Preface

Over the years, both ESA and NASA missions have been gradually adding autonomy to flight and ground systems to increase the amount of science data returned from missions, perform new science, and reduce mission costs. In new space exploration initiatives, there is emphasis on both human and robotic exploration. Even when humans are involved in the exploration, human tending of space assets must be evaluated carefully during mission definition and design in terms of benefit, cost, risk, and feasibility. Risk and feasibility are major factors motivating the use of unmanned craft and the use of automation and robotic technologies where possible.

The development of unmanned space exploration missions is closely related to integration and promotion of autonomy in robotic spacecraft. Both ESA and NASA are currently adapting autonomic computing as a valuable paradigm for development of autonomous spacecraft systems where, to tackle autonomy, traditional development approaches are applied. Experience has shown though, that traditional software development is inappropriate to such tasks, because it pays scant attention to autonomy itself, and therefore, new autonomy-aware software development approaches should be employed.

Nowadays, requirements engineering for autonomous systems appears to be a wide open research area with no definitive solution yet. Elicitation and expression of autonomy requirements is one of the most significant challenges autonomous spacecraft engineers need to overcome today. This book presents the Autonomy Requirements Engineering (ARE) approach, intended to help software engineers properly elicit, express, verify, and validate autonomy requirements. ARE is the result of a joint project of Lero—The Irish Software Engineering Research Centre and ESA's ESTEC—the European Space Research and Technology Centre.

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