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This book discusses all
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spacecraft (including
attitude measurements,
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attitude determination and estimation, and spacecraft attitude controls. Unlike other books addressing these topics, this book focuses on quaternion-based methods because of its many merits. The book lays a brief, but necessary background on rotation sequence representations and frequently used

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scheduling control.

Applications of these methods to spacecraft attitude control

problems are provided.

Appendices are provided for readers who are not familiar with these topics.

Roger D. Werking

Head, Attitude

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Determination and

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National Aeronautics

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Center Extensive work

has been done for many

years in the areas of

attitude determination,

attitude prediction, and

attitude control. During

this time, it has been

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reference material that provided a comprehensive overview of attitude support activities. This lack of reference material has made it difficult for those not intimately involved in attitude functions to become acquainted with the ideas and activities which are essential to understanding the

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serve as a reference for
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information source for experimenters or others involved in spacecraft-related work who need information on spacecraft orientation and how it is determined, but who have neither the time nor the resources to pursue the varied literature on this subject; and a tool for encouraging those who

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could expand this discipline to do so, because much remains to be done to satisfy future needs.

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treatises, especially in
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examples will be
provided through an
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This book discusses all
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disturbance torques), modeling, spacecraft attitude determination and estimation, and spacecraft attitude controls. Unlike other books addressing these topics, this book focuses on quaternion-based methods because of its many merits. The book lays a brief, but necessary background on rotation sequence

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algorithms, and the instruments and methods of popular vector measurements.

With available attitude measurements, attitude control designs for inertial point and nadir pointing are presented in terms of required torques which are independent of actuators in use. Given the required control torques,

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Some actuators are not able to generate the accurate control torques, therefore, spacecraft attitude control design methods with achievable torques for these actuators (for example, magnetic torque bars and control moment gyros) are provided. Some rigorous controllability results are provided. The book

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also includes attitude control in some special maneuvers, such as orbital-raising, docking and rendezvous, that are normally not discussed in similar books. Almost all design methods are based on state-spaced modern control approaches, such as linear quadratic optimal control, robust pole assignment control,

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problems are provided.

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