

**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.

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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](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.

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1. Review the motor application notes and URLs at:  
[http://ece.colorado.edu/~mcclure/misc.html#motor\\_information](http://ece.colorado.edu/~mcclure/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://mechatronics.mech.northwestern.edu/mechatronics/design_ref/actuators/stepper_intro.html)
    - [http://www.solarbotics.net/library/pieces/parts\\_mech\\_steppers.html](http://www.solarbotics.net/library/pieces/parts_mech_steppers.html)
    - [http://www.freescale.com/files/microcontrollers/doc/train\\_ref\\_material/MOTORTUT.html](http://www.freescale.com/files/microcontrollers/doc/train_ref_material/MOTORTUT.html)
    - <http://www.st.com/stonline/books/pdf/docs/1679.pdf>
  - RC Servos
    - <http://www.google.com> (keywords: RC servo)
    - <http://www.towerhobbies.com>