

Chapter 2

Calculus of Variations and Optimal Control

Solution to Problem 2.1

The performance index is

$$\begin{aligned} J &= \int_0^2 [2x^2(t) + \dot{x}^2(t)] dt, \\ &= \int_{t_0}^{t_f} V(x(t), \dot{x}(t)) dt \end{aligned}$$

where

$$V = 2x^2(t) + \dot{x}^2(t), \quad t_0 = 0, \quad t_f = 2.$$

Using the Euler-Lagrange equation (2.3.15)

$$\begin{aligned} \left(\frac{\partial V}{\partial x} \right)_* - \frac{d}{dt} \left(\frac{\partial V}{\partial \dot{x}} \right)_* &= 0 \longrightarrow \\ 4x^*(t) - \frac{d}{dt} (2\dot{x}^*(t)) &= 0 \longrightarrow \\ \ddot{x}^*(t) - 2x^*(t) &= 0. \end{aligned}$$

Solving the previous equation

$$x^*(t) = C_1 e^{\sqrt{2}t} + C_2 e^{-\sqrt{2}t}$$

Optimal Control Of Spatial Systems Problem Solvers No 14

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Kumar Ojha**

Optimal Control Of Spatial Systems Problem Solvers No 14:

Soft Computing for Problem Solving Jagdish Chand Bansal, Kedar Nath Das, Atulya Nagar, Kusum Deep, Akshay Kumar Ojha, 2018-10-30 This two volume book presents outcomes of the 7th International Conference on Soft Computing for Problem Solving SocProS 2017 This conference is a joint technical collaboration between the Soft Computing Research Society Liverpool Hope University UK the Indian Institute of Technology Roorkee the South Asian University New Delhi and the National Institute of Technology Silchar and brings together researchers engineers and practitioners to discuss thought provoking developments and challenges in order to select potential future directions The book presents the latest advances and innovations in the interdisciplinary areas of soft computing including original research papers in the areas including but not limited to algorithms artificial immune systems artificial neural networks genetic algorithms genetic programming and particle swarm optimization and applications control systems data mining and clustering finance weather forecasting game theory business and forecasting applications It is a valuable resource for both young and experienced researchers dealing with complex and intricate real world problems for which finding a solution by traditional methods is a difficult task

Limiting Modes of Aircraft Flight Alexander Nikolaevich Akimov, Vadim Vadimovich Vorobyov, Dmitry Alexandrovich Zatuchny, 2022-10-31 This book describes in detail a method of direct optimization which makes it possible to choose the best trajectory of an aircraft in conditions of its limited resource This can happen in the event of an emergency on board associated with both a possible equipment failure and external influences for example when lightning strikes an aircraft or collides with a moving object The highlight of this book is the fact that the results presented in it can be applied universally to the choice of the flight path of large and small aircraft as well as helicopter technology In addition they take into account various conditions of aircraft flight including a possible accident The methods and algorithms presented here can be used as the basis for the creation of automatic collision avoidance systems as well as the choice of the best aircraft trajectory for flights in different regions and in different conditions

Scientific and Technical Aerospace Reports, 1994 **Control of Distributed Parameter Systems 1982** Jean-Pierre Babary, Laurent Le Letty, 2014-05-16 Control of Distributed Parameter Systems 1982 covers the proceeding of the Third International Federation of Automatic Control IFAC Symposium on Control of Distributed Parameter Systems The book reviews papers that tackle issues concerning the control of distributed parameter systems such as modeling identification estimation stabilization optimization and energy system The topics that the book tackles include notes on optimal and estimation result of nonlinear systems approximation of the parameter identification problem in distributed parameters systems and optimal control of a punctually located heat source This text also encompasses the stabilization of nonlinear parabolic equations and the decoupling approach to the control of large spaceborne antenna systems Stability of Hilbert space contraction semigroups and the tracking problem in the fractional representation approach are also discussed This book will be of great interest to researchers and professionals

whose work concerns automated control systems Applied Mechanics Reviews ,1973 *U.S. Government Research & Development Reports* ,1968 **Optimal Observation for Cyber-physical Systems** Zhen Song,YangQuan Chen,Chellury R. Sastry,Nazif C. Tas,2009-06-30 Optimal Observation for Cyber physical Systems addresses the challenge fundamental to the design of wireless sensor networks WSNs presented by the obligatory trade off between precise estimates and system constraints A unified theoretical framework based on the well established theory of optimal experimental design and providing consistent solutions to problems hitherto requiring a variety of approaches is put forward to solve a large class of optimal observation problems The Fisher information matrix plays a key role in this framework and makes it feasible to provide analytical solutions to some complex and important questions which could not be answered in the past Readers with an applied background in WSN implementation will find all the understanding of the key theory of optimal experimental design they need within this book The use of multiple examples to illustrate the theoretical parts of the book brings the subject into sharper focus than would an abstract theoretical disquisition *Nuclear Science Abstracts* ,1971-10

Nonlinear Analysis and Optimization Boris S. Mordukhovich,Simeon Reich, Alexander J. Zaslavski,2016-02-26 This volume contains the proceedings of the IMU AMS Special Session on Nonlinear Analysis and Optimization held from June 16 19 2014 at the Second Joint International Meeting of the Israel Mathematical Union IMU and the American Mathematical Society AMS Bar Ilan and Tel Aviv Universities Israel and the Workshop on Nonlinear Analysis and Optimization held on June 12 2014 at the Technion Israel Institute of Technology The papers in this volume cover many different topics in Nonlinear Analysis and Optimization including Taylor domination property for analytic functions in the complex disk mappings with upper integral bounds for p moduli multiple Fourier transforms and trigonometric series in line with Hardy s variation finite parameter feedback control for stabilizing damped nonlinear wave equations implicit Euler approximation and optimization of one sided Lipschitz differential inclusions Bolza variational problems with extended valued integrands on large intervals first order singular variational problem with nonconvex cost gradient and extragradient methods for the elasticity imaging inverse problem discrete approximations of the entropy functional for probability measures on the plane optimal irrigation scheduling for wheat production existence of a fixed point of nonexpansive mappings in uniformly convex Banach spaces strong convergence properties of m accretive bounded operators the Reich Simons convex analytic inequality nonlinear input output equilibrium differential linear quadratic Nash games with mixed state control constraints and excessive revenue models of competitive markets Government Reports Announcements & Index ,1991 **Current Catalog** National Library of Medicine (U.S.),1970 First multi year cumulation covers six years 1965 70 **Government Reports Announcements** ,1972-07-25 *National Conference on Environmental Problem-Solving with Geographic Information Systems* ,1995 *Government Reports Annual Index* ,1991 **Management** ,1978 **Technical Abstract Bulletin** Defense Documentation Center (U.S.),1963-05 Automation and Robotics in Construction XI Alan Chamberlain,2012-12-02

Sourced from international experts this book presents papers dealing with a wide range of soft and hard research issues at various stages of development in the field Some cover entirely new ground whilst others reflect progress on the sometimes frustrating path to truly robust technology Of particular interest are contributions discussing issues of exploitation and commercialisation the integration of end products within the design and construction processes incorporating information technology IT and the impact of the emerging technology on the culture and organisation of the construction industry A mark of growing maturity is apparent in the coverage of health and safety and related social issues This is complemented by a clear commitment to the consideration of human factors and the environment It is hoped that by promoting a wider debate on the matters of future technology and its horizons on the identification of what industry needs from the research and development community and on building effective partnerships between academia industry and government the publication not only addresses the practical commercial obligation to seek robust solutions for today's problems but will stimulate research for the years to come

Artificial Intelligence: Methodology, Systems, and Applications Daniel Dochev, Paolo Traverso, Marco Pistore, 2008-08-25 This book constitutes the refereed proceedings of the 13th International Conference on Artificial Intelligence Methodology Systems and Applications AIMSAS 2008 held in Varna Bulgaria in September 2008 The 30 revised full papers presented together with the 10 posters were carefully reviewed and selected from 109 submissions The papers are organized in topical sections on agents natural language processing and text analysis machine learning and information retrieval knowledge representation and reasoning constraints heuristics and search applications posters

Mathematical Reviews, 2003 2023 Asia-Pacific International Symposium on Aerospace Technology (APISAT 2023) Proceedings Song Fu, 2024-07-04 This book is a compilation of peer reviewed papers from the 2023 Asia Pacific International Symposium on Aerospace Technology APISAT2023 The symposium is a common endeavour among the four national aerospace societies in China Australia Korea and Japan namely Chinese Society of Aeronautics and Astronautics CSAA Royal Aeronautical Society Australian Division RAeS Australian Division Japan Society for Aeronautical and Space Sciences JSASS and Korean Society for Aeronautical and Space Sciences KSAS APISAT is an annual event initiated in 2009 It aims to provide the opportunity to Asia Pacific nations for the researchers of universities and academic institutes and for the industry engineers to discuss the current and future advanced topics in aeronautical and space engineering This is the volume II of the proceedings

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