The Link

NEWS FROM

KU INFORMATION & TELECOMMUNICATION TECHNOLOGY CENTER
The University of Kansas

Summer 2006 ■ Vol. 9, No. 2

ITTC Future Takes Center Stage

The Center's eight newest faculty members introduced themselves and their research programs to the ITTC Industry Advisory Board (IAB) at the annual IAB meeting on April 7. IAB members learned of the investigators' initial accomplishments, which ITTC Director **Victor Frost** highlights on page 2.

In his "State of the Center" presentation at the meeting, Frost examined ITTC's continued strong growth and development. During FY2005, the Center secured more than $6.6 million in awards for sponsored research and submitted 87 research proposals totaling more than $25 million. IAB members then learned of technology transfer efforts from **Tim Johnson**, executive director. His Office of Applied Technology continues promoting and developing commercialization efforts, including the KU-Tag (page 3, "Deavours Highlights Research at RFID Live!"). The Office also has partnered with the KU Center for Research to provide technical resources and expertise for the transfer of software and IT for the entire University of Kansas, Lawrence campus.

Frost and Johnson led discussions on the revised Strategic Plan and IAB subcommittee activities. The Board provided additional perspectives on trends and potential opportunities for ITTC. (The refined Mission and Vision statements are listed in the blue box on the right.)

The meeting ended as it traditionally does with a student poster session. A record number of posters, 38, filled the lobby and second-floor balcony of Nichols Hall. Impact of the new faculty on research at ITTC was evident, as nine of the projects represented by the posters are led by new faculty investigators. IAB members chatted with faculty and students, learning more about investigators and their innovative research. To view the posters, log on to www.ittc.ku.edu/techreview2005/posters2006.phtml.

As a result of the meeting, IAB members have invited ITTC researchers to their facilities to discuss industry challenges and opportunities. ■

Faculty Presenters

At the ITTC IAB Meeting, April 7

Shannon Blunt - Radar
Jianwen Fang - Bioinformatics
Donna Haverkamp - Image Understanding
Erik Perrins - Communications Systems
James Sterbenz - Networks
Weichao Wang - Security
Alex Wyglinski - Communications Systems
Anne Zhang - Bioinformatics

ITTC Mission

– To advance knowledge and create innovative technologies in telecommunications, information systems, bioinformatics, and radar;

– To educate and train students for technology leadership;

– To transfer knowledge and innovative technologies to Kansas companies and national industries—

by providing an excellent interdisciplinary research and development environment.

ITTC Vision

To be a global leader and strategic partner in the creation and commercialization of innovative technologies in telecommunications, information systems, bioinformatics, and radar.

Director's News

As the front page indicates, we held another successful annual ITTC Industry Advisory Board (IAB) meeting this spring. IAB members provided meaningful feedback on the Center's updated Mission and Vision statements, which are listed on page 1. The strategic planning process, which began last September, included input and comments by faculty, staff, and Board members. The IAB met our eight new faculty members and learned about their research agendas.

Director Victor Frost

Our newest faculty have done well during their first year at ITTC. EECS Assistant Professors **Shannon Blunt** and **Erik Perrins** have obtained external research funding. Blunt, affiliated with the RSL (see full lab names in upper right corner of this page), is developing ways in which multiple radars can operate cooperatively with one another in the same spectrum. For more on his research, please see page 3. Perrins, an investigator with the CNSL, and I are collaborating with researchers from the KU Natural History Museum and Biodiversity Research Center. We are developing ways to transport and store data from the field, which will help assess environmental change on the Central Plains. The article on page 4 details this research project. Blunt and **Weichao Wang**, an investigator in the CNSL and assistant professor of EECS, aided **Dan Deavours**, ITTC assistant research professor, in developing new security concepts for RFID tags and readers. See page 3 for more about our RFID activities. **Alex Wyglinski**, ITTC assistant research professor, will serve as a guest editor for an upcoming *IEEE Communications Magazine*'s special issue on cognitive radio technology and dynamic spectrum access networks. Finally, please see article to the right about BCLSL researchers who attended the Kansas City Area Life Sciences Research Day.

ITTC Students Research, Learn at Sprint Lab: Two ITTC students performed research at the Sprint Advanced Technology Laboratory (ATL) in California this spring semester. Ph.D. student **Soshant Bali** conducted design research on high-speed wireless networks during his six-month internship. Graduate student **Senthil Shanmugham**, advised by **John Gauch** (an investigator with the eDL and an associate professor of EECS), worked with ATL's Sprint/Nextel video networking research group for two weeks in February. He examined perceptual quality measurement techniques and how to generate video sequences for the Kansas University Image Processing (KUIM) software pipeline.

KU in the Capitol Day Showcases Service to Kansas: **Michelle Ward**, ITTC's public relations and marketing coordinator, attended KU in the Capitol Day in March. This annual event, which takes place in the Kansas Statehouse and highlights how KU serves Kansas, allows ITTC staff to meet various legislators, state employees, students, and other participants.

We have had a busy and productive spring and will carry that energy into the summer. ■

ITTC LABORATORIES

Bioinformatics and Computational Life-Sciences Lab (BCLSL)

Communications and Networking Systems Lab (CNSL)

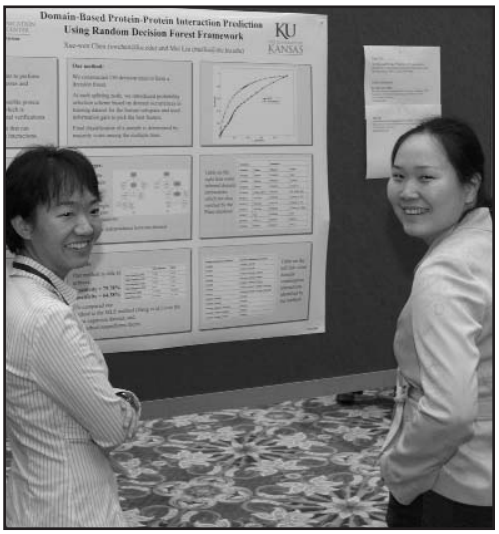
Computer Systems Design Lab (CSDL)

e-Learning Design Lab (eDL)

Intelligent Systems Lab (ISL)

Radar Systems & Remote Sensing Lab (RSL)

Kansas City Area Life Sciences Research Day



Ph.D. student **Mei Lui**, left, and a Research Day attendee stand next to Lui's poster, which details her research on protein-protein interaction predictions. ITTC researchers are developing machine learning algorithms to uncover patterns within these interactions.

ITTC researchers **Xue-wen Chen** and **Anne Ya Zhang** attended one of the largest scientific meetings held in the Kansas City region, on March 30. In addition to faculty, six ITTC students, including those of fellow BCLSL investigator **Terry Clark**'s research group, participated in the poster session. Chen, Zhang, and Clark are all assistant professors of EECS. ■

Information and Telecommunication Technology Center
A KTEC Center of Excellence at The University of Kansas

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The Link is prepared and published by ITTC. The Center is funded, in part, by the Kansas Technology Enterprise Corp., a state-owned corporation created to stimulate economic development in Kansas. Articles in *The Link* may be reprinted for reuse without special permission from the editor or Center. We ask only that you credit ITTC for the information.

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Deavours Highlights Research at RFID Live!

Dan Deavours' recent trip to Las Vegas was eventful. The ITTC research assistant professor conducted eight demonstrations on the exhibition floor, gave six talks, led a break-out session, manned a booth for the RFID Alliance Lab, and met with various industry leaders during the three-day RFID Live! conference in May. The event, attended by more than 2,000 people, showcased radio frequency identification (RFID) technology.

Dan Deavours, ITTC assistant research professor, right, and Madhuri Eunni, a graduate research assistant, manage the RFID Alliance Lab booth during RFID Live! in Las Vegas.

RFID tag technology tracks consumer goods through the entire supply chain, from the factory to the store. Using a system of readers and tags to communicate information wirelessly, RFID technology also monitors companies' internal assets such as laptops, tools, machines, and metal drums. Deavours says the potential of RFID is unlimited.

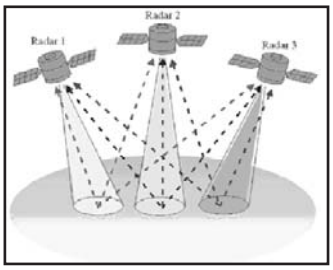
Deavours began his conference duties by unveiling ITTC's solution to an alarming, ongoing concern over RFID technology—privacy. As *Consumer Reports* documented in its June issue, the RFID industry does not have the safeguards in place to protect consumers' privacy. ITTC researchers have developed a two-layered solution. Deavours says the one-two punch of cryptography and low-probability-of-intercept (LPI) signaling makes it extremely difficult for information thieves to cull personal information. ITTC Investigators **Shannon Blunt**, Deavours, and **Weichao Wang** created an application that is simpler than current privacy models and enables greater power use, which allows tags and readers to communicate from longer distances. It would permit RFID tags to be made from alternative technologies, rather than silicon, drastically reducing the price of tags.

During the conference, **Keith Braman**, ITTC's associate director for applied technology, and Deavours met with industry leaders about licensing KU's "Adamas-I Tag," developed at ITTC. Prior to the invention of KU's RFID tag, RFID communication was stymied when a tag was placed on metal or near liquid. The Adamas-I Tag solves the metal/liquid problem and promises to be one of the best-performing, least costly, and thinnest tags with this capability. Braman, Deavours, and graduate student **Madhuri Eunni** manned the RFID Alliance Lab booth, answering questions and providing information on sponsored research and performance reports.

ITTC involvement in RFID Live! provided increased visibility while underscoring the Center's leadership in this emerging field. ■

Interference Represents Unique Data Source

With cell phones, personal digital assistants (PDAs), and other wireless devices devouring the radio frequency (RF) spectrum, the available spectrum for radar is steadily diminishing. RSL Investigator **Shannon Blunt**, assistant professor of EECS, is developing techniques that enable radars to share the spectrum. Radar receivers' strict sensitivity requirements have previously made coexistence impossible.



Interference from radars sharing the radio frequency (RF) spectrum may provide additional information about the environment without using additional bandwidth.

A radar transmits a radio signal into the air and then listens for a return signal. The transmitted signal scatters off of objects in its path, some of which may be targets of interest. Small amounts of the scattered signal will be reflected back to the receiver from which the radar determines the presence of a target.

When numerous radars (and/or possibly communications systems as well) share spectrum, interference from these other sources may prevent a receiver from intercepting the desired reflected signal. However, if it can be made feasible, spectrum-sharing radar could provide additional information about the environment without using more bandwidth, thus enabling substantial improvements in surveillance capabilities.

Blunt garnered funding for his "Waveform Diverse Sensors" project from the Office of Naval Research. He is using adaptive receivers to effectively separate the return signals from multiple radars. Blunt is also investigating how these radar signals interact with communication signals to determine if they can share the spectrum.

His research has a defense objective, as available spectrum is rapidly diminishing in coastal regions, where applications such as cellular communications and television already occupy a considerable portion of the spectrum. To provide homeland defense in these regions, a greater spectral efficiency is needed for defense radar systems. This work is one piece of a much larger Department of Defense vision to fully utilize the RF spectrum, says Blunt. ■

Achievements and Acclaim

KU Promotes Andrews to Full Professor

David Andrews received the rank of full professor this spring. Andrews, affiliated with the CSDL, is with the Department of Electrical Engineering and Computer Science (EECS). ■

Mohammad s Research Poster Places Second

Ph.D. student **Abdul Jabbar Mohammad** participated in the Graduate Research Competition and Summit sponsored by KU's Graduate and Professional Association (GPA) on March 6. **Victor Frost**, ITTC director and Dan F. Servey distinguished professor of EECS, mentored Mohammad on this research. Mohammad's poster, "Data Communication for Polar Research Expeditions," explained the Frost-led research that provided a North Greenland field camp with reliable Internet access for the first time. His poster won one of four second-place prizes, and he received a cash award. ■

University Recognizes Center Faculty, Staff

During KU's annual employee recognition ceremony, Chancellor **Robert Hemenway** honored those completing five-year increments at the University. **Gary Minden**, director of the CNSL and EECS professor, marked his 25th year of service. **Swapan Chakrabarti**, affiliated with the BCLSL and an associate professor of EECS, was honored for 20 years while **Tim Johnson**, executive director, has 15 years with KU. ■

Johnson Graduates with Master s Degree

David Johnson, systems administrator for the Integrated Bioinformatics Information Infrastructure at ITTC, has successfully completed his master's in computer science from the University of Oklahoma. ■

ITTC Hosts KU CiteSeer Web Site

Collaborative work on a National Science Foundation project led **Susan Gauch**, director of the ISL and professor of EECS, to duplicate the Scientific Literature Digital Library (CiteSeer). The mirror Web site, http://citeseer.ittc.ku.edu/, allows ITTC investigators to examine user behavior on a smaller scale. Research will lead to personalized recommendations and searches among the library's 700,000 articles. ■

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ITTC Collaborates on Biodiversity Research

The ecologically complex Kansas grasslands will serve as a laboratory for assessing and forecasting changes in biodiversity and ecological systems. Biological diversity and ecological processes vary locally and regionally with climate, soils, topography, natural disturbances, and land management. By deploying multiple study sites within rural and urban settings, researchers will gather critical data on the human impact of environmental change. Specifically, KU Biodiversity and ITTC researchers will assess the interactions and reciprocal impacts of socioeconomic, biological, and physical factors.

CNSL Investigator Erik Perrins, center, discusses his communication research during the ITTC Industry Advisory Board poster session this spring. Perrins' graduate student Dileep Kumaraswamy, left, and other students listen.

Leonard Krishtalka, director of KU Natural History Museum and Biodiversity Research Center, leads the "Understanding and Forecasting Ecological Change: Causes, Trajectories, and Consequences of Environmental Change in the Central Plains" project. The National Science Foundation and the Kansas Technology Enterprise Corporation are sponsoring the project, which began this spring. **Erik Perrins**, affiliated with the CNSL and an assistant professor of EECS, and **Victor Frost**, ITTC director and Dan F. Servey distinguished professor of EECS, serve as project investigators. They are developing a data collection and archival storage infrastructure.

The KU research will better position Kansas researchers to participate in several National Science Foundation initiatives. Understanding ecological change is also integral to the State's multi-million-dollar Kansas Bioscience initiative. The Central Plains project will improve forecasting in such critical areas as food safety and production, vector-borne diseases, and environmental risk analysis. ■