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Description of the PhD thesis of Dyhia BOUHADJRA

PhD Candidate : Dyhia BOUHADJRA

Title : Modeling and Control of Plants Described by PDEs with Application to Biological Systems School : University of Genoa, Italy Supervisors : Prof. ALESSANDRI, Prof. BAGNERINI, and Prof. ZEMOUCHE Funding : University of Genoa

Partial differential equations (PDEs) are pretty well-known and studied for modeling distributed parameter systems (DPSs). PDEs are used to model biological systems. Among other, level set methods rely on Hamilton-Jacobi PDEs to account for moving interface and hence describe complex biological systems. The thesis aim to match the gap between control and system modeling based on PDEs in such a way to provide viable tools to design regulators with stability guarantees. Lyapunov methods and linear matrix inequalities (LMIs) will be considered to pursue this goal. In the thesis, the following subjects will be addressed :

- 1. parabolic and hyperbolic PDEs;
- 2. level set methods;
- 3. numerical methods to solve PDEs;
- 4. Lyapunov methods for PDEs;
- 5. Control and observer design for DPSs;
- 6. LMI and semidefinite programming (SDP) tools.

Dr. Dyhia BOUHADJRA will attend courses for PhD students at the Universities of Lorraine and of Genoa and she will be under the supervision of Prof. ALESSANDRI, Prof. BAGNERINI, and Prof. ZEMOUCHE. The fellowship of Dr. BOUHADJRA is payed by the University of Genoa.