Partial Differential Equations in the Modeling of Collective Phenomena

A control problem for structured population dynamics

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Abstract: We introduce a model of structured population dynamics on a simple net- work. When the population under consideration consist of two stages, say juveniles developing into adults as in [1], it is natural to write a renewal equation for each of the two stages and couple them through a nodal condition analytically similar to those arising in road traffic or fluid dynamics in pipes. Models with similar structures arise when dealing with the demography of sexual reproduction or with the exploitation of biological resources. We are interested in control problems for similar structures. Here the control functions act as distribution matrices at the nodes. A well posedness result applicable to these situations is presented, see [2]. Moreover we prove that the solution is differentiable with respect to the control. This work is done in collaboration with R. M. Colombo.

References

[1] A. S. Ackleh, K. Deng: A Nonautonomous Juvenile-Adult Model: Well- Posedness and Long-Time Behavior via a Comparison Principle. SIAM J. Appl. Math., 69, 6, 2009.

[2] R. M. Colombo, M. Garavello: Stability and Optimization in Structured Population Models on Graphs. Math. Biosci. Eng., 12 (no. 2) (2015), pp. 311-335.