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External Engagement Statement

As a roboticist motivated by creating highly capable and intelligent mobile robots to robustly conduct missions in humanitarian crises, such as after-disaster response, restoration, reconstruction, and betterment, my research work not only requires, but also fosters, engagement with external communities, such as robot manufacturers, first responders, emergency management agencies, and the general public.

Bringing State-Of-The-Art Robotics Technologies to Stakeholders Worldwide

During my Ph.D. years at Texas A&M University, I have developed robotics technologies and deployed them in multiple real-world humanitarian crises, including Hurricanes Harvey and Irma, the Greece refugee crisis, and other emergency response exercises world-wide. For example, we deployed our Unmanned Aerial/Surface Vehicle team (UAV/USV) for marine mass casualty incident response in search and rescue exercises conducted by the United States Coast Guard and Galveston Fire Department during Summer Institute 2016 in Galveston, TX; Italian Coast Guard during 2016 exercise in Genoa, Italy; Brazos County Fire Department and Grimes County Emergency Management during Brazos Valley Search and Rescue Exercise 2017 in Gibbons Creek, TX [9]; Los Angeles County Fire Department Lifeguards during 2017 exercise in Los Angeles, CA [5]; and Department of Homeland Security during 2017 CAUSE V exercise in Bellingham, WA. As Assistant Chief Fernando Boiteux said [5], our UAV/USV team reduced the time for certain tasks of his Los Angeles Baywatch team, which currently take a long time. By engaging with stakeholders worldwide and bringing them our latest robotics technologies out of the lab, we provide them with a new perspective of and new possibilities to conducting their daily tasks in a more efficient way.

During my postdoctoral research, I developed an Adaptive Planner Parameter Learning (APPL) pipeline, which allows non-expert users to effectively use robotics technologies without expert robotics knowledge. The users, e.g. army soldiers, can simply use a game controller to teach the robot how to outperform humans with a simple demonstration or only a few interventions [2]. Through this work, we pass the baton of sophisticated robotics technologies to non-expert end users, whose capability is augmented by using our robotics research to achieve direct commercial and societal impact.

Connecting Robot Manufacturers with Potential Customers

Another type of external engagement that I have been involved in is through a three-way relationship with industrial robot manufacturers and their potential customers. Fire fighters, search and rescue responders, emergency management agencies are always on the look out for better equipments and technologies to address humanitarian crisis. On the other hand, in addition to building proof-of-concept robot platforms from scratch, my field work oftentimes involves hardened robots built by professional robot manufacturers. Therefore, I have very deep relationships with the robot industry, for example, start-up companies like Fotokite [1] and Flyability [12] for UAVs, Hydronalix [6] for USVs, and large companies like iRobot [3] and Endeavor Robotics [8] (now acquired by FLIR [7]) for ground vehicles. My research on developing highly capable and intelligent robots is an effective catalyst to bring these two parties together. While presenting our latest research results and potential future use cases to the stakeholders, I also connect them as potential customers to those mature robotics technologies developed by the industrial partners. For example, we introduced Elios, a hardened UAV with a protective rotating cage for collision-resilient flight in extremely cluttered spaces built by Flyability [12], to Japan Atomic Energy Agency, when I was working on my tethered UAV solution for their remote decommissioning task. Another example is by using the first generation of Fotokite, a tethered selfie drone, for Fukushima Daiichi nuclear decommissioning in my Ph.D. thesis, we introduced the company Perspective Robotics AG) [1] who built Fotokite into the field of disaster robotics. The company has now successfully pivoted from focusing on aerial photography/videography to a company that builds tethered UAVs for firefighters and first responders. The new generation of Fotokites have been mounted on fire trucks and deployed in search and rescue missions around the globe.

Introducing Robots to the General Public

Robotics, commonly perceived as a sophisticated engineering field, is usually intimidating for the general public. My research work aiming at developing robots working in the real world also provides an effective channel to engage the general public. As mentioned before, APPL is one representative work of introducing complicated robotics technology to non-expert users. Furthermore, working with many physical robots deployable in the real world gives me the opportunity to introduce robotics as popular science to non-technical audiences. Through many Robot Petting Zoo [4] events organized by Center for Robot-Assisted Search and Rescue during my Ph.D., I was able to introduce the general public to different aerial, ground, and water robots through interactive demonstrations. Our robots have been successfully introduced to high school students, undergraduates students, local kids and parents, and more importantly, many minority and underrepresented groups. These outreach events unveil our robots to the public, foster societal acceptance of these new technologies, and inspire young generations to purse robotics engineering and research in the future.

In addition, as the co-assistant director of Texas Robotics [11], I worked closely with our industrial partners, including Amazon, Apptronik, Bosch, Grit Ventures, Sandia National Laboratories, and YASKAWA [10], to promote science and engineering partnership among education, research, and industry.

Building on the history of all my engagement experiences and relationship with external communities, spanning from the robotics industry, first responders, emergency management agencies, to the general public, I will continue to promote such engagement in my future academic career. I believe only through an active and frequent channel of external engagement can our academic research be effectively applied to achieve direct real-world commercial and societal impact and ultimately realize my research goal of having highly capable and intelligent robots working in our society for every one of us.

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