

ECE471: Embedded Systems – Homework 2 Part B
Assembly Language Programming

Due: (UPDATED) Thursday, 10 October 2013, 5PM EDT

1. Use your Gumstix board to work on this project. Instructions for setting it up are found in HW2 Part A.
 - Download the code from:
`http://web.eece.maine.edu/~vweaver/classes/ece471_2013f/ece471_hw2_code.tar.gz` and copy it to the gumstix board.
 - Uncompress/unpack it with the command `tar -xzvf ece471_hw2_code.tar.gz`
 - Change into the `ece471_hw2_code` directory `cd ece471_hw2_code`
 - Run `make` to build the code.
2. Make the ARM processor count down from 32 in assembly language. The code is setup to assemble Thumb2 objects by default.
 - Run `./countdown_32`
This should only print “0”
 - Modify the `countdown_32.s` file so it counts down from 32 to 0.
Be sure to comment your code!
Hint: make sure you keep track of which registers are over-written by subroutines.
3. Describe how the provided decimal printing routine in `countdown_32.s` works. Put your answer in the README file.
4. Modify the provided `countdown_32.c` file to also print backwards from 32, but in C. Compile the result using `make`.
In the README, compare the sizes of the two executables, `countdown_32_c` and `countdown_32`. (you can use `ls -l`). What advantage does the C program have over the assembly version? What advantage does the assembly program have over the C version?
5. Make a program that counts down in hexadecimal (base-16) rather than decimal in assembly language.
 - Copy your working countdown 32 code over the included file:
`cp countdown_32.s countdown_32_hex.s`
 - Convert the `print_number` routine in `countdown_32_hex.s` to print hexadecimal.
Hints: `man ascii` can help when figuring out how to print letters efficiently.
Also remember that dividing by 16 is much easier than dividing by 10.
The finished program should countdown from 0x20 to 0 in hex.
6. Submitting your work.
 - Run `make submit` which will create a `hw2_submit.tar.gz` file containing README, `countdown_32.s` and `countdown_32_hex.s`.
You can verify the contents with `tar -tzvf hw2_submit.tar.gz`
 - e-mail the `hw2_submit.tar.gz` file to me by the homework deadline. Be sure to send the proper file!