concrete suggestions for solutions. The core role is played by property graphs and graph traversal, and the core challenge is to design the "right" host languages for higher-order modelling, and the "right" graph traversal query tools for reasoning.