A Stochastic Decision Model for Hurricane Logistics, Preparedness, and Response

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Project Scope: (Abstract) With an approaching hurricane, emergency managers face a set of logistical action timing decisions: supply, pre-positioning, mobilization, evacuation, and humanitarian aid. The location, time and intensity of the hurricane at landfall are random variables governed by nature. We developed a stochastic dynamic program incorporating economic, social, and logistical impacts of alternative sequential decisions. Results are given for a set of global case studies.

Recent Progress: We have partnered with key weather information services in order to strengthen the backend of the stochastic of hurricanes. Partnerships with the National Hurricane Center, FEMA, and Weather Services International have been established. We have used these relationships not only to strengthen the dynamics of how risk is reported, but also to capture the interaction between weather information and the media. This information is being used to model public responses including the Boy who cries wolf syndrome. Over the past few months we have built a prototype model in order to test and provide initial validation of our approach. In order to test the accuracy of the model, it was run against three historical hurricanes (Charlie, Rita, and Andrew). The results of these runs project a 21-26% reduction in lives lost and a 17-18% reduction in property losses.

Future Plans: Currently, we are strengthening the model by developing a user defined interface for emergency managers. We are developing relationships with emergency mangers in three Florida cities. By working with key officials, we want to continue to look at the social aspects of decision making (ex. Boy Who Cries Wolf, budget limitations, mutual aid, and national aid). We plan to work with these managers to explicitly model these cities and run a set of simulations to determine how our model interacts and differs from the current decision process. Our second goal is to partner with Home Depot to model the back end or humanitarian supply chain process that goes into decision making.

Relevance to listed research areas: Our research cuts across four of the sixteen areas. First our modeling is a decision making tool for hurricane preparedness and response; making our research relevant in the emergency preparedness in response area. By trying to mitigate the effects of potential hurricanes, our research interfaces with the natural disaster area. Our model is a decision making tool; thus lending itself to the risk and decision sciences area. What is unique about our approach is that we are modeling social factors such as the Boy Who Cries Wolf and the effect of the media, overlapping with the social, behavioral, and economic sciences area.

Publications: *Responding to Emergencies: Lessons Learned and the Need for Analysis*, INTERFACES (Special Issue, Applications of Homeland Security, January 2007)