

Preface

The present book discusses sequential decision-making under uncertainty and reinforcement learning, two classes of problems in artificial intelligence which can be formalized in the framework of Markov decision processes. It has been written for students, engineers and researchers likely to be interested in these fields and models.

The book is organized as follows:

- Part 1 provides an introduction to this domain and to efficient resolution techniques (Markov decision processes, reinforcement learning, approximate representations, factored representations, policy gradients and online resolution).

- Part 2 presents important extensions of Markov decision processes that make it possible to solve more complex sequential decision-making problems (partially observable Markov decision processes, Markov games, multi-agent approaches and non-classical criteria).

- Part 3 completes the book with example applications showing how Markov decision processes can be employed for various problems (micro-object manipulation, biodiversity preservation, high-level control of a helicopter, control of an exploration mission and operations planning).

It was not possible for this book to cover all research directions in this very active field. We give here some references to point the reader to some uncovered aspects. For example, we have decided not to cover continuous time reinforcement learning [MUN 01], relational reinforcement learning [DZE 01], hierarchical reinforcement learning [BAR 03], learning classifier systems [SIG 07] or predictive state representations [LIT 02].

In addition, we endeavor in each chapter to provide the reader with references to related work.

Additional information related to this book (e.g. *errata*) can be found at the following website: <http://www.loria.fr/projets/PDMIA/Book/>.

Bibliography

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