Preface

This book presents an overview of formal decision making methods for decentralized cooperative systems. It is aimed at graduate students and researchers in the fields of artificial intelligence and related fields that deal with decision making, such as operations research and control theory. While we have tried to make the book relatively self-contained, we do assume some amount of background knowledge.

In particular, we assume that the reader is familiar with the concept of an *agent* as well as search techniques (like depth-first search, A*, etc.), both of which are standard in the field of artificial intelligence [Russell and Norvig, 2009]. Additionally, we assume that the reader has a basic background in probability theory. Although we give a very concise background in relevant single-agent models (i.e., the 'MDP' and 'POMDP' frameworks), a more thorough understanding of those frameworks would benefit the reader. A good first introduction to these concepts can be found in the textbook by Russell and Norvig, with additional details in texts by Sutton and Barto [1998], Kaelbling et al. [1998], Spaan [2012] and Kochenderfer et al. [2015]. We also assume that the reader has a basic background in game theory and game-theoretic notations like Nash equilibrium and Pareto efficiency. Even though these concepts are not central to our exposition, we do place the Dec-POMDP model in the more general context they offer. For an explanation of these concepts, the reader could refer to any introduction on game theory, such as those by Binmore [1992], Osborne and Rubinstein [1994] and Leyton-Brown and Shoham [2008].

This book heavily builds upon earlier texts by the authors. In particular, many parts were based on the authors' previous theses, book chapters and survey articles [Oliehoek, 2010, 2012, Amato, 2010, 2015, Amato et al., 2013]. This also means that, even though we have tried to give a relatively complete overview of the work in the field, the text in some cases is biased towards examples and methods that have been considered by the authors. For the description of further topics in Chapter 8, we have selected those that we consider important and promising for future work. Clearly, there is a necessarily large overlap between these topics and the authors' recent work in the field.

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