FABS and LABS

Wireless Innovation Lab Tackles Problems, Forges Partnerships – Even Bumblebees

Photo credit to Matthew Burgos / WPI.

Before you can pronounce his name, Alexander Wyglinski has introduced himself and is showing us around. Words streaming in a New York minute, he is totally engaged, gesturing, writing on the white board, smiling, laughing, enthusiasm bubbling. Wyglinski (pronounced: wig-lin-skee) is the director — father — of the Wireless Innovation Laboratory at Worcester Polytechnic Institute, or WPI, as the locals call it.

The WI Lab was born with Wyglinski's arrival at WPI during the summer of 2007. He was recruited to set up a research facility focusing on wireless communication systems. Wyglinski says the lab's mission is "to advance the current state-of-the-art in wireless communication, coming up with practical solutions to technological challenges that are facing the wireless sector and society in general." The WI Lab chooses high-risk projects with a five-year horizon, fundamental and applied research across a range of wireless applications: wireless communication systems engineering, cognitive and software defined radio, satellite communication, electromagnetic spectrum security and connected vehicles. Mirroring WPI's project-oriented curriculum, the lab's projects are "hands on"— meaning they build and test lots of prototype hardware. The lab typically has five externally-sponsored projects underway, keeping six to seven Ph.D., one or two master's and about 10 undergraduate students busy.

The list of company and government labs sponsoring WI Lab projects is impressive: Analog Devices, MathWorks, MITRE, Raytheon, Toyota, the Air Force Research Laboratory (AFRL), National Science Foundation (NSF), Naval Research Laboratory (NRL) and the Office of Naval Research (ONR). Such collaboration is symbiotic: enabling meaningful research that neither company nor WPI can do alone, extending the R&D horizon beyond what most quarterly-driven companies can tackle, providing research for advanced degrees and identifying future technical talent for the sponsoring organizations.

One of Wyglinski's keen interests is autonomous driving. He can talk at length about the technical, regulatory and human factors challenges to be solved — no surprise that he's the president-elect of the IEEE Vehicular Technology Society. In one of WPI's labs, students work on a golf cart outfitted with the various subsystems required for autonomous driving. It's definitely a prototype, with a mix of wires, circuit boards and computer monitor juxtaposed with the seats and frame.

Reading about research in WPI's biology and biotechnology department, Wyglinski wondered whether vehicle-to-vehicle (V2V) communication could learn from bumblebees. How bumblebees collect information and make decisions is analogous to a cognitive radio. In a highway of autonomous vehicles, each will need to quickly identify the most reliable and low latency communications channel. Seeing if bumblebees can help solve that cognitive radio challenge led to collaboration with two biology professors, supported by three Ph.D. candidates and a $300,000 NSF grant. We'll likely never know what's buried in the code of the autonomous vehicles our children or grandchildren will ride in; however, it may bear the legacy of WPI's bumblebees.

Wyglinski says "nine of 10 ideas don't pan out, yet you have to pursue them all to yield the one success." His enthusiasm is undiminished.

http://ecewp.ece.wpi.edu/wordpress/wireless/