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Emerging technologies

FEMA’s Chief Innovation Adviser, Desi Matel-Anderson, founder of the Field Innovation Team (FIT) is on a mission to deliver real-time innovations in disasters, says J P Vielleux

Having recognised the power of networks during a disaster, Matel-Anderson has pulled together 29 diverse backgrounds (inventors, engineers, sci-fi writers, hackers, social innovators, nanotechnologists, the drone industry and more). The team and its collaborators have already created numerous apps; found ways to increase signal bandwidth to help FEMA Disaster Recovery Centres (DRCs) enhance operations; helped re-design the set-up and flow of FEMA DRCs; and piloted the concept of sending FEMA Corps members directly to survivors at their locations to perform disaster assistance registration on-the-spot with tablets.

FIT embraces open source solutions. When the team develops a new technology or process internally, it is shared openly on FIT’s website or through other collaborative websites such as GitHub.

Among the growing list of successes are two technologies created by FIT partners—one of which has been deployed in a disaster zone. The second is ready to help and will probably be deployed in the near future.

FIT members deployed in Oso, Washington, USA soon after the mudslide, using a piece of technology that empowered engineers managing recovery efforts. The case of Oso was particularly challenging. The muddy terrain, also known as the Moonscape, looked impossible to cross and the rescuers risked getting stuck in mud that was metres deep in places or triggering a new mudslide.

The quadcopter UAS, or drone, is the result of collaboration between the FIT and Roboticians Without Borders, a team from the Center for Robot-Assisted Search and Rescue of the Texas A&M Engineering Experiment Station, as well as the unmanned aerial system (UAS) teams from Insitu, and PrecisionHawk.

The drone was the first of its kind to fly over a mudslide disaster zone on US soil. Its mission was to collect visual data of the Moonscape with a digital camera and then use the images and videos to create a computer-generated 3D rendering of the topography.

The UAS collected visual data within a few hours, completing seven flights over a four-hour period. Using Autodesk’s Objet 500 3D printer, the team used the computer model to print a real-life 3D model and give a better idea of the terrain. The maps and models were delivered to the Oso Fire Chief and engineers. There is still work to do: the high-resolution LIDAR data took two to four days from the time the data was collected to when it was received by incident management. Nonetheless, such information is precious: it saves time and keeps responders safe. The mapping prevents them from taking risks that would be otherwise unavoidable.

Underwater signal

Anyone who has been on the ground in a disaster zone knows that communication is often a challenge. Damaged infrastructure makes it hard for survivors and responders.

Tony Sutherland of Chamtech and a volunteer for FIT, has developed a Nanoparticle Spray Antenna, the Chamtech Spray-On Antenna. Responders could walk around the area where there is a communication blackout, spray the substance on trees, buildings, ground or even people, to re-establish the signal. The tiny particles act as communication nodes on the ‘smart grid’. The range is frequently more than double that of a standard antenna. It does not need energy, which means no drain on battery life, nor does it get too hot like traditional antennas. The spray can be used underwater, with dramatic results: signals carried more than a mile during testing, and all this by using only three watts as opposed to the thousands of watts normally required.

The Nanoparticle Spray Antenna has been tested, but is yet to be used on the ground in the aftermath of a disaster. Most new technologies go through some resistance before their widespread adoption. Whether it is privacy concerns or military associations, the UAS and Nanoparticle Spray Antenna technologies also face those issues.

And it does not stop there. One of FIT’s upcoming projects is to work with aquanauts (astronauts under the sea) to test preparedness in Key Largo, Florida, for the next hurricane season, where they will test the underwater communication infrastructure.

Author

J P Vielleux is a writer and collaborator with FIT