Mosquito population Feedback Control with Deep Reinforcement Learning

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While the Sterile Insect Technique (SIT) has traditionally been used in agriculture and is currently a method for controlling vector-borne diseases transmitted by mosquitoes, the practical implementation of feedback controls derived from classical control theory (see [1]) is limited by the need for continuous and often impractical measurements. Finding a feedback control that ensures the global stability of the system with only practical measurements is a complicated mathematical problem. To overcome this, our approach focuses on utilizing deep reinforcement learning (RL) to suggest and construct feedback laws that only depend on these measurements, namely the adult mosquito population, which can be measured using pheromone traps.
Many dynamical systems arising from practical applications are subject to measurement constraints, which render the stabilization problem complex from a mathematical perspective. We believe that this approach could help in finding new solutions to these problems.

This is a joint work with **Jean-Michel Coron, Amaury Hayat** and **Nathan Lichtlé** [2].

[1] K. Agbo Bidi, L. Almeida, J.-M. Coron. *Global stabilization of sterile insect technique model by feedback laws.* arXiv e-prints, pp. arXiv–2307, 2023.

[2] K. A. Bidi, J.-M. Coron, A. Hayat, N. Lichtlé. *Reinforcement learning in control theory : A new approach to mathematical problem solving.* arXiv preprint arXiv :2310.13072, 2023.

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