Asymptotic analysis of some selection-mutation models

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The focus of this presentation is the asymptotic analysis of some reaction-diffusion equations modelling individuals who die and proliferate, but also move randomly in space or are subject to mutations. The reaction term is logistic and non-local through a Kernel, while the diffusion term is typically a Laplacian.

I will explain how one can derive Lyapunov functionals for the PDE as in [1], and when this determines the asymptotic behaviour when mutations are neglected. This can be generalised to the case of system, which is the subject of a submitted work [2]. With mutations, it provides a result for the non-local Fisher-KPP equation.

I will finally present a simple case for which we know that the asymptotic limit must be the sum of two Dirac masses (two phenotypes are asymptotically selected), but the masses depend on the initial condition. A possible approach is to use a viscosity method to recover uniqueness and infer the appropriate masses.

References

[1] P-E. Jabin, G. Raoul, *On selection dynamics for competitive interactions*, Journal of Mathematical Biology, 2011.

[2] C. Pouchol, E. Trélat, *Global stability with selection in integro-differential Lotka-Volterra systems modelling trait-structured populations*, submitted, 2017.