

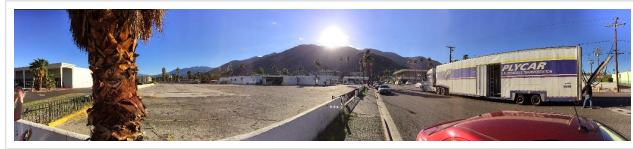


This blog hosts weekly news about the Texas A&M University Sketch Recognition Lab. SRL is directed by Dr. Tracy Hammond, an associate professor in the Computer Science and Engineering Department. More information about the lab can be found at <http://srl.tamu.edu>

Friday, April 3, 2015

Dr. Hammond Presents at 2015 Esri Developer Summit

On Thursday, March 12, the Director of the Sketch Recognition Lab, Dr. Tracy Hammond, presented GeoTrooper at the 2015 Esri Developer Summit, held in Palms Beach, Florida, in a presentation titled "Wearable Haptic Navigation Systems for Soldiers and Motorcyclists."



As described by their website, Esri is a company that "inspires and enables people to positively impact the future through a deeper, geographic understanding of the changing world around them." The Esri Developer Summit is a convention by developers, for developers. Over 2,500 geographic information system (GIS) experts and enthusiasts attended the conference. More than 300 presentations took place at the convention from March 10 to March 13.

Dr. Hammond started her presentation with a short video clip from KBTX (<http://www.kbtx.com/home/headlines/Texas-AM-Team-Puts-the-Vibe-on-Navigation-Technology-235487141.html>) concerning Texas A&M University putting the "vibe on navigation technology." This transitioned into a discussion about the current methods and issues that paratroopers go through to navigate from their drop site to the rendezvous point.

Normally done in the dead of night, soldiers plummet from the skies in enemy territory to land and find their way to a safe point with their allies. However, between the fatigue stemming from no sleep, carrying about 200 pounds of equipment, and being a stranger in a strange land, this trek to safety can be dangerous and difficult.



(Dr. Hammond presenting at 2015 Esri Developer Summit)

A few current methods in place to solve the issues of navigation are Stiner Aids, Heavy Drops (HD), and memorization. Stiner Aids are 15 foot tall poles that are visible with night vision goggles. Different assembly areas are differentiated with different chemical colors. However, these poles are heavy to transport, can be hard to identify, and can be seen by enemy forces that have Infrared (IR) vision capabilities. Heavy Drops are

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platforms marked on all four sides with visual chemical lights. HD platforms, however, may or may not be located at planned areas. The chemical lights used to guide soldiers to the landing platforms have the same issues as the Stiner Aids – they are hard to identify and can be seen by anyone with IR capabilities. This begs the question, if a soldier can't see a HD platform or chemical lights, how does he find it?

Before GeoTrooper, the answer was that the soldiers were to memorize their expected landing point, the number of paces to a rendezvous point, and the angle to turn based on the direction which the plane was flying. This is difficult in practice fields, let alone on battle fields where people are shooting at the soldiers while they try and navigate their way to their correct location. While these walks were supposed to take 15 minutes, they took up to two hours in practice.

"This is a vital issue that we need you to solve," Lieutenant General Helmick, who was the mentor for GeoTrooper, stated on a visitation to the Sketch Recognition Lab (SRL). "Not only is this a problem in battle, but also in training: two lost soldiers died of hypothermia 50 meters from the road."



(LTG Helmick talking to Dr. Hammond and the SRL)

Dr. Hammond made 12 visits to Fort Bragg, flew on several C17's and C130's while watching troops jump from inside a plane and into a practice drop zone. She also made a practice jump with the Golden Knights and held weekly tests of GeoTrooper at Texas A&M University with the Corps of Cadets and the ROTC.

While Dr. Hammond and her team went through a variety of prototypes involving visual and auditory sensations to guide soldiers, testing concluded that to take away these senses from soldiers led to a reduced ability to pay attention to the area that surrounds them – their focus was greatly hindered.

"I only realized I was being shot at when my team members ducked from the bullets," one team leader commented about the difficulties of having an audio navigating system.

That left Dr. Hammond and her team with touch. Thus, they created GeoTrooper, a vest that navigates using haptic technology. Soldiers are guided by vibration-taps on either shoulder that correspond to Bluetooth navigation. At each rendezvous point, there is a transmitter that acts as a beacon to the receiver inside of the vest.

With GeoTrooper, no training is required. Based on many tests and experiments, Dr. Hammond and her team found that everyone instinctively reacted the same way to touch-guidance. So soldiers also did not need to think about how to react to the vibration-taps. They just allow their bodies to move. It is also lightweight – only a few ounces – and does not distract soldiers from the situation taking place around them.

"Finally," a retired army captain commented, "a solution that actually responds to the needs and burdens of the soldier."

With GeoTrooper introduced and explained, Dr. Hammond went on to introduce the motorcycle GPS system application of the product, called HaptiMoto.

As she explained in the presentation, motorcyclists' needs for situational awareness are surprisingly similar to soldiers – both sets of people need hyper-awareness in a dangerous environment, both have their hands occupied (thought cyclists are holding the clutch and gas/brake, not a gun), and both have their eyes and ears occupied.

Similarly, the current methods of navigation for cars are not feasible for safe for motorcyclists. GPS systems are an auditory and visual hazard. Cell phones need to be looked at and held. Cyclists need turn-by-turn guidance, timely and accurate directions, and warning before a turn is to be made.

HaptiMoto allows for a motorcyclist to be navigated to their desired location through a series of vibration-tap signals. For example, when a driver is approaching a left turn, their left shoulder will be tapped once, when they need to prepare to turn, they will receive two taps, and when they need to take the next turn, they will be signaled with three taps.

	Approaching Turn	Get Ready To Turn	Take the Next Turn
Left	L  R _____ B _____	L  R _____ B _____	L  R _____ B _____
Right	L _____ R  B _____	L _____ R  B _____	L _____ R  B _____
U-Turn	L  R  B _____	L  R  B _____	L  R  B _____
Straight	L _____ R _____ B 	L _____ R _____ B 	L _____ R _____ B 

(HaptiMoto Signal Dictionary image from Dr. Hammond's presentation)

After various tests that allowed for fitting and other issues to be fixed, HaptiMoto has proven to be a successful guiding system for its wearers. It does not interfere with situation scanning by being a cognitive burden or by distracting people from being able to focus on what is happening around them. Interestingly, drivers using haptics solutions were significantly faster at getting to their destination than those using audio.

"Being a motorcyclist myself, I look forward to having a product like this in the future to ride further and to new areas without having to pull over so often to check a map repeatedly," Amanda Lampley, a senior at Texas A&M University in environmental studies, later commented about the presentation in an email. "One of the most interesting ideas to come up from the audience was using the technology for handicapped individuals, such as deaf and blind people"

Dr. Hammond finished her presentation with the unavoidable conclusion - haptics is better than visual and auditory navigation interfaces for soldiers and motorcyclists.

"I loved Dr. Hammond's presentation!" Lampley stated, "I think what her and her team are doing is fantastic."

Amanda Lampley is one of Dr. Daniel Goldberg's staff members who is planning to pursue a Masters' under Goldberg in the fall. Goldberg also brought several other members of his lab including Payton Baldrige, Aron Harmon, and Edgbar Hernandez.

Goldberg presented a talk on the development and impact of GIS Days at TAMU (prior blog highlighted this: <http://tamusrl.blogspot.com/2014/11/gis-day-2014-esri-director-of-software.html>) which was incredibly well received.

Clint Brown (<http://tamusrl.blogspot.com/2014/12/clint-browns-reflections-on-his-visit.html>) also attended Hammond's talk.

Brown, Hammond, and Goldberg vibrantly discussed ways for TAMU and Esri could be more interconnecting for over an hour in the hallways between talks.

Posted by [Hannah Conrad](#) at 9:07 PM



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