ECEN3000/3360
Digital Design Laboratory
Evolution

1947

1981

1990s

2010

Monday, January 13, 14
It is everywhere
End-to-End Complexity

Wearables  Mobile  Cloud
Objective

Hands-on experience of electronic system software--hardware co-design

- ARM eco-system for the embedded -- ARM + C/assembly programming
- Android eco-system for mobile computing -- Java programming + Android
Logistics

- **Schedule**
  - Lecture: M 3:00-3:50 FLMG 104
  - Labs: TTH 1:00-2:50 ECEE 281/282
  - Office hours: M TBD ECEE281/282

- **TAs**
  - Qi Liu: qi.liu@colorado.edu
  - Matthew Phillips: Matthew.Phillips-1@colorado.edu
Course materials

- Books
  - The Definitive Guide to the ARM Cortex-M0
  - Beginning Android 2

- Course website
  - http://ece.colorado.edu/ecen3000

- Online materials
  - ARM eco-system
  - Android eco-system
Grading policy

Weekly labs: 70%  Final project: 30%
Hands-on

A self-defined project built-up through weekly labs
Fall 2013

Pretty Lights Bike
Fletcher and Nathaniel
Understand the domain problem

- **Eyes Open**
- **Eyes Close**
- **Blink**

10Hz EEG α-Rhythm
SW/HW co-design

Embedded HW
- Filtering & Digitization
- Amp.
- Amp.

Android Phone
- Feature Extraction
- ML Translation
- Feedback Decision

Feedback Decision

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Infrastructure
--LPCXpresso ARM MO
The DE0 Development and Education board is designed in a compact size with all the essential tools for novice users to gain knowledge in areas of digital logic, computer organization and FPGAs. It is equipped with Altera Cyclone III 3C16 FPGA device, which offers 15,408 LEs. The board provides 346 user I/O pins, and is loaded with a rich set of features that makes it suitable to be used for advanced university and college courses, as well as the development of sophisticated digital systems. The DE0 combines the Altera low-power, low-cost, and high performance Cyclone III FPGA to control the various features of the DE0 Board. The DE0 Development Board includes software, reference designs, and accessories required to ensure the user simple access in evaluating their DE0 Board.
Survey

--Who knows/has what?

• ARM
• C/C++ programming
• Verilog, Altera DE0 board
• Java programming
• Android smart phone
Announcements

- M/W lab sessions are merged to Tu/Th 1:00-2:50pm
- Find a lab partner (EE/ECE)
- Equipment needed: Windows Laptop, Android device (tablet, phone)
- Start reading Java if needed (tutorial will be posted)