Midterm: Embedded computing technologies

For the midterm, the student must report on one of the myriad technologies available for embedded computing, and must undertake the process of locating information about these technologies. Questions to be addressed may include (but are not necessarily limited to):

- What is the history of the technology?
  Example: ARM is both a company and a technology. The company started in 1985, and saw enormous growth in the late 90's and early 2000's.

- What niche does the technology serve?
  Example: ARM is a microcontroller architecture. Rather than produce chips, ARM licenses a microcontroller core design to manufacturers. In this way, ARM can concentrate on optimizing this part of the design, and manufacturers can concentrate on integrating microcontrollers into larger systems.

- What is special (different from general purpose technology) about that niche?
  (Note: You will be time constrained, so a full explanation will not be possible.)
  Example: ARM microcontrollers are more complex than typical low-end microcontrollers, and are targeted towards handheld consumer electronics.

- What are the interesting features of the technology?
  Example: ARM is a licensed design, not a manufactured chip. There are several versions of ARM (show table), with varying features in paths to memory, amount of on-chip memory, power consumption, (etc.). The instruction set is fairly RISC (show table only if interesting). The chips are 32-bit, showing their complexity.

- What companies and products use or incorporate the technology?
  Example: ARM has been licensed by Atmel, Cirrus, Samsung, Ericsson, Intel, Motorola, Qualcomm, Texas Instruments, among others. The Intel StrongARM SA-111x microcontroller chips use an ARM core, and sold for $15-28 in 2000. The Compaq iPAQ PC 3760 (a handheld computer) uses an Intel StrongARM chip, and sells for $500 in 2003.

- How much does it cost?
  Example: ARM licensing costs are not publicly available.

- What are the competitor technologies?
  Example: The older, more established microcontroller families like 8051, Z80, and 68HC11 are the primary competitors. ARM is the most successful modern (2000’s) microcontroller technology.

Students are to work in the teams assigned in class. Each team is to research information about a technology, as assigned to each team in class. The team must prepare a report, not to exceed three pages, and give a presentation to the class, not to exceed 7 minutes.
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The report must clearly address the above questions (or similarly relevant questions, depending on the technology). Some technical detail should be included, such as data size, but uninteresting detail (such as an entire instruction set) should be avoided. A bibliography must be included, but keep it concise.

Searching the web will be the primary source for information.

The presentation must use the computer projector. Live projections (e.g. Powerpoint, PDF, etc.) must be on a USB drive and ready to go before class starts. Handouts should be used only if absolutely necessary (e.g. technical sketches that are difficult to see via projection).

Students in the audience will be providing anonymous feedback on the presentations.

Topics may be suggested by each team, and must be finalized by the due date given at the course website. Dates may also be suggested by each team. Topics and dates will be provided on a first-come first-served basis. During the next class I will show a schedule of the topics and dates.

Presentations will be on the dates given at the course website. Reports are due by the end of class of the second day of presentations.

Here are a small number of suggested topics including many that have been shown in previous years. Note that I encourage new and emerging technologies!

PIC
Stamp
PowerNP
I2C
GPIO
VMEbus
Multibus
PCMCIA
VDSL
RSA
SSH
Fujitsu FR processors
Fibre channel
Speex
Qualcomm’s Snapdragon
DisplayPort
Intel Atom processors
CAN bus
AMD Fusion processors
Zigbee
Texas Instruments DaVinci processors
MOST bus
Android O/S
PowerVR
802.11ac
PIC microcontrollers
NVidia CUDA parallel programming
Near field communication (NFC)
TI MSP430 processors
Apple’s A4 processor
Bluetooth
OLED
Freescale’s Coldfire
802.11
TI’s DaVinci Digital Media Processor
Gidel Proc board FPGAs
SGX Series5XT Graphics IP Core Family
DisplayPort interface
Freescale HC11 ucontroller
Android O/S
Qualcomm’s Snapdragon family
Atmel AVR family
Sandy Bridge architecture
Freescale’s Xtrinsic sensor family
Samsung Hummingbird processors