

The Institute of Electrical and Electronics Engineers (IEEE) Galveston Bay Section Meeting



Organized by Joint Societies Chapter

September 21st, 2017 (Thursday) Luncheon Meeting TOPIC: "Swarm Intelligence and the Automatic Navigation of Multiple-Drones"

SPEAKER: Dr. Trung Pham, Universidad de Talca, TALCA, CHILE

PRESENTATION: Swarm intelligence is a discipline of mimicking the coordinated movement of animals in a flock to explore a (terrain) space with the objective of discovering a point of interest. In this aspect, artificial (computational) agents are created and coordinated with simple behavioral rules facilitated through simple communication protocols to explore a data space in order to solve a complex optimization problem. In this approach, the objective function of the optimization is formulated into a hypersurface in a data space, and the computational agents are sent crawling on the hypersurface to explore and discover the optimal point. By spreading out the computational agents across the hypersurface, it is common sense to expect that both the global optimal point and other local minimal (or maximal) points will be discovered by a computational agent, and through the communication protocols all agents will be coordinated to converge toward the global optimal point. Applications of swarm intelligence have been directed toward many interesting problems, but little has been done toward the original observation of the navigation of a flock of animals. In this research work, a flock of simple and inexpensive drones are considered for monitoring forest to detect fire that commonly occur in Chile (as well as in many parts of the world) at the early stage so that extinguishing effort can be effectively applied. The automatic navigation of a flock of many drones is required to minimize the operational manpower, and therefore swarm intelligence is designed to automatically guide the drones in their effort to monitor the terrain and detect sign of fire. Algorithms are derived, and computer simulations are presented as part of the feasibility study for an effective method to combat forest fire

GUEST SPEAKER: Trung Pham received his BSEE, MS, and PhD in Electrical and Computer Engineering from Rice University; and his MBA from the University of Houston in Clear Lake. He is currently a professor in information system engineering, and the Director of the Center of Research in Information Technology at the University of Talca in Chile. He was awarded two R&D research projects (totaling about \$800K USD) by the Chilean agency CONICYT, one on application of encryption technology, and the other on data mining. Trung is a Senior Member of the IEEE, and a Senior Member of the ISA. Previously, Trung worked for Lockheed Engineering and McDonnell Douglas Aerospace at JSC in Houston.

Gilruth Recreation Center NASA-JSC, Discovery Room (downstairs)

Free parking. No security processing required. Easy drive in off Space Center Blvd. See website below for map. Interested non-IEEE engineers, technicians, scientists, IEEE Members and guests alike are welcome!

12:00 PM – 1:00 PM - Program and Q&A

11:30 AM - Light Lunch with reservation (\$10.00 donation). You do not buy lunch to attend. Complimentary for IEEE student members with reservation. Please RSVP Before Noon Monday Sept18th, 2017

Number of lunches is limited. Please reserve early

Reservations for **lunch** or to attend this meeting should be made by email to: <u>d.k.rutishauser@ieee.org</u>

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