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Advances in Industrial Control

Engineering : Control

Orsag, M., Korpela, C., Oh, P., Bogdan, S., University of Zagreb, Zagreb, Croatia

Aerial Manipulation

- Careful selection of rigid-body dynamics and kinematics elements and essential principles of aerodynamics, provides well-balanced background for effective, efficient design of unmanned aerial manipulation systems
- Systematic presentation of control techniques and structures forms a blueprint for immediate implementation in real-world aerial robotic systems
- Easy-to-follow exercises and examples accustom students and researchers to practical aspects of modeling and control

This text is a thorough treatment of the rapidly growing area of aerial manipulation. It details all the design steps required for the modeling and control of unmanned aerial vehicles (UAV) equipped with robotic manipulators. Starting with the physical basics of rigid-body kinematics, the book gives an in-depth presentation of local and global coordinates, together with the representation of orientation and motion in fixed- and moving-coordinate systems. Coverage of the kinematics and dynamics of unmanned aerial vehicles is developed in a succession of popular UAV configurations for multirotor systems. Such an arrangement, supported by frequent examples and end-of-chapter exercises, leads the reader from simple to more complex UAV configurations. Propulsion-system aerodynamics, essential in UAV design, is analyzed through blade-element and momentum theories, analysis which is followed by a description of drag and ground-aerodynamic effects. The central part of the book is dedicated to aerial-manipulator kinematics, dynamics, and control. Based on foundations laid in the opening chapters, this portion of the book is a structured presentation of Newton–Euler dynamic modeling that results in forward and backward equations in both fixed- and moving-coordinate systems. The Lagrange–Euler approach is applied to expand the model further, providing formalisms to model the variable moment of inertia later used to analyze the dynamics of aerial manipulators in contact with the environment.

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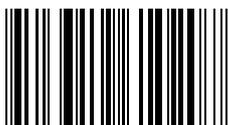
Tiergartenstrasse 15-17

69121 Heidelberg

Germany

T: +49 (0)6221 345-4301

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