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Refereed Article

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Symbolic and qualitative reconstruction of control skill

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Abstract: *Controlling a complex dynamic system, such as a plane or a crane, usually requires a skilled operator. Such a control skill is typically hard to reconstruct through introspection. Therefore an attractive approach to the reconstruction of control skill involves machine learning from operators' control traces, also known as behavioural cloning. In the most common approach to behavioural cloning, a controller is induced as a direct mapping from system states to actions. Unfortunately, such controllers usually lack typical elements of human control strategies, such as subgoals or desired trajectory and do not replicate the robustness of the human control skill. In this paper we investigate a novel approach. We apply the GoldHorn program to induce from the control traces a set of symbolic constraints. Those constraints describe the operator's generalized trajectory and are then used together with locally weighted regression model to determine the next action. Using the crane problem in a case study, this approach showed significant improvements both in terms of control performance and transparency of induced clones. Moreover, generalizing the trajectory into qualitative strategy shows the potentials of such an approach.*

Publication and review history

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