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# Studying auditory-induced escape manoeuvres and flight activity of pest moths to improve bat-inspired drones hunting moths in greenhouses.

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## Abstract

Although greenhouses are more advanced and have greater crop yields than ever before, moths still cause considerable damage to crops. The primary method for fighting moth infestations are insecticides. This practice is under societal pressure, and so new sustainable moth control methods are needed. In nature, moths are hunted by bats, which they have developed dedicated escape strategies against. This includes an auditory system tuned to ultrasound echolocation calls, and dedicated evasive flight manoeuvres. In response, bats alter their calls and use their own specialized flight manoeuvres to counter the moth's lastminute effort at survival. By studying this arm's race between bats and moths and understand what makes a bat a successful hunter, we develop new bio-inspired moth control solutions in a greenhouse environment. This includes bat-inspired autonomous quad-copter robots that hunt down moths, like bats would, and eliminate them in their propellers. To quantify the efficacy of our systems, we track and analyse: 1) highspeed camera footage of moths getting hunted by our drones and 2) the reduction in flight activity of the moth population in greenhouses with and without our system. This research highlights the inherent predator avoidance behaviour of moths and enforces application of our new bio-inspired solutions as a sustainable alternative to the use of pesticides in greenhouses.

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