Household-level wildfire evacuation trigger modeling

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Abstract

Wildfire evacuation trigger points are prominent geographic features (eg., ridges, roads, and rivers) utilized in wildfire evacuation and suppression practices, and when the fire crosses these features, an evacuation will be recommended for the communities or firefighters in the path of the fire. Recent studies of wildfire evacuation triggers have used Geographic Information Systems (GIS) and wildfire spread modeling to calculate evacuation trigger buffers around a location (P) with a given time (T) as the input. This process has been formulated into a Wildland Urban Interface Evacuation (WUIVAC) model. Wildfire evacuation trigger modeling has been applied in many scenarios, e.g., dynamic forecast weather conditions, community-level evacuation planning, pedestrian evacuation, and protecting firefighters. However, little research has been conducted on household-level trigger modeling. This work explores the potential uses of wildfire evacuation trigger modeling in household-level staged evacuation planning. The method consists of three steps: 1) the WUIVAC model is used to calculate trigger buffers for each house; 2) fire spread simulations are run to trigger the evacuation of all households; 3) the homes are ranked by their evacuation times, which will enable the emergency managers to develop a staged evacuation plan for these homes. This method uses GIS to model the process in which a spreading fire triggers the evacuation of a set of homes based on their trigger buffers. In the end, a case study of Julian, California is used to test the effectiveness of the proposed method, and the results reveal that the proposed method is effective and can be used for household-level staged evacuation planning.

Keywords: wildfire evacuation, trigger, staged evacuation planning