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Reaction-diffusion PDE coupled to integral equation with nonlocal dispersal term and time delay

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Abstract

This presentation focuses on certain mathematical models and a particular analysis. We consider a class of biological models represented by a system composed of reaction-diffusion PDE coupled with difference equations (renewal equations) in n-dimensional space, with nonlocal dispersal terms and implicit time delays. The difference equation generally arises, by means of the method of characteristics, from an age-structured partial differential system. Using upper and lower solutions (monotonic case), we study the existence of monotonic planar traveling wave fronts connecting the extinction state to the uniform positive state. The corresponding minimum wave speed is also obtained. In addition, we investigate the effect of the parameters on this minimum wave speed and we give a detailed analysis of its asymptotic behavior. We also conducted a generalization to the non-monotonic case, and for simplicity reasons, it will not be detailed in this talk. For those who are not very familiar with all these concepts, I will provide a lot of illustrations and numerical simulations.

Key words : Planar monotone traveling wave front, Reaction-diffusion PDE with delay, Difference equation, Monostable equation.
Mathematics Subject Classifications [2020] : 35K20, 35Q92, 92D30.

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