A Wireless Initiative

It is generally agreed that wireless technologies will bring about the next revolution in the field of information technology. Wireless makes it possible for all users to be simultaneously connected to each other, *regardless of location*. Doing so one can take advantage of the gains that enhanced connectivity provides. One can envisage several applications of particular interest to Louisiana, such as communications and connectivity for geological surveying, e-commerce, digital arts and entertainment industry, distance learning, and telemedicine.

The department of electrical and computer engineering at LSU has a small group (four or five people) that works in this area. But in order to be nationally competitive and to be able to make an impact on the economy of the state, we feel the ongoing effort should be enhanced in several ways. We request six more faculty and ten graduate assistantships to broaden the research orientation of the communication group to develop new research projects on wireless communication, such as system design, testing and simulation. Upgrades of the existing facilities are also required. This initiative requires a support of $1.5 million per year for three years.

Wireless Communications System Design and Analysis:

1. Develop a complete research support environment for wireless communication systems, such as the simulator of the base-band system, channel and receiver emulator, pseudo-noise generator, antenna and RF system evaluator. Speech coding for cellular environments.
2. Algorithm research and investigation regarding CDMA and 3G wireless communications, which includes direct sequence design, source coding, error control coding, retransmission schemes, modulation/demodulation, features of optimal receiver and other methods embedded on the physical layer of communications. Intelligent signal processing algorithms will be investigated.
3. Experiments and programming on portable pseudo codes for communication sub-systems such as SPW software simulator.
4. Digital subscriber lines, wireless internet.

Multimedia Communication:

5. Start a wireless multimedia research group focused on new research projects including image/audio compression, detection, transmission, recognition and privacy. The evaluation environment for the wireless multimedia design is also desired.

Communication Networks

6. Enhance research and study in communication networking. Future research will be conducted in the area of routing and congestion, as well as traffic control mechanisms for networks ranging from wireless networks (such as multihop packet radio networks, wireless local area networks and personal communications networks) to high-speed guided media networks (such as fiber-optic ATM networks and multi-processor computer networks), Bluetooth.

7. Development of the interface between wireless and guided media networks, which apply the stochastic modeling and analysis, estimation theory and information theory.

Digital Signal Processing for Communication

8. Set up a research/educational digital signal processing laboratory for embedded software development of wireless communications. Digital signal processing methods applied for communications will be implemented and investigated on digital signal processing platforms connected with mixed-signal interfaces.

9. Array processing for smart antennas.

10. Text to speech synthesis, data compression.

INFRASTRUCTURE: We propose two laboratories: one on wireless, and another on networking and lightwave communications. The items needed include the following:

Wireless Lab:

* FPGA prototype facility
* EEsof for advanced design
* A 25 Mbps wireless communication system hardware
* Protel PCB Layout
* High speed digital T/R antenna
* Eagleware RF design
* Signal Processing workstations
* Simulink
* Synthesizers, analyzers, etc

This will require $500,000 a year for three years.

Networking and Lightwave Communication Lab:

* ATM switches and concentrators
* IP routers
* Testbed connections
* High speed WANs
* Ciena Multiwave WDM systems
* Erbium-doped fiber amplifiers
* Fiber-optic polarization analyzer

* Laser sources

This will require $400,000 a year for three years.

The facilities upgrades would require 30 PC, 10 workstations and additional computer accessories, TI TMS-320 DSP evaluation boards, and SPW software licenses.

In brief, this Initiative would complement the ongoing efforts of the LSU communications faculty. We expect to be able to leverage the enhanced profile to obtain funding for various projects in wireless communication theory and its applications from various federal and state agencies. This field has the potential of generating considerable entrepreneurial activity which will be another point of benefit from this initiative.