

Rewarded Interactive Systems: a situated approach to human-computer interfaces

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Abstract

Man-machine interaction has been studied for several decades and especially text-based, speech-based and multimodal interaction. Managing the interaction in a natural and user-adapted way is crucial although the interpretation of inputs can be error-prone. This general problem has been mainly addressed by psychologists, ergonomists and people from cognitive science, sometimes by computer scientists and not much by engineers. It often results in a dedicated work which is not easily transferable to other domains, other systems, other users. Yet, because of the increasing complexity of systems and the growing intrusion of machines in our everyday life, some more systematic ways to design interaction management systems have to be found. Also, a user-adapted interaction strategy should evolve with time and change according to user preferences and usages which makes standard hand-coded solutions impracticable.

In this talk, we show how the interaction management problem can be cast into an optimal control problem in discrete time and to provide solutions to automatically generate adapted interaction strategies. First, because the human is in the control loop and human behavior is hard to model, a model-free method for searching optimal control strategy, namely reinforcement learning, will be introduced. Second, because it is often the case that some data is available from previous versions of an interface, we will study novel methods able to learn from observations of an acceptable but not adapted strategy from fixed sets of recorded interactions (batch and off-policy learning). Third, to handle large systems, we will explain generalization schemes able to deal with continuous multidimensional systems. Finally, because adaptation involves evolutions in the strategy along time, online learning methods will be investigated. Yet, because the human is in the loop, it is important that learning doesn't generate locally inconsistent behaviors. Thus, a special focus will be made on safe online learning methods.