

Krzysztof Oprzędkiewicz: **A Sample Time Assign for Linear 1st and 2nd Order Control Plants with One Zero in Transfer Function** • Automatyka 2010, t. 14, z. 2

In a paper a problem of sample time assign for 1st order and 2nd order plants with one zero in transfer function is presented. In systems we deal with, during discretisation the zero of the transfer function can move outside the unit circle. In the paper the analytical conditions for keeping the zero inside the unit circle were formulated. For 2nd order aperiodical plant it was proven, that the zero of the transfer function is kept inside the unit circle for each positive value of the sample time. For 1st order plant and 2nd order oscillatory plant without damping exact analytical conditions for keeping the zero inside unit circle were given. For a 2nd order oscillatory plant with damping analytical conditions are also given, but in the more complicated form. Theoretical results are by numerical examples depicted.

Keywords: *digital control systems, discrete transfer functions, sample time assign*

Adam Piłat: **Investigation of Discrete PID Controller for Active Magnetic Suspension** • Automatyka 2010, t. 14, z. 2

In paper the PID controller designed for stabilization task of the levitated object at the desired level is presented. The continuous in time controller has been discredited with the use of the following methods like: zero-order-hold, bilinear, first-order hold, and matched. The investigation of the sampling period and its influence on the control quality has been included into this research. The dynamical properties that depend on the discretisation and sampling are discussed. The sampling frequency is also considered due to the structural instability of the levitated system. The experimental investigation were provided in the integrated computer environment for illustration of the considered problems. The remarks are important for the designing stage of the control system implemented in the sampled control hardware units.

Keywords: *active magnetic suspension, PID, digital control, real-time control, system dynamics*

Paweł Skruch: **Stabilization of a Class of SISO Nonlinear Systems by Dynamic Feedback** • Automatyka 2010, t. 14, z. 2

The paper considers a class of single-input single-output (SISO) nonlinear systems whose behavior is defined by nonlinear

differential equations. An uncontrolled system from this class is already asymptotically stable. Dynamic feedback controls are given to improve the dynamic stability performance of appropriate closed-loop systems. The main advantages of the presented approach are reduced-order design of the controllers and their robustness. The asymptotic stability in the Lyapunov sense is analyzed and proved by the use of Lyapunov functionals and LaSalle's invariance principle.

The results of computer simulation are included to verify theoretical analysis and mathematical formulation.

Keywords: *SISO nonlinear systems, stabilization, dynamic feedback, Lyapunov functional*

Wiesław Wajs: **Medical Data Classification with Statistical Methods** • *Automatyka* 2010, t. 14, z. 2

The problem of data classification with statistical methods is presented in the paper.

Described classification method enables calculation of probability of disease incidence. A case of disease incidence is described with two parameters expressed in real numbers. The case can belong to a known set of cases where the disease occurred or to the set where the disease did not occur. There was presented a method for calculating probability with which a given case belongs to the set labeled as "1" or "0". Source data used in the paper come from medical databases and are original. The algorithm of the method was checked on clinical cases. Correlation method was used for generating respective statistics. The calculated correlation at a level of 0.8 is indicative of disease occurrence, whereas the correlation coefficient at a level of 0.0 is indicative of lack of disease. This property is used in the classification algorithm. It is frequent in the clinical practice that we have one test case and we try to determine whether or not that case describes symptoms of liability to the disease. Classification is related with the occurrence of disease bpd, which is analyzed in a 3 to 4 week period preceding the disease incidence.

Bronchopulmonary dysplasia is a chronic lung disease that develops in neonates treated with oxygen and positive pressure ventilation. The majority of bpd cases occur in premature infants, usually those who have gestational age less than $wp = 34$ weeks and birth weight less than $mu = 1500$ g. These babies are more likely to be affected by a condition known as infant Respiratory Distress Syndrome, which occurs as a result of tissue damage to the lungs from being mechanical ventilator for a significant amount of time.

Although mechanical ventilation is essential to their survival over time the pressure from the ventilation and excess oxygen intake can injure a newborn's delicate lungs. If symptoms of respiratory distress syndrome persist then the condition is considered *Bronchopulmonary Dysplasia*. Important factors in diagnosing bpd are prematurely, infection, mechanical ventilator dependence, and oxygen exposure.

Keywords: *Statistic Methods, Artificial Neural Networks, Classification Methods*