Enhanced Biosecurity and Pest Animal Control with Machine Vision

BY JOHN MUEHLEBACH, VIGILANCE TECHNOLOGIES, AND MICHAEL ATZENI, DAF

A prototype system has been developed that can locate, classify and deter wildlife that are biosecurity risks or predators to poultry. The detect-alert/deter system (DAD) has been developed by Vigilance Technologies in collaboration with the Queensland Department of Agriculture and Fisheries (DAF) and was funded by AgriFutures Australia.

The system uses security cameras combined with machine vision to detect target species, then triggers a series of deterrents to scare them away. The primary application on a poultry farm would be to deter waterfowl – the main reservoir for avian influenza viruses – from water storages, particularly dabbling ducks such as Pacific Black Duck and Grey Teal. These high risk species mainly feed along the water edge but retreat towards the middle when threatened.

The prototype system uses a pan-tilt-zoom security camera that constantly scans the entire dam for target species. Alternatively, a number of lower-cost cameras could be positioned near high bird traffic areas. Deterrents that can be deployed include inflatable men, lights, bioacoustics such as an alarm or distress call, and remotely controlled boats. The entire system is managed by a central control system that uses machine vision to identify ducks and activate deterrents. Each part of the system is connected to the central station wirelessly.

However, we know that if birds are overexposed to deterrents they will grow accustomed to them. To ensure this does not happen, three things are important:

1) Timing

For maximum impact and effective training of birds, deterrent tools should be 'responsive' to bird presence.
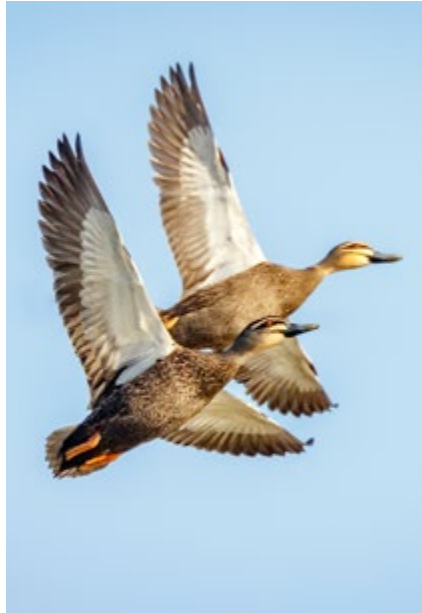
The DAD system deters species such as the Pacific Black Duck.

The deterrent units should only be activated when birds enter the dam area. This responsive capability means birds associate entering the dam area with a bad experience and learn to stay away. Birds are also likely to gain a sense of being watched. When 'non-responsive' tools or methods are used, birds will often learn that the deterrents used are harmless or can be avoided.

2) Strategy

Deterrents should be located where bird traffic is greatest and the areas they retreat to when threatened. Placing the camera system into an area before deterrents are active can help identify the areas where birds are most likely to spend their time and be detected.

3) Monitoring results

The DAD can display bird activity graphs that help evaluate performance. These graphs can be shown by area or species, allowing for the optimal placement of deterrents, or insights as to how farming practices or habitat may be influencing bird behaviour.

A pan-tilt-zoom security camera scans the dam for target species.

The DAD deterrents are portable and tripod-mounted. In the case of a boat, it would contain on-board solar panels and loiters on the dam until sent towards a target's location by the central controller.

The central controller can be located several kilometres away in an area with mains power and can communicate with the rest of the system wirelessly. The DAD can also be accessed over the internet so bird data and status information can be accessed remotely.

Preliminary trials centred on ducks and water have been successful and longer-term trials will commence in June. Previous efficacy trials, using radar instead of cameras, were successful in deterring birds in horticultural applications.

With further software development the DAD system may be adapted to other poultry monitoring tasks, and for many other applications beyond the poultry industry.