World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:16, No:12, 2022

Generating Individualized Wildfire Risk Assessments Utilizing Multispectral Imagery and Geospatial Artificial Intelligence

Authors : Gus Calderon, Richard McCreight, Tammy Schwartz

Abstract : Forensic analysis of community wildfire destruction in California has shown that reducing or removing flammable vegetation in proximity to buildings and structures is one of the most important wildfire defenses available to homeowners. State laws specify the requirements for homeowners to create and maintain defensible space around all structures. Unfortunately, this decades-long effort had limited success due to noncompliance and minimal enforcement. As a result, vulnerable communities continue to experience escalating human and economic costs along the wildland-urban interface (WUI). Quantifying vegetative fuels at both the community and parcel scale requires detailed imaging from an aircraft with remote sensing technology to reduce uncertainty. FireWatch has been delivering high spatial resolution (5” ground sample distance) wildfire hazard maps annually to the community of Rancho Santa Fe, CA, since 2019. FireWatch uses a multispectral imaging system mounted onboard an aircraft to create georeferenced orthomosaics and spectral vegetation index maps. Using proprietary algorithms, the vegetation type, condition, and proximity to structures are determined for 1,851 properties in the community. Secondary data processing combines object-based classification of vegetative fuels, assisted by machine learning, to prioritize mitigation strategies within the community. The remote sensing data for the 10 sq. mi. community is divided into parcels and sent to all homeowners in the form of defensible space maps and reports. Follow-up aerial surveys are performed annually using repeat station imaging of fixed GPS locations to address changes in defensible space, vegetation fuel cover, and condition over time. These maps and reports have increased wildfire awareness and mitigation efforts from 40% to over 85% among homeowners in Rancho Santa Fe. To assist homeowners fighting increasing insurance premiums and non-renewals, FireWatch has partnered with Black Swan Analytics, LLC, to leverage the multispectral imagery and increase homeowners’ understanding of wildfire risk drivers. For this study, a subsample of 100 parcels was selected to gain a comprehensive understanding of wildfire risk and the elements which can be mitigated. Geospatial data from FireWatch’s defensible space maps was combined with Black Swan’s patented approach using 39 other risk characteristics into a 4score Report. The 4score Report helps property owners understand risk sources and potential mitigation opportunities by assessing four categories of risk: Fuel sources, ignition sources, susceptibility to loss, and hazards to fire protection efforts (FISH). This study has shown that susceptibility to loss is the category residents and property owners must focus their efforts. The 4score Report also provides a tool to measure the impact of homeowner actions on risk levels over time. Resiliency is the only solution to breaking the cycle of community wildfire destruction and it starts with high-quality data and education.

Keywords : defensible space, geospatial data, multispectral imaging, Rancho Santa Fe, susceptibility to loss, wildfire risk.
Conference Title : ICDRBE 2022 : International Conference on Disaster Resilience in Built Environment
Conference Location : New York, United States
Conference Dates : December 09-10, 2022