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on Control Applications of
Optimization
(CAO 2018)**

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MoR1B Hotel Hall B
Robot Control and Stabilization I (Regular Session)

Chair: Andreev, Aleksandr Ulyanovsk State Univ
 Co-Chair: Popova, Svetlana Udmurt State Univ
 Nikolaevna

15:00-15:20 MoR1B.1

On Global Trajectory Tracking Control of Robot Manipulators with Flexible Joints, pp. 28-33

Andreev, Aleksandr Ulyanovsk State Univ
 Peregudova, Olga Ulyanovsk State Univ
 Sobolev, Aleksei Ulyanovsk State Univ

In this paper a novel approach to the global trajectory tracking control problem for manipulators with flexible joints is presented. The dynamic model of such mechanical systems has a cascade structure that allows to decouple the links dynamics from the actuators ones. We propose a design procedure for nonlinear controller with computed feedforward of robot manipulators with revolute joints in a cylindrical phase space. Stability proof of the closed-loop system is given by constructing a Lyapunov function which is periodic on angular coordinates. We illustrate the implementation of the controller using simulation example.

15:20-15:40 MoR1B.2

Robust Disturbance Rejection by the Attractive Ellipsoid Method Part I: Continuous-Time Systems, pp. 34-39

García González, Pablo CINVESTAV-IPN, México
 Josué
 Ampountolas, Konstantinos Univ. of Glasgow

This paper develops sufficient conditions for the constrained robust stabilization of continuous-time polytopic linear systems with unknown but bounded perturbations. The attractive ellipsoid method (AEM) is employed to determine a robustly controllable invariant set, known as attractive ellipsoid, such that the state trajectories of the system asymptotically converge to a small neighborhood of the origin despite the presence of non-vanishing perturbations. To solve the stabilization problem, we employ the Finsler's lemma and derive new linear matrix inequality (LMI) conditions for robust state-feedback control design, ensuring convergence of state trajectories of the system to a minimal size ellipsoidal set. We also consider the state and control constrained problem and derive extended LMI conditions. Under certain conditions, the obtained LMIs guarantee that the attractive ellipsoid is nested inside the bigger ellipsoids imposed by the control and state constraints. Finally, we extend our AEM approach to the gain-scheduled state-feedback control problem, where the scheduling parameters governing the time-variant system are unknown in advance but can be measured in real-time. Two examples demonstrate the feasibility of the proposed AEM and its improvements over previous works.

15:40-16:00 MoR1B.3

Assignability of Certain Lyapunov Invariants for Linear Discrete-Time Systems, pp. 40-45

Popova, Svetlana Nikolaevna Udmurt State Univ

We prove that the property of uniform complete controllability is sufficient for the simultaneous proportional local assignability of the Lyapunov spectrum and the Lyapunov irregularity coefficient for linear control systems with discrete time.

16:00-16:20 MoR1B.4

Control of Plane Motions of a Helicopter with Cargo on the Basis of the Double Pendulum Model, pp. 46-50

Bezglasnyi, Sergey P. Samara State Aerospace Univ

The problem of constructing asymptotically stable program

motions of the double pendulum with variable length and movable pivot is solved. This program motions are given arbitrarily. The solution is obtained by synthesis of the active program control applied to the system of bodies. Also, it's obtained by the synthesis of the stabilizing control based on the feedback principle. The control is constructed in the form of an exact analytic solution in the class of continuous functions. The problem is solved based on the direct Lyapunov method of stability theory. The Lyapunov's function with sign-constant derivative is used.

MoR1V Hotel VIP-Hall
Applications in Economics, Management and Environmental Science I (Regular Session)

Chair: Berg, Dmitry Urals Federal Univ. and Inst. of Industrial Ec. UB RAS
 Co-Chair: Dorofeyuk, Yulia Insitute of Control Sciences of RAS

15:00-15:20 MoR1V.1

Structural Correction Method for Monitoring Parameter Estimation in the Unrepresentative Sample Analysis Problem, pp. 51-54

Dorofeyuk, Yulia Insitute of Control Sciences of RAS
 Dorofeyuk, Alexander Insitute of Control Sciences of RAS
 Chernyavskiy, Alexandr Inst. of Control Science

One of the key issues of the selective statistical investigations (monitoring) analysis problem in case of small samples is insufficient representativeness of the monitoring parameters, especially in the context of selective statistical data generation. In the paper, the structural-classification correction method of monitoring parameter estimation is proposed. The new method allows increasing the reliability of indices estimates, which is critical for largescale socio-economic system analysis and control problems. Developed method applied for economic activity rates analysis problem.

15:20-15:40 MoR1V.2

Optimization of Sentiment Analysis Methods for Classifying Text Comments of Bank Customers, pp. 55-60

Lutfullaeva, Malika Ural Federal Univ
 Medvedeva, Marina Ural Federal Univ
 Komotskiy, Eugene Ural Federal Univ
 Spasov, Kamen Sofia Univ. "St.Kliment Ohridski"

A method of sentiment analysis of the text and its approbation in solving the problem of analysis of text comments left by the Bank's customers are performed. The proposed method consists in a combination of three approaches: rules-based, dictionaries and machine learning with a teacher. New method of text vectorization-tonal vectorization instead of classical ones, such as "bag-of-words" and TF-IDF, is proposed. The text was classified by logistic regression with regularization. A series of experiments were carried out and the optimal value of the regularization parameter was found in terms of classification accuracy.

15:40-16:00 MoR1V.3

Modeling of the Municipality Entrepreneurial Community Functioning Using the Methods of System Dynamics, pp. 61-66

Berg, Dmitry Urals Federal Univ. and Inst. of Industrial Ec. UB RAS
 Kolomytseva, Anna Donetsk National Tech. Univ
 Apanasenko, Anastasiya Ural Federal Univ. Named after the First President of Russia
 Isaichik, Ksenia Ural Federal Univ. Named after the First President of Russia