

## EE 299 Project 4

### Third Steps to Design

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#### Introduction:

In our final project for this quarter, we will continue to learn and practice the formal design process as we specify and develop a more complex system. We will also continue to build on the designs that we developed earlier.

This project is open-ended – it will be the design of a system of your choice. We only have approximately three weeks, so be a little conservative in your choice.

#### Prerequisites:

Designed a number of the bits and pieces and a simple system in the first three projects that we'll now need and use. Have become double plus good at spelling and pronouncing C and can say UNO with unbridled enthusiasm and with both hands. Ready to continue to extend and develop your design skills.

#### Postrequisites:

Sorry, still, only if you are twenty-one or more.

#### Thoughts and Reflections – Things People want to Know

##### Curiosities:

- If a CD spins faster closer to the center, why does the music play the same speed? Is the same thing true for a DVD?
- What happens if a radio wave accidentally gets into a television; will it know what to do? Will it wave hello or good-bye?
- We've all heard of short wave radio...do smaller and smaller radios use shorter and shorter waves?
- Does dry ice come from deserts?
- If you melt dry ice and take a bath in it, will you get wet?
- If a stealth fighter crashes how do they find it?
- If we say that's Greek to me, what do the Greeks say when they don't understand something?
- If you have an accident on the freeway do you use solar flares in the daytime and lunar flares at night?
- Can a lunar module only fly at night?
- If you fly to the sun during the day will you burn up...what about going at night?
- If the battery on your laptop dies while you are on a camping trip, can you plug it into a current bush to recharge it?

## Cautions and Warnings

As you gain more experience with developing software for the Arduino, make sure that your code has approximately an equal number of 1's and 0's. Because 0's are fatter than 1's, if you have too many 0's, your memory will fill up very quickly and not leave room for the 1's. This will also prevent bits from sticking and causing a memory block. With a memory block, sometimes the Arduino IDE system will sometimes forget to download, get sick of the mines game, and give you an upload.

If you find that your code is running a bit slower than you had anticipated, you may have an excessive number of clogging 0's, Bill has wire wideners similar to the devices used in angioplasty; use the device carefully before each download. He also has a supply of bit greaser. Be careful, you'll only need a small amount. If you use too much, your bits will be moving too quickly and pass right through the Arduino board. Finally if all else fails, make certain that your Arduino board is lower than your computer...this will allow your bits to get a running start onto your board. Be careful that they don't slip on the bit grease, however.

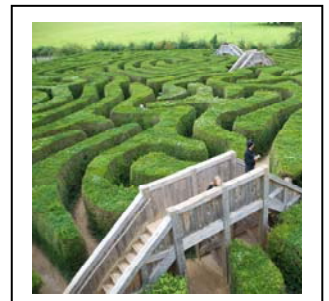
## Background

In the previous two projects, we observed that embedded systems development required several things. To do the job, we need,

1. To recognize the problem we are trying to solve.
2. A good understanding of that problem and the requirements.
3. A specification of what and from which we are to design.
4. Some tools to work with.
5. A target platform on which to develop the application.
6. A mechanism for programming the target platform.

Such requirements really apply to the design of any kind of system.

In this project, we will provide a high-level description of the things that need to be included. Using what we learned from Projects 2 and 3, you will now put together a high-level statement of the necessary requirements. Following the process we introduced in Project 2, you will then put together the appropriate design documents, do the functional decomposition, design the architecture for the system, and finally bring the design together and test it....just like Project 3 ...just a different maze.



## Project Overview

For this project, you will design and implement a system of your own choosing. That said, we will still choose a few things. Your system must include the following:

1. Two of the Arduino UNO boards
2. Support for wireless communication between the two boards
3. Utilize the serial monitor
4. Utilize the LCD display

5. Incorporate the temperature sensor or tilt sensor brick – or both.
6. Include two other features or capabilities of the Arduino UNO that we haven't used in any of our projects so far.

You can find a good introduction to the wireless shield and XBEE on the Arduino page here:

<http://arduino.cc/en/Guide/ArduinoWirelessShield>

Work through the first *Simple Example*.

What other things can you do with wireless? How about the other capabilities?

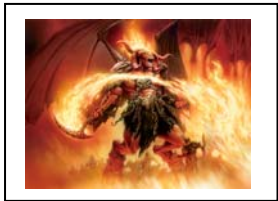
### Thoughts and Specifications

First step, ... think about the design and develop the specification that identifies and quantifies all the requirements.

Your first job, wahoo !!!!!!!!!!!!!!!!

Some things to think about,

1. What do you want your design to do?
2. What will the major pieces of functionality be?
3. What inputs might you have for the system? What outputs?
4. What kind of display do you want to use?
5. How do you want to communicate between the two Arduino boards?
6. Do you have other requirements or features?
7. Will you have time to complete the project in time for your demo to the customer – us?
8. Watch out for the smoke demon!!!!!!!!!!



Now that we have a specification that we can design from...let's do it. None of this will change.

### Design

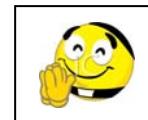
Your next job, cool !!!!!



Once the design is complete, we test it to make sure that it does what the specification requires. Sure hope that it does.

### Test

Another job for you !!!!!!. Oh, ok but I need some special help.



### Demo

Show your stuff .....



Finally writing the final report.



### Report

Your job too, bwa ha ha !!!!!!! What!!!!!! My partners still can't just do it??????

Done – turn it in .... eeeeeeeee haaaaaaaaaaaaa !!!!!!!

### Done



Hey, we're done, we're good, we rock, and here's our project.

### Deliverables

A Project report containing

1. The annotated source code for all your *programs* / *sketches* for the UNOs.
2. Screen shots showing the results of executing the applications on the PC.
3. A short user's manual for your design.
4. Remember, your report has to be your original work, not just made up of sections borrowed from the Project spec.