Stop the Flame in Its Infancy! Multivariable Early-Warning System for Low-Cost Prevention of Wildfire Proliferation

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Every year, devastating wildfires cause substantial environmental and economic damage all around the world. In most cases, firefighters are unable to identify wildfires until the flames grow into uncontrollable blazes. A novel, low-cost system that uses multiple fire characteristics corrected for environmental variables was developed to detect wildfires at their earliest stage, allowing firefighters to combat flames before they grow into deadly infernos. The present system consists of a dispersed network of devices that wirelessly communicate to provide comprehensive, real-time monitoring of the area. To evade false positives, multiple stages of verification are employed, using a variety of characteristics during detection (long-wave infrared thermal imaging, near infrared narrow-band imaging, smoke signature, and others). Last verification is performed by a dedicated artificial intelligence method. The most probable false positives were proved to not set off fire warnings due to the system's multivariable verification algorithm. Spectral analysis was performed on various emission sources to identify unique spectral features used in the flame identification. Meteorological factors such as wind patterns, temperature and humidity variation, are compensated by an algorithm that compares real-time readings to a calibrated baseline. The novel, affordable method of early wildfire detection provided by this unique system will allow firefighters to contain early wildfires. Furthermore, the present system can be used in conjunction with the existing NASA satellite network. Thus, the distributed system can save billions of dollars in fire damage and prevent future wildfire-related fatalities, all at a fraction of the cost of existing wildfire detection methods.

Awards Won:
Intel ISEF Best of Category Award of $5,000
First Award of $5,000
ASU Rob and Melani Walton Sustainability Solutions Service: Award of $1,000
American Meteorological Society: First Award of $2,000
U.S. Agency for International Development: USAID Science for Development Third Place Award of $2,000.
China Association for Science and Technology (CAST): Award of $1,200