

# Abstract

USING SOCIAL MEDIA CONTENT TO INFORM AGENT-BASED MODELS FOR HUMANITARIAN CRISIS RESPONSE

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Crisis response is a time-sensitive problem with multiple concurrent and interacting subprocesses, applied around the world in a wide range of contexts and with access to varying levels of resources. The movement of individuals with their shifting patterns of need and, frequently, disrupted normal support systems pose challenges to responders trying to understand what is needed, where, and when. Unfortunately, crises frequently occur in parts of the world that lack the infrastructure to respond to them and the information to inform responders where to target their efforts. In light of these challenges, researchers can make use of new data sources and technologies, combining the information products with simulation techniques to gain knowledge of the situation and to explore the various ways in which a crisis may develop. These new data sources - including social media such as Twitter and volunteered geographic information (VGI) from groups such as OpenStreetMap - can be combined with authoritative data sources in order to create rich, synthetic datasets, which may in turn be subjected to processes such as sentiment analysis and social network analysis. Further, these datasets can be transformed into information which supports powerful agent-based models (ABM). Such models can capture the behavior of heterogeneous individuals and their decision-making process, allowing researchers to explore the emergent dynamics

of crisis situations. To that end, this research explores the gathering, cleaning, and synthesis of diverse data sources as well as the information which can be extracted from such synthetic data sources. Further, the work presents a rich, behaviorally complex agent-based model of an evacuation effort. The case study deals with the 2012 Colorado Wildfires, which threatened the city of Colorado Springs and prompted the evacuation of over 28,000 persons over the course of four days. The model itself explores how a synthetic population with automatically generated synthetic social networks communicates about and responds to the developing crisis, utilizing real evacuation order information as well as a model of wildfire development to which the individual agents respond. This research contributes to the study of data synthesis, agent-based modeling, and crisis development.