

Piotr Bania: **State Estimation of Linear Systems with Quantized Output Measurement** • Automatyka 2011, t. 15, z. 1

Paper describes state estimator for linear systems with quantized measurement. When quantization interval tends to zero estimator became Kalman-Bucy filter. If measurement noise intensity is low relative to quantization interval, then estimation error could be several times smaller than estimation error of Kalman-Bucy filter. Considerations are illustrated with examples.

Keywords: state estimation, quantized measurement, quantized Kalman-Bucy filter

Piotr Bania: **Conditions for Normality of Pontryagin's Maximum Principle with Final State Constraints** • Automatyka 2011, t. 15, z. 1

A version of Pontryagin's Maximum Principle for optimal control problems with final state and control time constraints is presented. Sufficient conditions for normality of Lagrange multipliers are given. Considerations are illustrated with examples.

Keywords: Pontryagin's Maximum Principle, abnormal extremal, optimal control

Henryk Górecki: **Tautochrone Problem** • Automatyka 2011, t. 15, z. 1

In the paper, a theoretical solution for the motion of cycloidal pendulum is presented. The period of oscillations of such a pendulum is independent of the amplitude of oscillations. This enables construction of very precise clocks. It turns out that the curve called *tautochrone* is, at the same time, the curve of quickest descent in the gravitational field, that is, brachystochrone. The birth of the sinusoid curve, so popular in electrical engineering, is also described.

Keywords: tautochrone, brachystochrone, sinusoid, cycloid

Adam Kowalewski: **Optimal Control of an Infinite Order Hyperbolic System with Multiple Time-Varying Lags** • Automatyka 2011, t. 15, z. 1

In this paper an optimal distributed control problem for an infinite order hyperbolic system in which different multiple time-varying lags appear both in the state equation and in the boundary condition is considered. Making use of Lion's scheme (Lions 1971), necessary and sufficient conditions of optimality for the Neumann problem with the quadratic performance functional and constrained control are derived.

Keywords: optimal control, infinite order, hyperbolic system, multiple time-varying lags

Wojciech Mitkowski: **Is a Fractional System a Dynamical System?** • Automatyka 2011, t. 15, z. 1

In recent years we may notice a return to the analysis of fractional systems. Such systems are described in the form of differential equations with fractional derivative. In this paper we notice the fact that this type of differential equations does not generate dynamical system. We show suitable numerical example.

Keywords: fractional system, dynamical system

Anna Obrączka: **Computers Methods for Chaos Diagnostic** • Automatyka 2011, t. 15, z. 1

In the paper the computers methods for chaos diagnostic in dynamical systems was described. Usually they are based on the analysis of value or behaviour of some coefficient. Among discussed properties are for example: autocorrelation, density of invariant measure or Lyapunov exponent. Its good to see that most of presented methods are based on numerical calculations, so it can be treat as good suggestion of system's behaviour, but not as mathematical proof of chaos existence.

Keywords: dynamical systems, chaos, strange behaviour

Adam Piłat, Piotr Włodarczyk: **The μ -Synthesis and Analysis of the Robust Controller for the Active Magnetic Levitation System** • Automatyka 2011, t. 15, z. 1

Paper presents the robust controller design for the Active Magnetic Levitation System (AMLS) using the μ -synthesis method. Non-linear and linear models are given. The system uncertainties are illustrated by the Bode plots of nominal and mass perturbed plant. For the sake of μ -synthesis the weighted functions were designed. the obtained continuous time controller was discretized at the specified sample time value, and executed in the real-time mode. The stabilisation of four objects characterised by variable mass and shape is presented by the experimental data. Finally, the conclusions devoted to the μ -synthesis method and the controller implementation are given.

Keywords: active magnetic levitation, robust controller, real-time control

Paweł Skruch: **Application of Model-Based Approach for Testing Dynamic Systems** • Automatyka 2011, t. 15, z. 1

The paper presents an application of model-based approach for testing software systems with dynamic behavior. Model-based testing concept is introduced and explained. Mathematical model of the system under test is described

by state space equations. Then, mathematical and implementation challenges associated with testing of the dynamic systems are briefly described. These challenges are related to notation of tests, calculation of test coverage, implementation of a test comparator and automatic generation of test cases. Some author's ideas and solutions are presented. An application example is given to illustrate theoretical analysis and mathematical formulation.

Keywords: *model-based testing; dynamic system; system testing*