

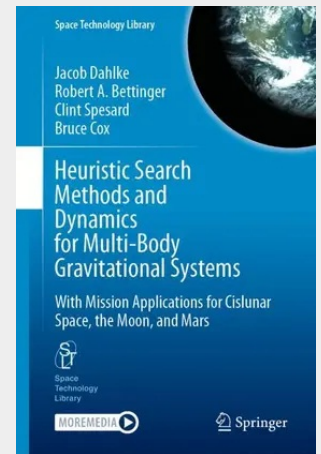
Heuristic Search Methods and Dynamics for Multi-Body Gravitational Systems

With Mission Applications for Cislunar Space, the Moon, and Mars

This book provides a comprehensive introduction to, and application of, heuristic search methods, specifically the genetic algorithm, for use with mission sets operating in multi-body gravitational systems. Detailed dynamical and mission models, as well as accompanying space-focused scenarios will allow the reader to implement different forms of the genetic algorithm to find Pareto optimal architectures within a multi-objective optimization problem. This book covers the Non-Dominated Sorting Genetic Algorithm II (NSGA-II) and delivers the first treatment of a scalable genetic algorithm employing a categorical chromosome form in book format. Although the book focuses on the space situational awareness (SSA) mission with space-based and lunar surface architectures, the heuristic techniques contained herein can be applied to other mission sets, such as positioning, navigation, and timing (PNT), communications, and space logistics.

This book gives the reader a singular reference for space domain architecture analysis and optimal search as the focus of mission development and planning continues to expand into cislunar space, low lunar orbit, and the lunar surface. It is meant for the beginning researcher and expert astronautical engineer alike, with detailed mathematical algorithms and application scenarios allowing for a wide range of skill-sets and acclimation to heuristic search methods to use genetic algorithms in order to solve complex multi-objective optimization problems. The book provides a go-to source for students, teachers, engineers, and mission planners for investigating space system architecture design for space-based and lunar surface applications in the Earth-Moon and Mars-Phobos-Deimos systems, and anywhere else in the Solar System required for a given mission.

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