

AI technology and self-coordinating drones to detect and investigate wildfires

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Credit: University of Sheffield

A swarm of self-coordinating drones for firefighting, as part of an effort to develop cost-effective early mitigation strategies for wildfires has been developed.

Using AI technology—incorporating thermal and optical imaging—which was developed in Sheffield at the School of Electrical

and Electronic Engineering, the drones can automatically detect and investigate fires, and relay all the information to the fire team.

Under the supervision of fire and rescue teams and using swarm technology developed by University of Bristol, the drones can then intelligently self-coordinate as first responders to rapidly deploy fire retardant onto the fire, monitor the situation and return to base.

"Autonomous wildfire detection and localization, especially in remote and large geographic areas, with hot weather is a challenging task that has not been fully achieved yet with the current technology.

"At the University of Sheffield, we have been developing AI and Computer Vision approaches able to work under different weather conditions and by extracting efficient image information from the incoming video data.

"The main aspects of our work are the robustness and scalability of the developed approaches, evaluation of the trustworthiness of the developed solutions, and efficient human-UAV teaming.

"Although autonomous singular drones have been partially used in firefighting, the swarms' technology provides a higher level of efficiency and trustworthiness.

"The technology can lead to a step change in wildfire tackling operations and equips firefighters with powerful tools for remote tackling of propagating fires," stated Dr. Lyudmila Mihaylova, Professor of Signal Processing and Control in the School of Electrical and Electronic Engineering at the University of Sheffield.

Lancashire Fire and Rescue, which in 2018 spent 41 days battling a wildfire across 18 square kilometers of moorland near Bolton, has tested

a swarm of self-coordinating drones for firefighting, as part of an effort to develop cost-effective early mitigation strategies for wildfires.

The project brought Lancashire Fire and Rescue together with Windracers (<https://windracers.com/>), the British developer of self-flying cargo aircraft, and some of the country's most respected AI and robotics scientists based at the University of Bristol and the University of Sheffield. Together they have developed unique [technology](#) for autonomously detecting and suppressing fires before they spread into uncontrollable wildfires.

"The earlier we reach fires, the less harm they pose to firefighters, communities, infrastructure and the environment," said Lancashire Fire and Rescue Service's Chief Fire Officer, Justin Johnston.

Windracer ULTRA self-flying cargo aircraft, which have also been used to carry parcels to the Orkney Islands as well as collect scientific data in Antarctica, are each able to carry 100 kg of fire retardant. They can fly autonomously in a search pattern to monitor danger areas over the summer months, with a swarm of drones potentially covering areas the size of Greece.

Wildfires have become more frequent, larger, and more severe in the United Kingdom. Factors such as land use changes, higher temperatures, drought conditions, and climate change contribute to this trend. In 2022, there were over 44,000 [wildfires](#)—a rise of 72% from the previous year.

Provided by University of Sheffield

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