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Bullo, Francesco (1-UCSB-MC); **Lewis, Andrew D.** (3-QEN)

★**Geometric control of mechanical systems.**

Modeling, analysis, and design for simple mechanical control systems.
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The book deals with the geometric theory of mathematical modeling, analysis, and control of ‘simple’ mechanical systems; that is, mechanical systems whose energy is the sum of kinetic and potential energy. The unified framework adopted in this book is that of second-order control systems on Riemannian manifolds, where the Riemannian metric is determined by the kinetic energy, and ‘second-order’ is formulated in terms of the covariant derivative corresponding to the Riemannian metric (possibly modified by the presence of kinematic constraints). The book provides in great detail an introduction to multilinear algebra, differential geometry (in particular distributions and affine connections), geometric modeling of mechanical systems and Lie groups. Based on this it treats extensively stability, controllability, kinematic reduction and perturbation analysis of mechanical control systems. Finally, it covers the control approaches of potential shaping, stabilization, tracking and motion planning. The text is written with great care and lucidity, includes many exercises, and has clearly benefited from being used in various undergraduate and graduate courses. The book will certainly become a main reference in this area, if not the ‘bible’ about this specific approach.

Reviewed by *A. J. van der Schaft*