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Sommario/riassunto	Es werden vier neue Lösungsansätze für Probleme aus dem Bereich Evolutionäre Robotik bzw. Agenten-Simulation wissenschaftlich untersucht. Von besonderem Interesse ist eine neuartige Methode zur Imitierung der natürlichen Evolution in ihrer Fähigkeit, die eigenen Mutations- und Rekombinationsoperationen während der Evolution von Robotern anzupassen. Today, autonomous robots are used in a rather limited range of applications such as exploration of inaccessible locations, cleaning floors, mowing lawns etc. However, ongoing hardware improvements (and human fantasy) steadily reveal new robotic applications of significantly higher sophistication. For such applications, the crucial bottleneck in the engineering process tends to shift from physical boundaries to controller generation. As an attempt to automatize this process, Evolutionary Robotics has successfully been used to generate

robotic controllers of various types. However, a major challenge of the field remains the evolution of truly complex behavior. Furthermore, automatically created controllers often lack analyzability which makes them useless for safety-critical applications. In this book, a simple controller model based on Finite State Machines is proposed which allows a straightforward analysis of evolved behaviors. To increase the model's evolvability, a procedure is introduced which, by adapting the genotype-phenotype mapping at runtime, efficiently traverses both the behavioral search space as well as (recursively) the search space of genotype-phenotype mappings. Furthermore, a data-driven mathematical framework is proposed which can be used to calculate the expected success of evolution in complex environments.