

Moncrief-O'Donnell
Endowed Chair
2016 Annual Report



**F. L. Lewis, Ph.D., Moncrief-O'Donnell Endowed Chair
National Academy of Inventors**

Fellow IEEE, Fellow IFAC

Fellow U.K. Inst. Meas. & Control

Prof. Engineer Texas, Chartered Eng. UK Eng. Council

University Distinguished Scholar Professor

University Distinguished Teaching Professor

Texas State Regents' Outstanding Teaching Professor

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The **Moncrief-O'Donnell Endowed Chair in Robotics** was filled in October of 1990 with the hiring of Dr. Frank L. Lewis. Dr. Lewis established the Advanced Controls and Sensors Group (ACS) of the UTA Research Institute immediately on his arrival.

ACS PROGRAM OVERVIEW

The UTARI Advanced Controls and Sensors (ACS) Group consists of Dr. Lewis, 5 Ph.D. students, masters and undergraduate students, and international visiting research faculty. The primary thrusts of ACS are research in controls design for robotic, aerospace, and autonomous systems, intelligent control, cooperative control of networked teams, sensor networks, and real-time control implementation.

Lewis has graduated 48 PhD students. Most of these students have won international and local awards for their work, and several have written books and received US patents. Three are NSF Career Awardees and one is a Dept. of Homeland Security Career Awardee.

New Patent Submitted

We have received 7 US patents. We submitted a new patent this year about our research on using cooperative decision-making for improved control of electric power microgrids. Microgrids are the key to integrating sustainable energy such as solar and wind into the US power grid. Patent Filed-

V. Nasirian, A. Davoudi, and F.L. Lewis, "System and method for distributed control of microgrids," Patent filed, application no. 15/070,611, March 2016.

Three Best Paper Awards for Work in Distributed Control of Electric Microgrids

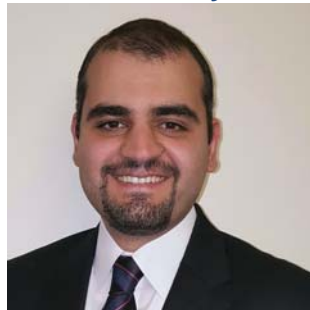


Lewis collaborates with Dr. Ali Davoudi in the UTA Department of Electrical Engineering. This is a highly successful team that develops distributed efficient control systems for renewable energy microgrids. This year we received 3 Best Paper Awards for papers written by PhD student Vahid Nasirian:

Best Paper Award, IEEE Transactions on Energy Conversion.

Prize Paper Award, IEEE Power and Energy Society.

Best Paper Award at International Conference on Resilient Control systems.



Award-Winning Student Vahid Nasirian

Minority and Female Master's Students – Autonomous Systems Lab

Many Master's students work in the UTARI Autonomous Systems Lab. Recent graduates include:

Nnennaya Udochu, female minority, now at Intel in Portland, Oregon.

Chaitanya Rani, female, now at Ceterpillar in Peoria Ill.



AIAA Intelligent Systems Award

This year Dr. Lewis received the Intelligent Systems Award of the American Institute of Aeronautics and Astronautics. This was for his work in developing more powerful adaptive flight control systems for use in unmanned aerial vehicles.



New Algorithms for Human-Robot Interaction (HRI)

This year we studied the interactions between humans and robots in collaborative activities. HRI is important in medical rehabilitation, assistive robots for senior home care, and industrial manufacturing. We developed a new approach for coordinating the intent of humans with the abilities of robots based on our discoveries in Psychological Reinforcement Learning. Here is Isura Ranatunga with the PR2 robot.



International Invited Lectures

Lewis delivered 7 International Invited and Plenary Talks this year including these:

Keynote Speaker, Int. Symposium on Resilient Control Systems, Philadelphia.

Plenary Speech, "Cooperative control for electric Microgrid," World Congress on Intelligent Control and Automation, China

Plenary talk, "Human-robot Interaction," International Conf. Intelligent control- ICIC, Langzhou, China.

Invited lecture, "Cooperative control for Electric Microgrid," City University of Hong Kong.

New Book –

This year we wrote a new book about intelligent distributed control of electric power microgrids, which are the key to integrating sustainable energy resources including solar and wind into the US power grid.

A. Bidram, V. Nasirian, A. Davoudi, and F.L. Lewis, *Cooperative Synchronization in Distributed Microgrid Control*, Springer-Verlag, Berlin, to appear 2016.



Funding of \$9M

ACS has received 80 competitive research grants since 1990 for a total of more than \$9M. Lewis has been continually funded by NSF since 1982. His recent funding is from NSF, Army TARDEC, Office of Naval Research, and Air Force Office of Scientific Research.

Highly Cited Research

Dr. Lewis was named a Highly Cited Researcher in 2016 by Thomson Reuters Web of Science.

UTA Advanced Control Systems Group

Sitting to Dr. Lewis' left is Dr. Vassilis Syrmos, his former PhD student and currently Vice Chancellor for Research of the University of Hawaii System.

