Model-Based Control of a Robot Manipulator presents the first integrated treatment of many of the most important recent developments in using detailed dynamic models of robots to improve their control. The authors work on automatic identification of kinematic and dynamic parameters, feedforward position control, stability in force control, and trajectory learning has significant implications for improving performance in future robot systems. All of the main ideas discussed in this book have been validated by experiments on a direct-drive robot arm.The book addresses the issues of building accurate robot models and of applying them for high performance control. It first describes how three sets of models - the kinematic model of the links and the inertial models of the links and of rigid-body loads - can be obtained automatically using experimental data. These models are then incorporated into position control, single trajectory learning, and force control. The MIT Serial Link Direct Drive Arm, on which these models were developed and applied to control, is one of the few manipulators currently suitable for testing such concepts.Contents: Introduction. Direct Drive Arms. Kinematic Calibration. Estimation of Load Inertial Parameters. Estimation of Link Inertial Parameters. Feedforward and Computed Torque Control. Model-Based Robot Learning. Dynamic Stability Issues in Force Control. Kinematic Stability Issues in Force Control. Conclusion.Chae An is Research Staff Member, IBM T.J. Watson Research Center, Christopher Atkeson is an Assistant Professor and John Hollerbach is an Associate Professor in the MIT Department of Brain and Cognitive Sciences and the MIT Artificial Intelligence Laboratory. Model-Based Control of a Robot Manipulator is included in the Artificial Intelligence Series edited by Patrick Winston and Michael Brady.

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