Workshop on New Perspectives for Intelligent Goal-Directed Behaviour in the Real-World Robotics Domain

Talk 2

Multisensory Memory Representation of Robot Actions
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The remarkably small number of publications that describe the combination of two or more robot actuators into a multipurpose service robot shows the complexity of such systems. One reason for this is that the development of complex tasks requires expertise in processing and control of all actuator and sensor modalities that are involved. The development of robots can be greatly simplified if basic robot operations (skills) will be reused and not developed from scratch each time they take part in complex behaviors. The implementation of a set of basic robot skills forms the basis for future investigations on more complex robot behavior.

In classical AI planning domains, the states of a system are represented by logical variables, and by a set of predicates. Actions are fully specified by a list of parameters, preconditions, and postconditions e.g. Strips (Fikes 1971) or PDDL (Ghallab 1998). Problems in the real world robotic domain have several properties that make it hard to formalize them in a way that is suitable for traditional AI planners. Major problems are partial observability of the world and uncertain effects of actions. However, it is widely accepted that intelligent behavior requires (among other components) a symbolic planning component. A set of basic skills that can be executed physically by a robot as well as being used as symbols in traditional AI planners are indispensable to bring AI and applied robotics closer together.

Both previous paragraphs point out that the construction of a memory base of skills that provide physical access to robots on the one hand and an interface to AI planners on the other hand is one big step on the way to embodied cognitive systems and the major goal of this PhD project. This presentation will show current progress of the implementation of a memory base for robot actions as well as predefined sequences of actions that form robot behavior (Weser 2008). The service robot TASER and a user interface to the intended memory base will be used together to demonstrate the feasibility of the proposed approach. Experiments with high-level robot tasks such as `<collect all rubbish cans>` will be used to show the systems applicability.

This presentation slot within the context of the workshop on *New Perspectives for Intelligent Goal-Directed Behavior in the Real-World Robotics Domain* aims to address the following questions:

- How can robot action sequences be stored and represented?
- What are common points in representing robot actions from a planning perspective and from physical execution perspective?
- How to balance complexity between symbolic and analogue layer (Weser 2007)? How to choose the level of abstraction to define atomic robot skills?

References

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