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Special session on “Recent trends in modeling and control applications”

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Recently, a manifold of emerging methodologies have been proposed for modeling and control purposes. From the modeling perspective, the focus lies on obtaining more accurate mathematical representations of real-life processes using fewer parameters and simpler models. Such an example is presented in the form of fractional order system identification, where complex, high order transfer functions are reduced to equations with fewer parameters and non-rational orders of differentiation. The method proves useful in modeling memory based physical phenomena such as viscoelasticity. In addition, optimization techniques are employed through methods such as ARX, ARMAX or IV in order to obtain accurate models from real-life data. The progress in modeling and identification methodologies leads to a better understanding of the physical process' control needs, being a fruitful tool in developing suitable control strategies. From the control perspective, the trend has been to extend well-known control strategies based on fractional order control, internal model control, Smith-Predictors, autotuning paradigms as well as optimization based approaches such as the MIGO methods. Classical control strategies focus on obtaining closed loop systems using indicators such as settling time, overshoot or steady state errors. However, most recent control trends focus on obtaining an additional robust characteristic of the closed loop system, as well as a certain sensitivity of the controlled process. For example, fractional order control strategies tuned using frequency domain specifications target robustness as a design entity, whereas new strategies based on MIGO utilize the system's sensitivity as a cost function that can be minimized. This special session welcomes papers dealing with modeling and control techniques relevant for the necessities of the current research juncture. We welcome any contribution within the general scope of the Special Session theme "Recent trends in modeling and control applications".

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