Electrical & Computer ENGINEERING

SEMINAR

THURSDAY
OCTOBER 21, 2004

Scaife Hall Auditorium
Room 125

4:00 PM
Refreshments—3:30 PM

Alex Dean

NORTH CAROLINA STATE UNIVERSITY

Dr. Dean's interests in embedded systems research include:

- Compiling for concurrency and performance.
- Energy efficient use of commercial off-the-shelf (COTS) processors.
- Benchmarking for embedded systems.
- Executable file analysis for detecting intellectual property theft.
- Robust embedded system design and analysis.

Dr. Dean received his BS EE from the University of Wisconsin in 1991 and then went to Carnegie Mellon in Pittsburgh for graduate studies with Dr. John Shen. He completed his MS ECE in 1993 after studying computer architecture and researching software implemented control-flow error detection. After his MS he worked at United Technologies Research Center, an industrial R&D lab in Connecticut, where he analyzed, simulated and designed communication networks and system architectures for jet engines, elevators, cars and building climate control systems. He also designed, programmed and built prototypes for several automotive applications. In 2000 he received his PhD in ECE from CMU.

USING ASYNCHRONOUS STI TO IMPLEMENT COMMUNICATION PROTOCOL CONTROLLERS IN SOFTWARE

The overhead of context-switching limits efficient scheduling of multiple concurrent threads on a uniprocessor when real-time requirements exist. We have developed asynchronous software thread integration (ASTI) methods which address starvation through the efficient use of coroutine calls and integration. ASTI allows threads to make independent progress efficiently and reduces the number of context switches needed through integration.

In software-implemented protocol controllers, the primary thread ``bit-bangs'' each bit of a message onto or off of the bus, leaving only fragments of idle time shorter than a bit time. This fragmented time may be too short to recover through context switching, so only the primary thread can execute during message transmission or reception, slowing the secondary threads and potentially making them miss their deadlines. ASTI simplifies the implementation of embedded communication protocols on low-cost, moderate speed (1 - 100 MHz, 8- and 16-bit) microcontrollers. We demonstrate ASTI by replacing a standard automotive communication protocol controller (J1850) with software and generic hardware. Secondary thread performance improves significantly when compared with a traditional interrupt-based software approach.

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For more information:
http://www.ece.cmu.edu/seminar

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