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accounted for. Furthermore, hypotheses for the molecular mechanisms of action of two existing drugs yield predictions in agreement with experiments. The results elucidate central aspects of force- and motion-generation by actin and myosin. Furthermore, the prediction of ensemble behavior on basis of parameters from studies of isolated proteins will be of great value in drug-discovery.

[1] A Månsson, *Actomyosin based contraction: one mechanokinetic model from single molecules to muscle?*, J. Muscle Research Cell Motility, **37** (2016) 181-194.

Hypersensitive Optimal Control of Invasive Species

Angela Martiradonna
Istituto per le Applicazioni del Calcolo M. Picone
CNR, Bari, Italy
a.martiradonna@ba.iac.cnr.it

Effectively dealing with invasive species is a pervasive problem in environmental management. The damages, and associated costs, that stem from invasive species are well known, as is the benefit from their removal. We investigate problems where optimal control theory has been implemented, and we show that these problems can easily become hypersensitive, making their numerical solutions unstable. We show that transforming these problems from state-adjoint systems to state-control systems can provide useful insights into the system dynamics and simplify the numerics. We apply these techniques to two case studies: one of feral cats in Australia, where we use logistic growth; and the other of wild-boars in Italy, where we include an Allee effect. A further development is to optimize the control strategy by taking into account the spatio-temporal features of the invasive species control problems over large and irregular environments. The approach is used in a management scenario where the invasive species to be controlled with an optimal allocation of resources is the deciduous tree *Ailanthus Altissima*, infesting the Alta Murgia National Park in the south of Italy. This work has been carried out within the H2020 project ECOPOTENTIAL (http://www.ecopotential-project.eu), coordinated by CNR-IGG. The project has received funding from the European Union's Horizon 2020 research and innovation programme (grant agreement No 641762).

The talk is based on collaborations with C.M. Baker, F. Casella, D. Lacitignola, F. Diele, C. Marangi.

[1] Baker C.M., *Target the source: Optimal spatiotemporal resource allocation for invasive species control*, Conservation Letters, February 2016.
[2] Baker C.M., D. Lacitignola, F. Diele, C. Marangi, A. Martiradonna, *Hypersensitive Optimal control of invasive species through a dynamical systems approach* , submitted.

Numerical bifurcation analysis of delay models for physiologically structured populations

Francesca Scarabel
Department of Mathematics and Statistics
University of Helsinki, Finland
francesca.scarabel@helsinki.fi

Physiologically structured populations are often described by mathematical models where a renewal equation for the birth rate is coupled with a delay differential equation for the environmental variable. These equations generate dynamical systems on an infinite-dimensional function space.
In order to study numerically the bifurcation properties when varying some parameters, we apply the pseudospectral discretization technique to the infinite-dimensional system and obtain a finite-dimensional system of ordinary differential equations. The discretized system is easy to write from the original equation and ensures high-accuracy approximations with low system dimension, thanks to the spectral convergence properties of the approximation scheme. Finally, the