

Note: there is nothing to hand in for this assignment. In this homework assignment, you will explore:

- Interfacing C and Assembly
- Data Conversion

The reading for this assignment is available on the course web site.

1. Learn how to interface C and assembly in SDCC. See the specific section on this topic in the SDCC manual.
 - a) Make sure you understand how parameters are passed to subroutines and how they are accessed on the stack.
 - b) How many bytes does each parameter occupy on the stack?
 - c) How do you write a function in assembly which calls a function which is written in C? How do you access the C function and pass parameters from your assembly code?
2. Review the notes on data conversion handed out in class.
3. Review the DAC and ADC Application Notes and URLs at:
http://ecee.colorado.edu/~mcclure/misc.html#data_conversion_information
4. What are the relative advantages/disadvantages of choosing a DAC which outputs a voltage versus one which outputs a current?
5. How can you use a DAC and a microprocessor to create an arbitrary waveform generator? Describe at least two ways you could control the amplitude of the output waveform in such a system.
6. Suppose you want to sample a time varying signal which has frequency components up to 2000Hz and varies between +1.5V and 3.0V.
 - a) What sampling rate would you choose and why?
 - b) What considerations would you make when choosing the reference voltages for your ADC?
7. Suppose you want to sample a 1000Hz sine wave. What sampling rate would you choose and why?
8. Suppose you want to sample a 1000Hz square wave that has a duty cycle ranging from 1% to 99%. What sampling rate would you choose and why?
9. What is the voltage resolution of an 8-bit ADC which has reference voltages of +5V and 0V?
10. What is the voltage resolution of an 8-bit ADC which has reference voltages of +2V and +1V? In what situations would it be better to use tighter reference voltages like these?

Note: there is nothing to hand in for this assignment. This assignment is optional.

In this homework assignment, you will explore:

- Motors

The reading for this assignment is available on the course web site and on the Internet.

1. Review the motor application notes and URLs at:
http://ece.colorado.edu/~mcclure/misc.html#motor_information

2. Review other documents on the web related to motors, such as:

<https://www.youtube.com> : Many videos on motor technology

- DC Motors:

– <http://lancet.mit.edu/motors/index.html>

– <http://www.micromo.com/technical-library/dc-motor-tutorials>

- Stepper Motors:

– <http://www.cs.uiowa.edu/~jones/step/>

– http://www.solarbotics.net/library/pieces/parts_mech_steppers.html

– http://www.freescale.com/files/microcontrollers/doc/train_ref_material/MOTORTUT.html

– <http://www.st.com/stonline/books/pdf/docs/1679.pdf>

– http://hades.mech.northwestern.edu/index.php/Main_Page

- RC Servos

– <http://www.google.com> (keywords: RC servo)

– <http://www.towerhobbies.com>