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Vortragsankündigung

Seminar Regelungssysteme LV 0430L654

Dienstag, 18. August 2015, 10:30 Uhr
Vortragsort: EN 223

Dr. Alexandros Charalampidis
National Technical University of Athens, Greece

“Recursive State Estimation for Nonlinear Stochastic Systems and Application to a Continuous Glucose Monitoring System”

The talk will start with an introduction to recursive state estimation. It will be presented how the problem can be solved exactly in two important cases (systems with finite state space and linear Gaussian systems). The difficulties associated with nonlinear systems will be explained and the main techniques will be presented (Extended Kalman Filter, Unscented Kalman Filter, Gauss-Hermite Kalman Filter, Particle Filtering, Gaussian Sums). Then the talk will focus on systems that consist of linear dynamical systems interconnected through static nonlinear characteristics. It will be explained that for them, it is possible to avoid integration on the space space, which may be of high order, reducing it to the solution of some linear systems and low-order integration. This way, more accurate calculations can be made. Additionally, a novel quadrature technique, alternative to the Gauss-Hermite quadrature, specially designed for nonlinear filters using norm minimization concepts will be presented. The proposed techniques are applied to an example and it is shown that they can lead to a significant improvement. The final part of the talk will deal with the application of filters to data from a Continuous Glucose Monitoring System (CGMS). The importance of the CGMS to the construction of an Artificial Pancreas will be explained. It will be shown that, using simple models of the system dynamics, the application of Kalman and Particle Filtering to experimental data from ICU patients leads to an important reduction of the glucose estimation error.