
Optimal Harvesting Modelling

Report 1

UAB
Universitat Autònoma
de Barcelona

Centre de Recerca Matemàtica
Universitat Autònoma de Barcelona
Group number 4.

Abstract

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1 Preliminary Concept

1.1 Constrained minimization in Banach spaces and Lagrange multipliers

Definition 1. Lower semi-continuous A functional F is lower-semicontinuous if

$$F\left(\lim_{n \rightarrow \infty} x_n\right) \leq \liminf_{n \rightarrow \infty} F(x_n) \quad (1.1)$$

Definition 2. Derivative. The functional F on a Banach space X

Let X, Y, U be Hilbert spaces and Z be a Hilbert lattice. Consider the constrained minimization problem:

$$\min_{x \in C} J(x)$$

subject to

$$\begin{aligned} E(x) &= 0 \\ \text{and} \\ G(x) &\leq 0 \end{aligned}$$

Where C is a closed and convex set in X , $J : X \rightarrow \mathbb{R}$, $E : X \rightarrow Y$, and $G : X \rightarrow Z$ are continuously differentiable

1.2 Control Problem



2 Problem Framework

3 Deterministic Model.

3.1 Logistic Equation.

3.2 Optimization problem.

$$\min_{u \in U_{\text{ad}}} J(u) = \frac{1}{2} \|y - y_0\|_{L^2(\Omega)}^2 + \frac{\alpha}{2} \|u\|_{L^2(\Omega)}^2 \quad (\text{P})$$

subject to,

$$-Ay + \phi(y) = u \quad \text{in } \Omega, \quad (3.1)$$

$$y = 0 \quad \text{on } \delta\Omega \quad (3.2)$$

and the pointwise constraints,

$$u_a \leq u(x) \leq u_b \quad \text{for almost every } x \in \Omega, \quad (3.3)$$

$$y_a(x) \leq y(x) \leq y_b(x) \quad \forall x \in K \subset \Omega, \quad (3.4)$$

3.2.1 Optimal Control.

3.2.2 Error Analysis.

4 Optimizing Algorithms and Simulation.

4.0.1 Algorithm.

4.0.2

5 Presence of Noise

6 Further Research
