

# Simple adaptive feedback control for positive state systems with potential applications to pest management

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Pest and weed management is vitally important for modern arable farming, but models for pest species are often highly uncertain. In the context of pest management, control actions are naturally described by a nonlinear feedback that is generally unknown, which thus motivates a robust control approach. I shall give a brief overview of our recent work on adaptive feedback control, designed in a pest management context. Two advantages of feedback controls are their (theoretical) ease of implementation and robustness to certain forms of uncertainty - aspects I shall discuss. Particular mathematical novelty is that models for pests are necessarily instances of so-called positive (state) systems, as their state variables only take nonnegative values capturing abundances or densities, and so the controls must respect these constraints. In developing our control strategies we thus appeal to comparison and monotonicity arguments. Interestingly, componentwise nonnegativity of the model, combined with an irreducibility assumption, implies that several issues typically associated with high-gain adaptive controllers do not arise and usual high-gain structural assumptions are not required.