ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Invitation to the Defense

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“Bifurcations in Periodic Integrodifference Equations”

HS 3 | Thursday, 2 July 2020 | 10:00 a.m.

Abstract

In theoretical ecology, one often models population growth with the help of discrete-time difference equations. One method to account for the effects of dispersal throughout the habitat is to employ integrodifference equations, or IDEs, as opposed to employing scalar difference equations. Given a compact habitat, we consider e.g. IDEs on the form of Urysohn integral operators; a commonly employed special case being where the integral kernel is the product of some probability distribution taking the role of a dispersal kernel (e.g. Laplace, Gaussian) together with some parameter-dependent growth function (e.g. Beverton-Holt, Ricker), lending itself naturally to ecological considerations.

One is frequently interested in the stability behaviour of fixed points, solutions to the IDE. As parameters change, the structure and stability of the solutions can change; we are particularly interested in bifurcations, that is, the situation where small changes of the parameters lead to large changes in the solution structure, featuring exchanges of stability together with such behaviour as folds, transcritical bifurcations and pitchfork bifurcations.

Additionally, certain IDEs, in particular – but not limited to – those using the Ricker growth function may feature transfers of stability from a branch of

fixed points to a branch of two- or higher-periodic solutions, solutions of the iterated equation. We explore such flip bifurcations in detail, and generalise this theory to cover bifurcations of periodic solutions of any integer period also in more general IDEs, with the particular goal of formulating our assumptions so that they can easily be verified numerically.

Christian Pötzsche and the Department of Mathematics look forward to seeing you at the talk!