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ALERTCalifornia: An Advanced Camera Network for Wildfire Control in California

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ALERTCalifornia is a network of state-of-the-art Pan-Tilt-Zoom (PTZ) fire cameras and associated tools to help firefighters and first responders confirm fire ignition; quickly scale fire resources up or down appropriately; monitor fire behavior through containment; and provide enhanced situational awareness to inform firefighting strategy and aid in evacuations. The system has now become an essential tool with over a thousand cameras located across California.

ALERTCalifornia represents the 3rd generation of UC San Diego's wireless network. The 1st generation was HPWREN, serving as the wireless backbone for first responders fighting the Cedar fire in 2003. With continued growth, we developed ALERTWildfire, which populated three collaborating states: California, Nevada, and Oregon with over 800 pan-tilt-zoom (PTZ) near infrared fire cameras funded by California utilities. ALERTCalifornia combines over 1000 state-of-the-art PTZ near-infrared sensors with new lidar and multispectral data across California. It is is a multi-hazard platform that provides remote sensing data to help California prepare for, respond to, and recover from events.

The overarching goals of ALERTCalifornia are three-fold. First, using lidar and multispectral data, we are quantifying the vegetative fuel load and moisture content before megafires, which will aid forest management decisions; second, during extreme wildfires, our array of sensors will provide actionable real-time data to quickly scale fire resources, help evacuations through enhanced situational awareness, and monitor fire behavior; and finally, lidar and multispectral data will image post-fire landscape changes in burn scar areas (e.g., soil erosion, debris flows, and revegetation). With the frequency and severity of wildfires in California increasing at an alarming rate over the last decade, remote sensing data have never been more essential to develop effective and time-critical plans for wildfire prevention, protection, mitigation, and response.

New high resolution lidar, multispectral and imagery data are instrumental in the study of fuels and fuel regrowth models. The collection of these data will improve fire resiliency in California by enabling data analytics and extensive research on fuels and forest health to accurately model wildfire behavior. An additional application of interest to our team includes assessing post-wildfire hazards. Through the employment of advanced data mapping techniques, the ALERTCalifornia program will create a virtual dashboard for direct targeting of fuel reduction efforts year-round and more efficient firefighting during peak fire season to save lives as well as protect habitats and infrastructure.

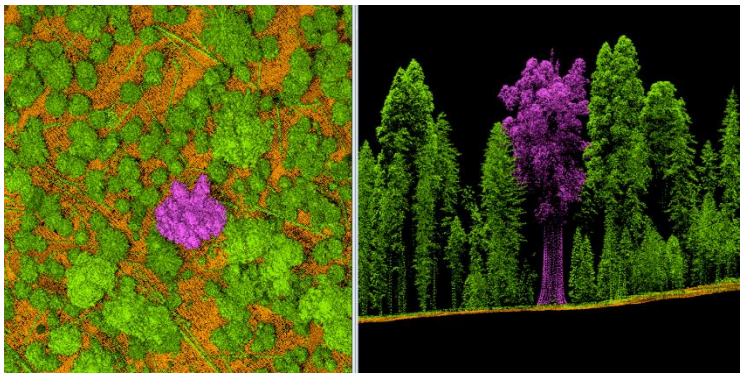

Figure 1. Fixed wing lidar and imagery data from the Sequoia National Forest images the 'General Sherman' tree and yields quantitative estimates of fuel loads in the canopy and on the forest floor. Purple distinguishes the 'General Sherman' tree, with the forest canopy in green and the forest floor in brown.

It is important to note the wildfires and the consequent cascading disasters are impacting soil, water, and air quality. An added advantage of fuel management and early fire confirmation and suppression will be the vast reduction in the level of CO2 generated by these megafires.

In 2018 alone, California wildfires released 68 million tons of heat trapping carbon dioxide, or about 15 percent of all emissions produced by California on an annual basis. Scientists estimate that the CO2 production from a 100K acre fire is equivalent to the CO2 emissions of 7 million automobiles running continuously for one year! We cannot solve the climate crisis without first addressing the wildfire problem. Likewise, water quality in reservoirs and riparian environments are being negatively impacted by these extreme wildfires.

As ALERTCalifornia is a UC San Diego project, the data are open sourced and will be available to firefighters, first responders, legislators, city planners, the public, and scientists for years to come.