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/~mcclurel/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 website and on the Internet.

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

2. Review other documents on the web related to motors, such as:
   - DC Motors:
     - http://lancet.mit.edu/motors/index.html
     - http://www.micromo.com/n42044/n.html
   - Stepper Motors:
     - http://www.cs.uiowa.edu/~jones/step/
     - http://mechatronics.mech.northwestern.edu/mechatronics/design_ref/actuators/stepper_intro.html
     - http://www.solarbotics.net/library/pieces/parts_mech_steppers.html
   - RC Servos
     - http://www.google.com (keywords: RC servo)
     - http://www.towerhobbies.com

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