Definition 4. *Nontrivial small solutions of system (1) with respect to x_1 are weakly observable if every nontrivial small solution with respect to x_1 has nonzero output for $t \geq 0$ and for x_2 being zero solution, i.e.*

$$\exists T > 0 \quad \left.\begin{array}{c} x_2(t) = 0\,\forall t \geq 0 \\ x_1(t) = 0\,\forall t \geq T \\ z(t) = 0\,\forall t \geq 0 \end{array}\right\} \Rightarrow x_1(t) = 0,\ \forall t \geq 0.$$

Theorem 3. *Nontrivial small solutions of system (1) with respect to x_1 are always observable.*

Conclusion. In this paper we have investigated the problem of relative weak observability of nontrivial small solutions of the hybrid differential-difference systems. Weak observability of nontrivial small solution with respect to x_2 and x_1 are considered. Strong small solutions are defined and weak observability of nontrivial strong small solutions with respect to x_2 is established. Other kinds of observability of small solution of system (1) and relations between these kinds of observability are also discussed.

This work was supported by Bialystok Technical University grant S/WI/1/08.

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PORT-CONTROLLED HAMILTONIAN SYSTEMS WITH NONHOLONOMIC CONSTRAINS IMPOSED BY CONTROL DESIGN OBJECTIVES

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This paper investigates the Port-Controlled Hamiltonian (PCH) model of nonholonomic dynamical systems [4]. Nonholonomic constraints on motion can be expressed in terms of nonintegrable linear velocity relationships $B(q)\dot{q} = 0$. Recently [2], this class of nonholonomic constraints has been broadened as to encompass affine velocity relationships $A(q) + B(q)\dot{q} = 0$. PCH model incorporates directly nonholonomic constraints and broadening the class of nonholonomic constraints allows us to propose in a PCH formulation a control algorithm for dynamical systems where nonholonomic constraints on velocities are imposed by control objectives [1] and not by the structure of the system itself [3]. As an application, the energy based robust control is studied of finite dimensional underactuated mechanical systems.

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ON ADAPTIVE TIME SERIES FILTERING BASED ON STOCHASTIC OPTIMIZATION TECHNIQUE

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Classical optimal filters assume knowledge on a priori probability characteristics for whole multitude of signal realizations when observation analysis is produced in accordance with open system principle. At deficient information adaptive filters based on feedback principle are used. They work under any initial conditions at the absence of data on environment and execute single-step movement to an optimal solution.

The basis of adaptive filter is formed by not statistical characteristics but signal realizations (sample functions). The main problems of existing adaptive filters are in probable divergence of obtained estimations with real values of estimated random sequences or in low speed of convergence.

The adaptive algorithm for time series when empirical data are only presented by current observations on the object under study is proposed. The random function from estimating errors that is different from mean square sum of errors is used as procedure criterion. The basis of the algorithm of criterion minimization is stochastic optimization technique.

The features of algorithm are analyzed for discrete simple system which has important practical applications under conditions with deficient a priori information. The algorithm is realized on the base of RATS (ESTIMA) software. The results are compared with optimal Kalman filter. The numerical examples are devoted to analysis of marine drifter location.

FEEDBACK STABILIZATION OF NONLINEAR CONTROL SYSTEMS ON TIME SCALES

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Introduction. In 1983 R. Brockett [2] proved a necessary condition for feedback stabilization of continuous-time nonlinear systems. A similar fact for discrete-time systems was shown by W. Lin and C.I. Byrnes [3] in 1994. We extends those results to nonlinear control systems on arbitrary unbounded time scales. A time scale is a model of time. Time may be continuous, discrete or partly continuous and partly discrete. Differential calculus on time scales unifies standard differential calculus and the calculus of finite differences. Control systems described by delta differential equations on time scales generalize continuous-time and discrete-time systems. A book by M. Bohner and A. Peterson [1] is a good introduction to the theory of dynamical systems on time scales.