COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

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for the degree of Doctor of Philosophy (Ph.D.)

"Distributed Algorithms for Energy-Efficient Data Gathering and Barrier Coverage in Wireless Sensor Networks"

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ABSTRACT OF DISSERTATION

Distributed Algorithms for Energy-Efficient Data Gathering and Barrier Coverage in Wireless Sensor Networks

Wireless sensor networks (WSNs) provide rapid, untethered access to information, eliminating the barriers of distance, time, and location for many applications in national security, civilian search and rescue operations, surveillance, border monitoring, and many more. Sensor nodes are resource constraint in terms of power, bandwidth, memory, and computing capabilities. Sensor nodes are typically battery powered and depending on the application, it may be impractical or even impossible to recharge them. Thus, it is important to develop mechanisms for WSN which are energy efficient, in order to reduce the energy consumption in the network. Energy efficient algorithms result in an increased network lifetime.

Data gathering is an important operation in WSNs, dealing with collecting sensed data or event reporting in a timely and efficient way. There are various scenarios that have to be carefully addressed. In this dissertation we propose energy efficient algorithms for data gathering. We propose a novel event-based clustering mechanism, and propose several efficient data gathering algorithms for mobile sink WSNs and for spatio-temporal

events.

Border surveillance is an important application of WSNs. Typical border surveillance applications aim to detect intruders attempting to enter or exit the border of a certain region. Deploying a set of sensor nodes on a region of interest where sensors form barriers for intruders is often referred to as the barrier coverage problem. In this dissertation we propose some novel mechanisms for increasing the percentage of events detected successfully. More specifically, we propose an adaptive sensor rotation mechanism, which allow sensors to decide their orientation angle adaptively, based on the location of the incoming events. In addition, we propose an UAV-aided mechanism, where a UAV is used to cover gaps dynamically, resulting in an increased quality of the surveillance.

BIOGRAPHICAL SKETCH

Born in Medellin, Antioquia - Colombia

B.S., University of Antioquia, Medellin, Antioquia - Colombia, 2007

M.S., Pontifical Bolivariana University, Medellin, Antioquia - Colombia, 2011

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CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

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Published Papers:

- Catalina Aranzazu Suescun, and Mihaela Cardei, Event-based clustering for composite event detection in wireless sensors networks. The 2016 IEEE 35th International Performance Computing and Communications Conference (IPCCC). Las Vegas, NV - USA. Dec, 2016. DOI: 10.1109/PCCC.2016.7820620. **Best Paper Award**.
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- Catalina Aranzazu-Suescun, and Mihaela Cardei, Distributed algorithms for event reporting in mobile-sink WSNs for Internet of Things. *Tsinghua Science and Technology Journal*. Vol. 22, No. 4, pp. 413 - 426. Aug, 2017. DOI:10.23919/TST.2017.7986944
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- Catalina Aranzazu-Suescun and Mihaela Cardei, Spatio-Temporal event detection and reporting in mobile-sink wireless sensors networks. *The 36th IEEE International Performance Computing and Communications Conference*. San Diego, CA - USA. Dec, 2017. DOI: 10.1109/PCCC.2017.8280438
- Luis Felipe Zapata Rivera, Catalina Aranzazu-Suescun and Imadeldin Mahgoub, An energy-aware collaborative multi-agent system for autonomous underwater vehicles. *The 36th IEEE International Performance Computing and Communications Conference*. San Diego, CA - USA. Dec, 2017. DOI: 10.1109/PCCC.2017.8280480
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- Catalina Aranzazu-Suescun and Mihaela Cardei, Anchor-based routing protocol with dynamic clustering for Internet of Things WSNs. *EURASIP Journal on Wireless Communications and Networking*. (Submitted)
- Catalina Aranzazu-Suescun and Mihaela Cardei, Energy-Efficient weak-barrier coverage with adaptive sensor rotation. *Journal of Combinatorial Optimization.* (Submitted).