ECE 471 – Embedded Systems Lecture 30

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Announcements

- Don't forget project update
- Don't forget HW#9
- Midterm Friday. Can have one piece of 8.5"x11" paper for notes (single side)
- Project status report due 20th (Monday before Thanksgiving)

Midterm #2 Preview

- Booting on the Pi
  - What a bootloader does
  - Why Pi is unusual
  - What is firmware, what is trusted firmware
- Real Time
  - Definitions
  - Is this hard, soft, firm
- i2c/SPI/1-wire
  - Know the tradeoffs between i2c, SPI, 1-wire

- ○ Be able to follow the C code for them
- Security
  - ○ Why security is necessary in embedded systems
  - ○ What can go wrong if security breached
- Coding Practices
  - ○ Be aware of the case studies we suggested
  - ○ Know of some of the recommended ways to write safer C code
  - ○ Be careful with code of unknown origin

Project – Starting Programs at Boot

- init process starts first
- Traditionally would start various shell scripts under /etc/init.d (the name and order of these can vary by distribution)
- With systemd you need to create a systemd unit file instead which is more complex
- Currently you can still put things you want to run at start in `/etc/rc.local`

Homework 8 – Code

- Error checking. Exit if cannot open. If you don't, can segfault if try to fscanf a NULL FILE*
- Returning -1 on error might be bad idea
- Compiler warning: `strncpy()` comparing if src longer than count and you don't NUL terminate
- What to report on error? What's an invalid temperature? Not just unlikely? (Below Absolute zero)
- If using streams (FILE *fff), on fopen() error it returns NULL, not -1.

- Be sure to close files, otherwise leak file descriptors Be careful if multiple exit points, must close at all (goto)
- Be careful with your 9/5 Fahrenheit conversion!
- Finding a file using C. `opendir()` `readdir()`, horrible interface
  Bit of a tangent on the downsides of the `readdir()` interface

HW#8 – Questions

- Why need Vdd? To provide enough current for this particular chip needs extra current if you want parasite mode.
  You can try without Vdd but you will always read out 85C.
  Manual suggests MOSFET, but apparently it's possible on Pi if use 4.7k resistor as well as "strong-pullup=y" kernel command line option.
- Because of distance, 1-wire

HW#8 – Shell Script

- `#!/bin/sh` should be first line (magic number)
- Trouble if edit on windows, why (linefeed vs carriage return)
  shebang description
- Making executable with chmod
- Default shell, can put other things there, like python or perl, etc, even ARM emulator
- sh vs bash

Ethics in Software Engineering

- How do you define it?
- There's an IEEE document: `https://www.computer.org/education/code-of-ethics`

Ethics in Software Engineering

- We talked about accidental bugs in software
- What about intentionally bad or misleading code?
- What if company wants you to code Dark Patterns?
  - Making it easy to accidentally do bad/expensive things
  - Making it hard to cancel or close windows
  - Make interfaces confusing to trick people
- Are ethics involved when programming?

Ethics Issues

- Privacy? Data Logging? Tracking?
- Many computer companies make most of their money by tracking and logging user activity and selling it
- Is this wrong?

More Ethics Issues

• Properly citing sources/giving credit

Ethics Examples

- Unintentional security leaks: fitness trackers giving away military locations
- Thermostats: forget to change password if move or divorce, others now control your heating
- Amazon/Google devices, always listening in your house
- Get your youtube account banned, locked out of your google home, can't even contact a human to protest
- Web-cameras everywhere
- AI

Can you control who uses your software?

- What if you have open-source code but someone uses it for evil purposes?
- What if you are a contractor and someone hires you to write evil code?

Reporting Ethics Violations

- Who can you report them to?
- What about the IEEE/ACM who claim they have ethics hotlines?
- They are manned by lawyers and won't do anything if they think they might get sued
- See the Huixiang Chen / ISCA incident

FTDI USB/Serial Bricking Incident

- Is cloning / counterfeiting popular chips wrong?
- What if you steal their USB-ID/ Trademarks?
- What if they fight back by having their driver disable counterfeit devices
- How do you feel if you didn't realize you had a counterfeit chip and suddenly your important embedded device stops working
- Who is to blame? Who are you likely to blame?