ECE 471 – Embedded Systems
Lecture 34

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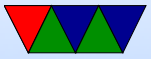
Announcements

- Don't forget HW#10
- Feel free to return borrowed hardware.
- Tentative presentation schedule was sent out

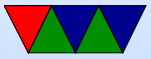


Final Preview

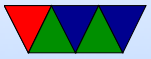
- Wednesday, December 16th, 12:15pm - 2:15pm, remote
  Like midterms, I'll send out e-mail, e-mail me back
  I'll send out a Zoom link I'll monitor for questions

- Is cumulative for whole class, but concentrates on material from latter half of class. *No assembly language*

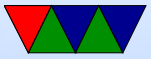
- Know the definitions of an embedded system and be able to say if a certain machine meets them.



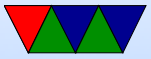
- Know hard/soft/firm realtime
- Know the benefits/downsides of an operating system
- Security/Code Quality – mostly be aware of what things can go wrong if you are not careful when coding
- Embedded busses – know the relative tradeoffs between i2c, spi, and 1-wire. Mostly speed, distance, number of devices
- Power/Performance like HW10



- Give you some C code from one of the homeworks, comment it



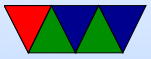
HW#9 – Review



HW#9 – Code

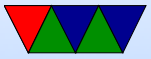
- C code review
- Do note, it's an LED display not LCD
- Error checking. Be sure not to segfault if dev not there!
- Heisenbug if not init buffer[0]
- How do you convert from float to decimal?
  - 45.9 print as 45.8?

    Floating point math is a pain! What do you get if you do `int result=10*(45.9-45);`? 9.000000? Print more digits 8.999999999999857891452847979963 for

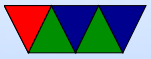


fp to int conversion just drops the floating point part, doesn't round

- Following a spec?
  - Corner cases
  - should shutdown_display() clear the display? Maybe, makes it harder to grade.
  - Single-digit temps, be sure to remove leading zeros
  - sig-figs for -1.0
  - right justified?
  - is Zero negative?
  - Rounding

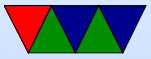


- Do you need a . after a three digit temp?
- Left/right justified for single digit
- Oddly placed minus sign
- Reporting error! Must be sure display not printing invalid info! (door on walk-in oven. If it goes from 70F to 1000F (off scale) between readings, don't want it to stay at 70F, you want ERR 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?



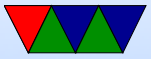
HW#9 – Questions

- Test inputs: try to have one in each case. Also might be nice to check each digit 0..9 to make sure those are all printing well.
- 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
  For some reason a number of assignments somehow didn't have updated time in the tar file.



- 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