Moncrief-O'Donnell Endowed Chair
2008 Annual Report

F. L. Lewis, Ph.D., Moncrief-O'Donnell Endowed Chair
Fellow IEEE, Fellow IFAC
Fellow U.K. Inst. Meas. & Control
Prof. Engineer Texas, Chartered Eng. UK Eng. Council
University Distinguished Scholar Professor
The Automation and Robotics Research Institute
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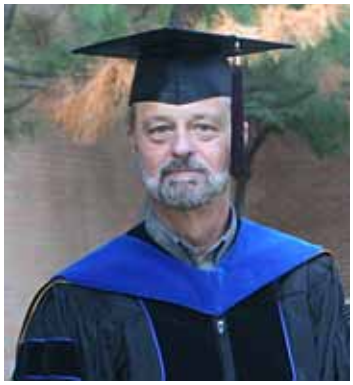

The **Moncrief-O'Donnell Endowed Chair in Robotics** was filled in October of 1990 with the hiring of Dr. Frank L. Lewis. Dr. Lewis established the Advanced Controls and Sensors Group (ACS) of the Automation and Robotics Research Institute immediately on his arrival.

ACS PROGRAM OVERVIEW

The ARRI Advanced Controls and Sensors (ACS) Group consists of Dr. Lewis, 7 Ph.D. students, masters and undergraduate students, and intermittent visiting research faculty. The primary thrusts of ACS are research in controls design for robotic, aerospace, and autonomous systems, intelligent control, Wireless Sensor Networks, and real-time control implementation.

Lewis has graduated 35 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.

Funding in excess of $6 million has been received from Texas State, the National Science Foundation, and the Army Research Office to perform research and develop technology in Intelligent Control Systems, Industrial Control, and Vehicle Control Systems. Ten SBIR contracts have been received from DoD to work with small companies to transfer technology developed at ARRI.

$530,000 in New Funding Received

Three major new grants were received this year:

NSF Grant for $250,000 for 3 years for research in intelligent neural network control for complex dynamical systems and electric power systems.

ARO/National Automotive Center Grant for $100,000 for research and development in autonomous helicopter systems and intelligent interfaces for operator teleoperation, decision, and control

SBIR Phase II Contract in Intelligent Fault Diagnostics. Follow-on funding of $180,000 received from U.S. Dept. of Energy through SignalPro, Inc., Dr. Chiman Kwan, CEO. To develop wireless sensors for fault diagnosis in electrical power system rotating machinery.

PhD Student Graduates

Two PhD students were graduated and now contribute as engineers in USA industry.

Dr. Prasanna Ballal published 7 journal papers from his work on decision & control for networked systems and distributed teams of sensors. His research resulted in a book "Wireless Sensor Networks". He now works at Caterpillar in engine controls.

Dr. Pritpal Dang published in his work on sensing and control of distributed actuator systems, decision & control for sensor networks, and face recognition. He is now at The Mathworks, a premier USA software company for signal processing & control systems.

Autonomous Helicopters

Under funding from Army Research Office/NAC we have developed a lab for control of autonomous unmanned vehicles (UAV). We bought three small helicopters which are being converted to UAV using circuits designed by PhD student Emanuel Stingu.

Students Chris McMurrough and Matt Middleton are designing a system to convert small remote controlled helicopters into disposable short range UAV for indoor and urban environments.

Quadrotor agile autonomous aircraft designed by E. Stingu for urban and cluttered environments

Work with Air Force and Army

Chris McMurrough was selected for the Air Force Summer Scholar program and worked at Wright Patterson Air Force Base with Dr. Siva Banda's AFRL Control Science Center of Excellence.

Matt Middleton visited Dr. Greg Hudas at US Army Tank Automotive Command for Technology Transfer on autonomous vehicle decision & control.

Awards Received

Lewis was elected as Fellow of the International Federation of Automatic Control (IFAC), the international organization founded in 1960 for feedback control systems.

Lewis received the Gabor Award from the International Neural Network Society for his work over the years in advanced feedback control systems based on neural networks.

Keynote Speech Invitations

Lewis was invited to deliver keynote plenary talks at 6 international events and conferences:

- Int. Conference on Life system Modeling, Shanghai
- IEEE Conf. Industrial Electronics and Applications, Singapore
- Chinese/Swedish Workshop on Control, Hong Kong
- IDGA Military Antennas Conf., Washington DC
- Workshop on Petri Nets and Agile Manufacturing, Xian.
- Invited Workshop on Neuro Adaptive Control, Xiamen.

Published

This year 14 journal papers were published on our research in:

MEMS Microsystem Control
Aircraft Control Systems
Intelligent Neural Network Control
Supervisory Manufacturing Control
Wireless Sensor Networks

We published 8 conference papers, which were presented internationally by Professor Lewis or his students.

SIGNIFICANT EVENTS THIS YEAR

- Lewis elected as Fellow of International Federation of Automatic Control
- Lewis Awarded the Gabor Award from the International Neural Network Society.
- $530,000 in NEW funding from National Science Foundation, the Army Research Office, and U.S. Dept. of Energy
- Two PhD students and 3 MS students were graduated.
- One book was completed.
- Fourteen journal papers and 8 conference papers were published.
- Built up a new lab for autonomous UAV helicopter control.
- Lewis was invited to deliver six keynote talks at international events.
- Three of Lewis' PhD students attended conferences worldwide to present their work.

Lewis gives keynote speech at ICCSE on advances in feedback control systems and their impact on education

DFW LOCAL IMPACT

Leadership in the Local Scientific Community

ACS has contributed to the reputation within the scientific community of both UTA and Dallas/Ft. Worth. Lewis is listed in the Ft. Worth Business Press top 200 Leaders. He served as Founding Chairman of the DFW IEEE Control Systems Chapter, which won the national IEEE best chapter award in 1994. He was selected as Fort Worth Engineer of the Year by the IEEE Section in 1995. We have received significant funding from NSF, ARO, Texas State, and the DoD SBIR program to work with local and national industry. This has enhanced the competitiveness of DFW and U.S. companies in the area of feedback control systems, automation, MEMS, and Wireless Sensor Networks.

US Patents and US Industry

Five US Patents have been received by ARRI's Advanced Controls and Sensors group on technology developed for intelligent control of nonlinear industrial, vehicular, and aerospace systems.

10 Department of Defense SBIR Contracts have been received to transfer technology to local and national small businesses. ARRI won the SBA Tibbets Award in 1996 for its work with small companies.

EDITORSHIPS

Dr. Lewis serves as:

- Editor, Taylor & Francis book series on Control Engineering.
- Editor, Transactions of the U.K. Institute of Measurement and Control.
- US Region Editor for Int. Journal Intelligent & Robotic Systems

Arlington ISD and High School Student Summer Outreach Program

We work with Diane Brewer at Arlington Independent School District to host her high school Engineering Technology Students at ARRI. We work with Melissa Grubb at the Oakridge School to run a summer high school outreach program.