Contribution ID: **97**   Type: **not specified**

Action Codes

Thursday, July 13, 2023 10:30 AM (20 minutes)

Frits Vaandrager and Thorsten Wißmann

Abstract: We provide a new perspective on the problem how high-level state machine models with abstract actions can be related to low-level models in which these actions are refined by sequences of concrete actions. We describe the connection between high-level and low-level actions using action codes, a variation of the prefix codes known from coding theory. For each action code R, we introduce a contraction operator α_R that turns a low-level model M into a high-level model, and a refinement operator ϱ_R that transforms a high-level model N into a low-level model. We establish a Galois connection $\varrho_R(N) \sqsubseteq M \Longleftrightarrow N \sqsubseteq \alpha_R(M)$, where $\sqsubseteq$ is the well-known simulation preorder. For conformance, we typically want to obtain an overapproximation of model M. To this end, we also introduce a concretization operator γ_R, which behaves like the refinement operator but adds arbitrary behavior at intermediate points, giving us a second Galois connection $\alpha_R(M) \sqsubseteq N \Longleftrightarrow M \sqsubseteq \gamma_R(N)$. Action codes may be used to construct adaptors that translate between concrete and abstract actions during learning and testing of Mealy machines. If Mealy machine M models a black-box system then $\alpha_R(M)$ describes the behavior that can be observed by a learner/tester that interacts with this system via an adaptor derived from code R. Whenever $\alpha_R(M)$ implements (or conforms to) N, we may conclude that M implements (or conforms to) $\gamma_R(N)$.

Presenter: WISSMANN, Thorsten

Session Classification: Track B