U N I V E R S I T Y

CS 240: Programming in C

Lecture 26: Interfacing with Hardware

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Announcements

- Course Evaluations Available
- Homework 13 Extra Credit
- Lecture Wednesday will wrap up networking and include final exam review and discussion
  - Last lecture

Final Exam

- Thursday, May 8
- 10:30am – 12:30pm
- ELLT 116 (Main Auditorium)

Final Grade Computation

- Grade cutoffs may be adjusted at the end of the semester, depending on distribution
  - Will not raise them (90/80/70/60 A/B/C/D) is guaranteed
  - Often lower the C cutoff
- Grade computation
  - 50% HW/Quiz/Style
    - Sum all points for hw/quiz/style and divide by points possible
    - Don't forget HW13 is extra credit, HW0 is 25 points
  - 14% Midterm 1
  - 14% Midterm 2
  - 22% Final

Grade Determination

Hwk/Quiz Avg		Test Avg		Course Avg	Grade
>= 85%	and	>= 85%	and	>= 90%	A
>= 75%	and	>= 75%	and	>= 80%	B
>= 65%	and	>= 65%	and	>= 70%	C*
>= 55%	and	>= 55%	and	>= 60%	D
< 55%	or	< 55%	or	< 60%	F

* C threshold may be lowered

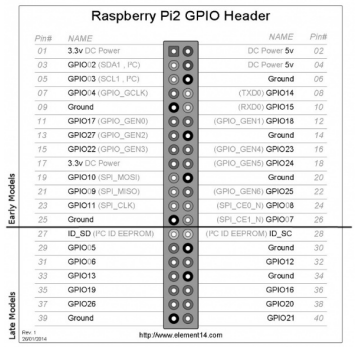
The Final Frontier: Interfacing to hardware

Ports

- Computers used to have things like serial and parallel ports
  - Great for (slow) communication, easy to interface
  - Rarely exist now
- Other ports are available...
  - Ethernet port – need the ethernet protocols
  - USB port – difficult due to transmission speed
  - Firewire port – more difficult than USB port
- Look in /dev on Linux

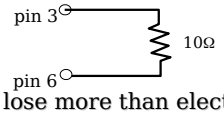
Raspberry Pi

- Embedded systems are cheap
- Lots of Systems on a Chip (SoCs) out there
- Often with exposed pins
  - Easy to interface
- Many can run a full-fledged OS



We can access those pins from a program...

- 3.3V
- Maximum 16mA (8mA default) per pin
- Maximum of 50mA total
- Don't do this:



- Hint: you'll lose more than electrons.

Datasheet

- Sometimes called "spec sheet"
- Details technical characteristics of a component
  - Can be hardware or software
- Often includes...
  - Functional descriptions
  - Pin diagram
  - Voltage ratings and specs
  - Power consumption
  - I/O waveforms
  - Timing
  - Physical dimensions
  - etc

BCM2835

- First generation Raspberry Pis use a 700MHz ARM11 processor (BCM2835)
- Newer Pis use BCM2836 (v2 1.1), then BCM2837 (v2 1.2, v3)

Raspberry Pi GPIO access

- RPI.h
- pins.c
- pins.h
- traffic.h
- traffic.c

Boiler Up!