Robotics is a topic with challenging applications specifically focused on autonomy of robots and their interactions. In this thesis, game theoretic and reinforcement learning approaches are utilised to contribute to strategic planning in robot soccer which serves as a motivating example.

First, a hardware independent game theoretic model of multi-player robot soccer is developed. The challenge of determining an optimal strategy for as many robots as possible is met by exact model reduction, i. e. by finding equivalent smaller models. For this, a theoretical framework of symmetries is developed which is based on homomorphisms between two-player zero-sum Markov games. It is proven that this kind of model reduction can be performed stepwise and that a qualitatively new symmetry is part of the framework.

The theoretical results are algorithmically exploited for dynamic programming (DP) and reinforcement learning (RL) methods. The more efficient DP methods are advanced by ideas of almost invariant sets. Furthermore, the following procedure for solving real world problems is recommended: firstly, to solve a rough model by DP methods and, secondly, to use that DP solution as initialisation for an RL method. All algorithms are studied numerically and the optimal strategies are interpreted in terms of soccer. Finally, some challenging tasks to implement these strategies on real robots are identified.