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QUALITATIVE ANALYSIS AND NUMERICAL APPROXIMATION OF AN OPTIMAL CONTROL MODEL FOR INVASIVE SPECIES

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Invasive species cause huge amounts of environmental, economic, social and cultural damage in Europe and worldwide. Improving measures to control them is an ongoing challenge, and mathematical modeling and optimization are becoming increasingly popular as a tool to assist management [1, 2, 4]. We analyse an optimal control model for the control of invasive species which aims to find the best temporal resource allocation strategy for the population reduction, under a budget constraint [3]. We derive the optimality system in the state and control variables and we use the phase-space analysis to provide qualitative insights about the behaviour of the optimal solution. We pay special attention to the nature of the optimal trajectories in long time intervals and the explore the Turnpike property of the problem [5]. Finally, we introduce a numerical scheme for the solution of the state-costate nearly-Hamiltonian system, based on exponential-Lawson symplectic Runge-Kutta schemes applied in a forward-backward procedure.

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