Synthesis of Reactive Systems

Bernd Finkbeiner
Universität des Saarlandes, Saarbrücken, Germany

More than fifty years after its introduction by Alonzo Church, the synthesis problem is still one of the most intriguing challenges in the theory of reactive systems. On the one hand, synthesis algorithms have found applications in many areas of systems engineering, from the construction and optimization of circuits and device drivers to the synthesis of controllers for robots and manufacturing plants. On the other hand, the logical and algorithmic foundations of the synthesis problem are still far from complete.

In this series of lectures, I will trace the developments triggered by Church’s classic problem [1] from the early solutions in the 1960s [2, 3] to the practical tools [4, 5, 6] that have come out in the past few years. The lectures will give an overview on the automata- and game-theoretic foundations (cf. [7]), explore the spectrum of logics for the synthesis of reactive systems, from reduced logics with simpler synthesis problems like GR(1) [8] to advanced logics such as strategy [9] and coordination logic [10], and discuss the ideas behind efficient synthesis approaches like bounded synthesis [11].

References