Planning & Learning Context-Aware Interactions by a Service Robot in Social Environments

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Abstract
Humans are able to extract information from the context, represent them in a symbolic form, and continuously learn by observing the effects of their actions and hence adapt themselves to the environment while interacting with others. To emulate these human capabilities, inside the PNRR MUR FAIR project, we aim to design bio-inspired AI-driven systems to empower a service robot TIAGo that can manipulate objects, navigate, and interact with humans by focusing on (a) the acquisition of social skills [1]; (b) the symbolic representation of the acquired knowledge and (c) finally, based on that, how to take decisions and plan new context-aware interactions with humans. These tasks are time-consuming and very challenging, especially in a social environment populated by people who typically modify their behaviors based on the context and can dynamically impact the robot's decision-making process. A framework based on ROS, the standard de facto in robotics, has been developed for these purposes in order to facilitate the transfer into several robotic platforms [2]. This video[1] presents the results achieved regarding the abstract representation of the domain knowledge extracted from the data acquired during the robot's exploration and the inferred causal-effect relations between the executed actions. Two different knowledge representations have been explored: (a) a PDDL-based description based on the learned context-aware symbols that describe the environment states at a high level and appear very suitable for the next planning [2]; (b) a causal model generated on the fly by the collected time series for learning the relations between low-level variables [3]. In both experiments, results suggest the possibility of describing the robot's experience via context-based representations consistently learned by the system from a few data samples.

Acknowledgments

References

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