ECE 471 – Embedded Systems
Lecture 24

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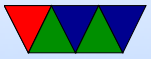
1 November 2017

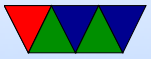
Announcements

- HW#8 was posted
- Keep thinking about projects.
- HW#8 due date extended due to windstorm

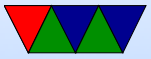


HW#7 Review

- Coding
  - Follow directions: temp probe channel 2
  - Why did we memset the structure before filling in the values?
  - Converting 2 bytes into one. Be sure to mask
  - What is the max frequency? someone setting to 500kHz by accident, a few degrees different. Data sheet unclear
  - Don't just cut/paste all code in. Don't



`ioctl(spi_fd, SPI_IOC_RD_MAX_SPEED_HZ, &f);` wh
does that do?
  - Errors: exiting. Not print plausibly real invalid values. In our case, printing 0V when actually 3.3V not an issue, but imagine if it were 10,000V and you print 0V
- Questions
  - Disadvantage of SPI?
    More wires, no standard, no errors
  - Advantage of SPI?
    Lower Power, Full Duplex, No max speed
  - TMP36 on end of cable.

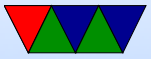


Voltage Drop, Noise?

Datasheet has two options, convert to current, or an extra resistor.

  - Minimum frequency of 10kHz or results invalid. Maybe cannot go this fast if bitbanging via GPIO.

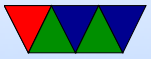
- Linux
  - /dev/null
  - /dev/full
  - /dev/zero
  - /dev/random – give explanation on sources of randomness (entropy), pseudo-randomness, etc.



C string review

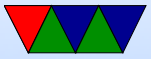
String manipulation is famously horrible in C. There are many ways to get the "YES" and "t=24125" values out of the text file for HW#8. Any you choose is fine.

- There are multiple ways to read files into a string in C
  Assume `char string[1024];`
  - `fd=open("filename",RD_ONLY);`
    `read(fd,string,1023); close(fd);`
  - `FILE *fff; fff=fopen("filename","r"); fread()`
    `fclose()`

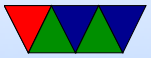


You can also use fgets()

- C strings
  - In C, characters are NUL (0) terminated character arrays
  - You can use either pointer or array access to get a value (string[0] is the same as *string)
  - Note that double quotes indicate a string, while single quotes indicate a single character
  - It is very easy to accidentally go off the end of a string and corrupt memory
  - Alternatives? Fancy libraries? Pascal strings (where



first char is the length?)
  - Always be sure your strings are terminated, otherwise bad things can happen (and not all C string manipulation functions do this properly, see strcpy(), strncpy(), strlcpy()
- Finding a location / substring in a larger string
  - If you trust the Linux kernel developers to keep a "stable ABI" you can assume the temperature will always be a fixed offset and hard code it. This can be a bit dangerous.
  - You can use the `scanf()` series of functions to parse



the string (either fscanf() directly, or sscanf() on the string)

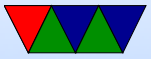
One helpful hint, putting a '*' in a conversion (like `%*s` tells scanf to read in the value but ignore it.

- You can use the `strstr()` search for substring C-library function, maybe in conjunction with `strtok()`
- You can manually parse the array.

  Using array syntax, something like:

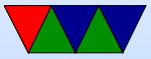
```
i=0; while(string[i]!=0) {
if (string[i]=='t') break; i++ }
```

  Using pointer syntax, something like:



```
char *a; a=string; while(*a!=0) {
if (*a=='t') break; a++; }
```

- Pointing into a string
  - If you searched for "t=" you might now have a pointer a to something like "t=12345". To point to 12345 you can just add 2 to the string pointer.
  - `printf("%s\n",string+2);`
  - `printf("%s\n",&string[2]);`
- Converting string to decimal or floating point
  - `atoi()` converts string to integer. What happens on error?



- `strtol()` will give you an error but is more complex to use
- `atof()` and `strtod()` will do floating point

- Comparing strings
  - Can you just use ==? NO!
  - Be careful using `strcmp()` (or even better, `strncmp()` they have unusual return value
    less than, 0 or greater than depending. 0 means match
    So you want something like
    ```
    if (!strcmp(a,b)) do_something();
    ```