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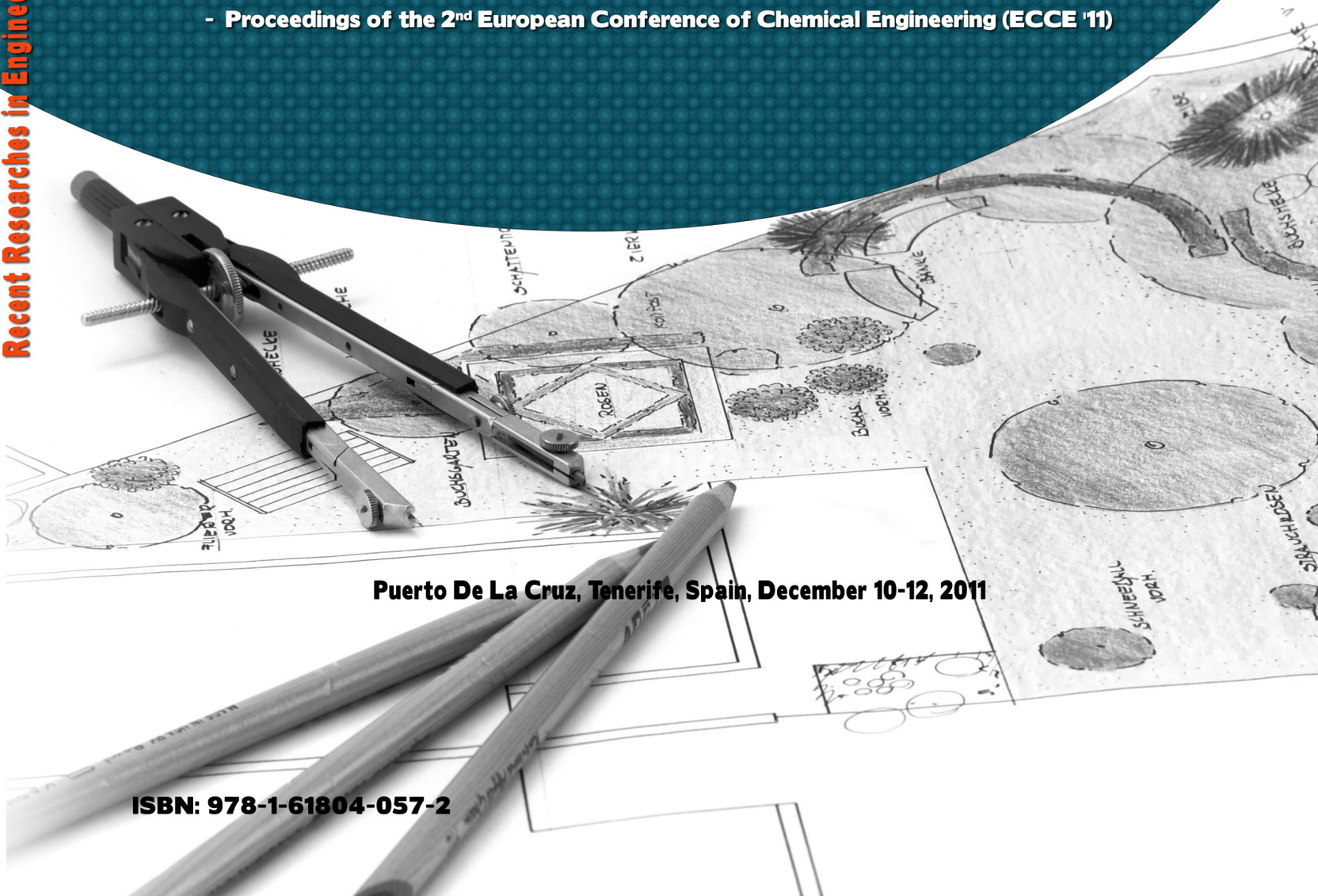
Recent Researches in Engineering and Automatic Control

- Proceedings of the 2nd European Conference of Control (ECC '11)
- Proceedings of the 2nd European Conference of Mechanical Engineering (ECME '11)
- Proceedings of the 2nd European Conference of Civil Engineering (ECCIE '11)
- Proceedings of the 2nd European Conference of Chemical Engineering (ECCE '11)



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Plenary Lecture 1

Contributions to the Stabilization of Some Distributed Parameter Systems

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Abstract: Many systems modeling physical, mechanical, biological or economical phenomena are governed by partial differential equations. Such systems are called distributed parameter systems. The theory of distributed parameter systems is becoming a more and more complete theory, containing all the topics that are well known from finite-dimensional systems theory or lumped parameter systems described by ordinary differential equations. One direction of research in the theory of distributed parameter systems consists of studying their stability or stabilization, that is, the design of feedback controls to stabilize or to enhance stability. In this talk, we intend to investigate the stabilization of some distributed parameter systems, namely,
(i) A one dimensional diffusive-wave equation commonly used in hydraulic engineering to describe dynamic behavior of the unsteady flow in a river for shallow water when the flow variations are not important. In order to stabilize and regulate the system, we propose a proportional and integral boundary controller. Contrary to many physical systems, we end up with a non-dissipative closed-loop system with non-collocated actuators and sensors. We show that the closed-loop system is a Riesz spectral system and generates an analytic semigroup. Then, we shall be able to assign the spectrum of the closed-loop system in the open left-half plane to ensure its exponential stability as well as the output regulation independently of any known or unknown constant perturbation. These results are illustrated by several numerical examples.
(ii) An n-dimensional wave equation with Neumann boundary conditions but without the presence of any displacement term. To stabilize the system, we propose a boundary feedback control involving only a damping term. Then using a new energy function, we show that the solutions of the system asymptotically converge to a stationary position, which depends on the initial data. Both linear and nonlinear controls are considered.

Brief Biography of the Speaker:
Dr. Boumediene CHENTOUF is currenly Associate Professor at Sultan Qaboos University. He received his master and PhD degrees from INRIA-Lorraine, Metz, France in 1998. He then passed 15 months in CEMAGREF and INRA in Montpelllier, France. His research is focused on control theory of linear/nonlinear distributed parameter systems.

Plenary Lecture 2

Droplet-based Micro Continuous-Flow Synthesis and Combinatorial Optimization of Composed Nanoparticles

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Abstract: A droplet-based synthesis concept offers several unique advantages for nanoparticle synthesis in comparison with the synthesis in homogeneous fluids, as constant residence times, suppression of undesired interactions between reactants, particles and the wall, support of efficient mixing and heat transfer by segment-internal convection. The possibility of precise control of changes of process conditions is of particular importance for multi step processes as nucleation, particle growth, particle aggregation and formation of shells. So, for example, different size, shape and optical properties of plasmonic Au/Ag particles can be addressed by tuning the conditions of microfluidic synthesis.
In addition, the micro segmented flow allows an efficient screening of large sets of reaction conditions by the definition of individual parameter sets in single nanoliter fluid segments. Two- three-, four- and five-dimensional concentration spaces are addressed by the application of computer-controlled syringe pumps for combinatorial experiments with several thousands single reaction volumes. The individual micro fluid segments with special reaction mixtures can be distinguished by their number in the segment sequence. The complete sets of synthesized colloidal solutions of nanoparticles were characterized by micro flow-through photometry and spectrophotometry. Selected products were further investigated by SEM, TEM, AFM and centrifugal sedimentation spectrometry. In result, homogeneous core/shell nanoparticles, double and triple shell nanoparticles as well as single crystal nanoparticles are synthesized under micro fluidic conditions.

Brief Biography of the Speaker:
J. Michael Kohler (born 1956) studied chemistry at the universities of Halle/S. and Jena. After dissertation on electrochemical effects in microfabrication (1986), he lead projects on submicron photolithography at the Institute of Physical Technology in Jena. During a research stay 1991 in Dortmund (MPG) he dealt with chemical waves in gels. He get the habilitation for general and physical chemistry of the university of Jena in 1992. In the same year, he become the head of the microfabrication department, in 1994 the head of the microsystem department of the Institute of Physical High Technology in Jena. Since 2001, he is a full professor for Physical Chemistry and Micro Reaction Technology at the Technical University of Ilmenau. His research activities are focussed on the connection between chip reactors, cell screening in microfluidic systems, biomolecular technologies, nanomaterials and nanotechnology.