Control and estimation of particulate processes

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Particulate materials and particulate processes are of great importance for chemical, pharmaceutical and food industries. A typical example is crystallization of the final product from a solution or as part of a purification step. In general, product properties are directly connected to the particle properties. For example, the flowing properties depend on the particle size distribution and the particle moisture content. As these processes are often subject to great uncertainties and may exhibit unstable behavior as for example depicted in Fig. 1 (left) there is a great need for control in order to guarantee a constant product quality.

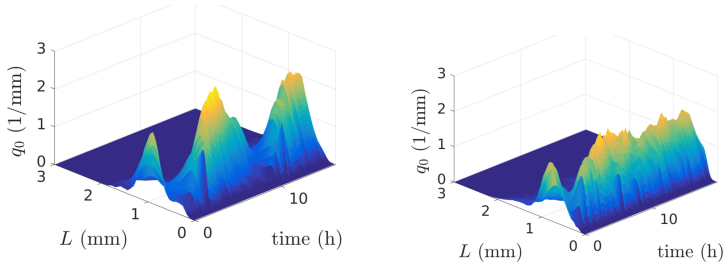

Figure 1: Particle size distribution measured in a fluidized bed spray granulation process without (left) and with (right) control

From a theoretical point of view, models of particulate processes cover a great range of model classes. Population balance models, describe the dynamical behavior of particle ensembles and lead often to nonlinear partial integro-differential equations. On the other end are models describing the physics on the single particle level, i.e. the interaction of particles with other particles and the surrounding fluid (disperse multi-phase flow). Depending on the problem at hand different model scales or combinations of scales may be needed to describe the inherent multi-scale behavior. In accordance with the variety of model paradigms, process analysis, control and estimation call for a broad spectrum of methods and approaches.
The open invited track "Control and estimation of particulate processes" aims to bring together researchers working on different particulate processes and theoretical approaches, to establish connections and allow for a discussion on future research needs in this developing field.
Possible topics for this open invited track include the following:

- Control of particulate processes and particle properties
- Optimization of particle properties and optimal process design
- Analysis of particulate processes
- Fault diagnosis and fault tolerant control strategies for particulate processes
- Modeling of particulate processes
- Measurement and estimation of particle properties
- Parameter estimation of particulate processes
- Machine learning for particulate processes