Foreword by Simon M. Lucas

Since the seminal work of the founding fathers of computer science and information theory, people such as Alan Turing and Claude Shannon, there has been a rich history of research applied to games, and without doubt this has contributed greatly to the development of artificial intelligence as a discipline. The focus of this book is on Mind Games, games of skill such as Chess, Go, and Bridge which predate computers. There have been two approaches to designing agents capable of a high standard of play in such games: hand programming, and machine learning. Both methods have had their high-profile successes, with Deep Blue (Chess) being an exemplar of expert hand-tuning, and TD-Gammon (Backgammon), Logistello (Othello) and Blondie (Checkers) being exponents of the machine-learning approaches (though each of these differed in the nature of the learning). As the book argues, there is much more to this field than simply designing agents that are capable of a high standard of play. The way in which it is achieved is of great importance. Hand programmed agents tend to be specific to a particular game. Learning agents on the other hand offer the potential of a more general ability, and the ability to learn is central to most meaningful definitions of intelligence. Games offer an excellent application domain and a demanding test-bed for AI and CI techniques.

This book offers a unique perspective on the subject, embracing both conventional AI approaches to game-playing as well as the open-ended challenges that games pose for computational intelligence. It gives a detailed account of the main events in the development of the field, and includes the most important algorithms in game-tree search, temporal difference learning, and in evolutionary game learning, and describes in detail how these have been applied to a range of different mind games. The focus on mind games enables a deep coverage of the most important research in this area.

The book is organised into four parts. The first part covers the foundations including the main game-tree search algorithms and then discusses the state of the art in the most important mind games. Part two describes the main computational intelligence methods that have been applied to learn

game strategy, and describes selected TD and neuro-evolutionary approaches to specific games including Backgammon, checkers, and Othello. Part three then goes into greater detail on how to get the best out of these methods, including the choice of function approximation architecture, the selection of game-features, and tuning the algorithms for best performance. It also discusses the main approaches to move ordering, and to opponent modelling. Part four describes some of the grand challenges in game playing, organised into chapters on intuition, creativity and knowledge discovery, and general game playing.

This is a well balanced book that celebrates the great achievements of the field while pointing out that many basic questions have yet to be answered. At all times the author shows an impressive knowledge of the subject and an ability to communicate this clearly. The book makes fascinating reading and should be of great interest to researchers involved in all kinds of computational intelligence and AI, and will help attract more people to study games. For PhD students starting out in the area it should be regarded as essential, and would also be useful as recommended reading for taught courses in computational intelligence and games.

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