EE335 Advanced Microcontroller Engineering
OIT Portland Wilsonville, Winter 2013
Course Project

Objective

The student will build a complete application using the 68HCS12 and additional components.

Description

You are on your own for this assignment! The only requirements for your project are:

- It perform something useful

- It has at least one input device

- It has at least one output device

- It uses interrupts beyond just the flashing heartbeat (which it must have)

- At least one input or output device must be hardware that is not on the Dragon12-Plus board, which you have interfaced to the 68HCS12. A device other than a computer connected to the RS232 port qualifies, as does a second 68HCS12 connected via any interface.

Two or three students can have a group project. In this case there must be at least four devices not on the Dragon12-Plus board interfaced to the 68HCS12. One of the devices can be a second Dragon12-Plus board.

Devices on the Dragon12-Plus board that might be useful include the push buttons, keypad, row of LEDs, 4 digit 7 segment display, 16x2 character LCD display, DACs, speaker, IR source and detector, temperature sensor, light sensor, RGB LED, motor controller, and the potentiometer. You can use any of the interfaces on the Dragon12-plus board including RS232, RS485 (basically a differential pair version of RS232), IIC, SPI, ADC, PWM, ... or even those we haven't studied in detail like the CAN bus.

You can see what students did the past nine years at http://almy.us/classes/win12.html.

I do have some suggestions.

1. Maintain a notebook. It is a useful record of what you did during the project so you know what worked and what didn't work. You will also find the notebook useful when you write your project report.

2. Gather together all external components early in the term, ideally once you have decided on your project. Some parts may be difficult or impossible to obtain quickly.

3. Don't try to do everything at once. Write small test programs to check out your external devices and to check operation of internal devices you might be using in different ways than in earlier lab assignments.

4. Keep your program modular to keep it manageable. Use interrupts extensively so that each interfaced device is independent, communicating with the 68HCS12 via its own interrupt routine. Use subroutines when you feel it would simplify your code either organizationally or by eliminating redundancy.

Once everything is working, you will need to convert to a standalone application, with the program in EEPROM and D-Bug12 not used. We will cover how to do this later in the term, but there is a section in the textbook on this if you want to read ahead.

Remember that the instructor is available for guidance with any aspect of your project.

Some students have taken their projects and used them as starting points for their Senior Project. This is a good way to try out Senior Project ideas. Naturally, the project here should not be as complex as a Senior Project!

The Project Report
In the last class meeting on finals week you will need to demonstrate your project and turn in a project report. The project report is a formal report which has several purposes:

- It provides a way for you (the student) to demonstrate the knowledge you gained from the course and show your understanding of microprocessors in system design.

- It acts as a summary of the course.

- It provides an additional component of the final grade.

- It is an exercise in technical writing, which is possibly the most important skill needed by practicing engineers.

It is a combination of a pure project report and a take-home final exam.

The project report is to cover the design, development, and testing of your project as well as work accomplished in EE 335. The following topics, as a minimum, should be covered:

- Description of your project. What you intended to accomplish.

- Use of the ADC (even if not used in your project)

- How the SCI, SPI, and I2C interfaces are used (even if not used in your project)

- Use of interrupts (which should be used in your project!)

- Timing considerations for all the external interfaces in your project. Expected performance, based on calculations.

- Detailed explanation of how your application program (code) works.

- Description of external components - data sheets if available, schematic diagrams.

- Design problems and how they were solved (give at least **two** examples).

The project report should have the following sections:

- Title Page and Table of Contents

- Abstract or "Executive Summary", description of what you accomplished, expressed in 50 to 100 words.

- Body of report, covering the topics listed above. The body of the report should be at least 1500 words long.

- Conclusion, describing final performance of project and how it matched expectations.

- Appendices containing schematic of external components (not on the Dragon-12 board), the program listing, test data, and any charts or figures.

Unlike other assignments, the report is to be printed and pages "bound" together. It is an individual (not group) effort, however you are encouraged to have someone proofread your report to minimize careless mistakes. The report will be graded on the following criteria:

- Thoroughness - does it cover the complete design?

- Technical correctness

- Spelling and grammar

- Style - is it well organized and easy to read?

A report receiving an "A" grade must be exceptional and have a quality suitable for publishing. A report receiving a "B" grade may have some style issues but otherwise exhibit the technical quality expected of a practicing engineer. A "C" report may have technical issues and/or some spelling or grammatical errors, but needs to show understanding of the topics. A "D" report has serious issues making it unacceptable, but demonstrates an effort was made to complete the report (all topics covered, although poorly).