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Title here

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Abstract The text of your abstract. 150 – 250 words.

Keywords key · dictionary · word ·

Mathematics Subject Classification (2000) MSC code 1 · MSC code 2 ·

1 Introduction

Your text comes here. Separate text sections with [1].

2 Background

In this section we first review two well-established techniques commonly used in sustainable fishery management. These are the maximum sustainable yield (MSY) and the constant escapement (CE) approaches. After this, deep reinforcement learning is briefly reviewed

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2.1 Fishery management

2.2 Deep reinforcement learning

3 A hierarchy of dynamical models

In this section we present three models of increasing complexity which plausibly describe the population dynamics of a marine ecosystem. These models will form the test beds for the comparison between classical fishery management strategies and DRL.

A one-dimensional tipping point model. Our first model has been used in [2] to study the possible dangers of driving a dynamical ecosystem past a tipping point. Its dynamics is given by

$$\frac{\mathrm{d}V}{\mathrm{d}t} = rV\left(1 - V/K\right) - \frac{\beta H V^2}{V_0^2 + V^2}. \tag{1}$$

Here the only dynamic degree of freedom is V, while $r,\ K,\ \beta,\ V_0$, and H are fixed parameters. This model describes a population V which grows logistically up to a carrying capacity of K, and whose growth is controlled by a constant population H of predators. For fixed values of $r,\ K,\ V_0$ and β, varying H may produce a *catastrophe* (see Fig. **??**).

4 Results

5 Discussion

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$$a^2 + b^2 = c^2 \tag{2}$$

References

1. R. Mislevy, in *Educational Assessment*, ed. by R.L. Brennan (American Council on Education and Praeger Publishers, 2006), chap. 8
2. R.M. May, Thresholds and breakpoints in ecosystems with a multiplicity of stable states, Nature **269**(5628), 471 (1977)