ECE 471 – Embedded Systems
Lecture 23

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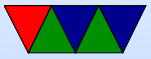
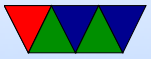
Announcements

- Don't forget project
- Let me know which day you plan to go
- Strict time limits, might want to practice
- HW#11 will be posted



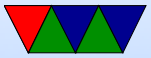
Chiptune Demo

Gave a sample project presentation



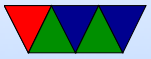
HW10

- C code review
- Do note, it's an LED display not LCD
- Error checking. 0 points if segfaults. Also if prints a wrong value to display.
- Leaking file descriptors. Close (or keep open) instead of just re-opening
- How do you convert from float to decimal?
  - Lots of people miss 0 due to gt/lt
  - 45.9 print as 45.8?

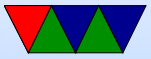


Floating point math is a pain! What do you get if you do `int fp=10*(45.9-45);`? 9.000000? Print more digits 8.999999999999857891452847979963 for fp to int conversion just drops the floating point part, doesn't round

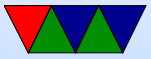
- Following a spec?
  - Corner cases
  - Spec says degree symbol, not F or C
  - Single-digit temps (unclear spec) Leading zeroes. Spec says 02.0 not 2.0 or 2.00
  - is Zero negative?



- Rounding
- Do you need a . after a three digit temp?
- Left/right justified for single digit
- Reporting error! Must be sure display not printing invalid info! (door on walk-in oven. If it goes from 70F to 1000F (off scale) between readings, don't want it to stay at 70F, you want ERR or HOT or some way to notify something is wrong) More realistically, probe wire broke, should it just report last reading? Or maybe go blank?
- What to do if temperature is -99.4 degrees?

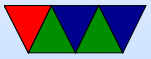


- Check inputs! Recent problem with europe Mars probe crashing! Was invalid input causing it to think it was below the ground.
- Error checking Most handled i2c error OK, but not 1-wire error.
- Buffer overruns
  sprintf into a too-small buffer, over-writing key variables
- List an *example* of poorly written embedded code.
- Why write good code?
  Cut-and-pasting, good practice, among other reasons.
- Why is touch useful? force make to rebuild



- 2038 problem
  Time in Linux is seconds since 1-1-1970. Not a problem 64-bit machines, but overflows in 2038 for 32-bit. Can avoid with a 64-bit system or else a specially patched Linux system
  * discuss y2k problem ** worst problem year 19100 on websites

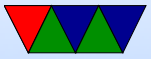
- ctime – last status (metadata) change (originally create time) things like permissions change, ownership change, rename



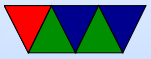
mtime – last modified

atime – last access

- In stat syscall. `stat` command. Why atime bad? noatime, relatime
- utime() used by touch. Cannot change ctime, set to current time
- why not believe timestamp? maybe could look at ctime. also set clock back if own machine.
  HW assignment at Cornell



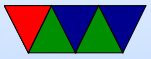
Project Comments?



Announcements

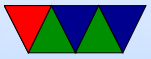
- HW11 Posted
  There will be a similar question on the final.

- Need volunteers to go Tuesday. (5 groups total). If I don't hear back by tomorrow morning I will use a random number generator.
  Don't worry about things being perfect, it's just a demo and actual working implementation is only a small part of the presentation.

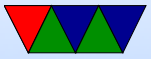


Final

- Thursday, December 15th, 2:45pm
- Is cumulative for whole class, but concentrates on material since midterm, and *No assembly language*
- Know the definitions of an embedded system and be able to say if a certain machine meets them.
- Know hard/soft/firm realtime
- Know the benefits/downsides of an operating system



- Security/Code Quality – mostly be aware of what things can go wrong if you are not careful when coding
- Embedded busses – know the relative tradeoffs between i2c, spi, and 1-wire. Mostly speed, distance, number of devices
- Power/Performance like HW11
- Give you some C code from one of the homeworks, comment it



Live Demo of perf