

Optimal location of resources for biased movement of species

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In this talk, we consider optimal configurations of resources for the survival of a species in a bounded habitat. We focus on a 1D diffusive logistic model with a drift term accounting for the movement of species towards more favorable environment, and Robin type boundary conditions.

We will see that the problem brings to seeking intrinsic growth rates which minimize the principal eigenvalue of an elliptic operator with an indefinite weight. The problem with no drift has been fully studied in [2]. The specificity of this problem is the presence of nonlinear function of the weight in the numerator and denominator of the Rayleigh function. By using a well-chosen change of variable and adapted rearrangement techniques, we show the existence of minimizers, and that they are of bang-bang type. The problem is then transformed into a shape optimization problem in the habitat. We give a full characterization of the solutions in the 1D case.

References

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