

Fritz Colonius

Optimal Periodic Control

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Optimal Periodic Control

Fritz Colonius



Optimal Periodic Control:

Optimal Periodic Control Fritz Colonius, 2006-11-15 This research monograph deals with optimal periodic control problems for systems governed by ordinary and functional differential equations of retarded type Particular attention is given to the problem of local properness i e whether system performance can be improved by introducing periodic motions Using either Ekeland s Variational Principle or optimization theory in Banach spaces necessary optimality conditions are proved In particular complete proofs of second order conditions are included and the result is used for various versions of the optimal periodic control problem Furthermore a scenario for local properness related to Hopf bifurcation is drawn up giving hints as to where to look for optimal periodic solutions The book provides mathematically rigorous proofs for results which are potentially of importance in chemical engineering and aerospace engineering **Optimal Periodic Control** ,1988

Annotation This research monograph deals with optimal periodic control problems for systems governed by ordinary and functional differential equations of retarded type Particular attention is given to the problem of local properness i e whether system performance can be improved by introducing periodic motions Using either Ekeland s Variational Principle or optimization theory in Banach spaces necessary optimality conditions are proved In particular complete proofs of second order conditions are included and the result is used for various versions of the optimal periodic control problem Furthermore a scenario for local properness related to Hopf bifurcation is drawn up giving hints as to where to look for optimal periodic solutions The book provides mathematically rigorous proofs for results which are potentially of importance in chemical engineering and aerospace engineering Optimal Periodic Control by Fritz Colonius Fritz Colonius,1988 Theory and Applications of Multivariable Optimal Periodic Control Dinko Sinčić,1976 **Optimal Periodic Control Models and Their Economical Applications** Mu Han,1992 **Optimal periodic control and regulator theory based on the second variation** Qinghong Wang,1989 **Optimal Periodic Control of Distributed Systems** Harjit Punj,1972 **Optimal Periodic Output Feedback Control** Gregory L. Hyslop,1989 **Optimal Periodic Control Theory** Richard T. Evans,1980

Existing conditions for locally optimizing a periodic process with free period are corrected extended and clarified using the strong properties of the Hamiltonian structure of the Optimal Periodic Control OPC Problem and the relationships of the second variation that result from the problem s periodicity constraints A neighboring optimum feedback controller is determined which regulates all perturbations back to the locally minimizing periodic trajectory This periodic regulator extends many of the concepts of the time invariant regulator An illustrative problem is constructed to demonstrate the basic characteristics of this class of problem A relatively comprehensive numerical investigation is conducted identifying a multiplicity of extremal solutions which are shown to form one parameter families of solutions to the OPC Bifurcation points which define the critical periodic solutions common to intersecting families are computed Extremal solutions satisfying all first order conditions are tested for local sufficiency conditions by verifying the existence of the Ricatti variable over one full

period The neighboring optimal feedback control law for a locally minimizing solution is tested by demonstrating the limit cycle behavior that results from perturbations to the initial conditions in a closed loop application An asymptotic series expansion is derived for the illustrative problem using a perturbation technique An extremal solution in the form of a Fourier series is obtained that accurately predicts the optimal period the locally minimizing periodic solution and the associated values of the Hamiltonian and the cost of the principal family Abstract report documentation page **Optimal periodic control theory** Richard Taylor Evans, FRANK J SEILER RESEARCH LAB UNITED STATES AIR FORCE ACADEMY CO., United States Air Force Academy, Frank J. Seiler Research Laboratory. Directorate of Aerospace-Mechanics Sciences. Guidance and Control Division, United States. Air Force. Systems Command, 1980 Existing conditions for locally optimizing a periodic process with free period are corrected extended and clarified using the strong properties of the Hamiltonian structure of the Optimal Periodic Control OPC Problem and the relationships of the second variation that result from the problem's periodicity constraints A neighboring optimum feedback controller is determined which regulates all perturbations back to the locally minimizing periodic trajectory This periodic regulator extends many of the concepts of the time invariant regulator An illustrative problem is constructed to demonstrate the basic characteristics of this class of problem A relatively comprehensive numerical investigation is conducted identifying a multiplicity of extremal solutions which are shown to form one parameter families of solutions to the OPC Bifurcation points which define the critical periodic solutions common to intersecting families are computed Extremal solutions satisfying all first order conditions are tested for local sufficiency conditions by verifying the existence of the Riccati variable over one full period The neighboring optimal feedback control law for a locally minimizing solution is tested by demonstrating the limit cycle behavior that results from perturbations to the initial conditions in a closed loop application An asymptotic series expansion is derived for the illustrative problem using a perturbation technique An extremal solution in the form of a Fourier series is obtained that accurately predicts the optimal period the locally minimizing periodic solution and the associated values of the Hamiltonian and the cost of the principal family Abstract report documentation p **A Note on Optimal Periodic Control and Nested Optimization Problems** Fritz Colonius, Lefschetz Center for Dynamical Systems, Brown University. Division of Applied Mathematics, 1984

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Extensions of Optimal Periodic Control and Regulation for Constrained Hypersonic Cruise Larry David Dewell,1996 *SIAM Journal on Control and Optimization* Society for Industrial and Applied Mathematics,2005

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