

Robots, Emergency Management (EM), and People

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Texas A&M University Center for Robot-Assisted Search and Rescue (nonprofit)

special thanks to Fort Bend County OEM, Roboticists Without Borders members Justin Adams and Florida State University Center for Disaster Risk Policy

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Hurricane Harvey

- \$125 BILLION in federal relief
- 107 people in US died
- 300,000 structures destroyed
- 30,000 people displaced
- 20% of Gulf of Mexico refining affected

https://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwiBoqLrajZAhUC7awKHcWZAC4QJRwIBw&url=http%3A%2F%2Fbgr.com%2F2017%2F08%2F29%2Fhurricane-harvey-photos-houston-before-after%2F&psig=AOvVaw39EAsxfQdOA3SEFAAqmPs&ust=151881952564525



The average number of major federal disasters each year

Annual direct costs just from FEMA Disaster Relief Fund (before Harvey)



Can Robots Help?



Might Have Needed the UMVs Used to Reopen Ports in 6 hours versus 6 months





Or Even the UGVs Used in Mexico City Earthquake if a Building Had Collapsed



Courtesy of Matt Travers and Howie Choset

But these are covered in the media as high profile, live-saving operations...

... there's more to emergency management!

Emergency Support Functions



- Transportation Department of Transportation
- . Communications National Communications System



3. Public Works and Engineering U.S. Army Corps of Engineers



Firefighting Department of Agriculture/Forest Service



5. Emergency Management Federal Emergency Management Agency



6. Mass Care, Housing, Human Services Department of Homeland Security American Red Cross



Resource Support General Services Administration



8.

- Public Health and Medical Services Department of Health and Human Services
- 9. Urban Search and Rescue Federal Emergency Management Agency



10. Oil and Hazardous Materials Response Environmental Protection Agency



11. Agriculture and Natural Resource US Department of Agriculture/Department of the Interior



- 12. Energy Department of Energy
- 13. Public Safety and Security Department of Homeland Security/Justice



14. Community Recovery, Mitigation, and Economic Stabilization U.S. Small Business Administration



15. External Communications Federal Emergency Management Agency



EM Are Responsible for Prevention and Preparation Too



EMs are Using Small UAVs

- Checking drainage and construction sites
- Irrigation canals
- Vegetation impacting power lines
- Documenting crime scenes

BUT FORT BEND COUNTY FOUND A PROBLEM

The Informatics is Hard!

- 1. Unmanned systems produce a data avalanche!
 - exceeds wireless capability
 - exceeds cognitive capability

UAV: ~40 Acres, 4cm resolution in 3 Hours



UAV: ~40 Acres, 4cm resolution in 3 Hours but 0.5-1 GB files, no comms



People Have to Solve Informatics



The Informatics is **REALLY** Hard!

- 1. Unmanned systems produce a data avalanche!
 - exceeds wireless capability
 - exceeds cognitive capability
- 2. All disasters are different
- 3. Recovery can take 3 decades

It's Not BigData+CPS+SmartCities+...



"CRICIS requires fundamental new research in socio-technical systems that enable decisionmaking for extreme scales under extreme conditions. This research cuts across physical and engineered artifacts, information technology, and human-computer collaboration."

2012 NSF/CCC National Workshop