Description and specifications
Design and implement a Simon Says game. The typical game consists of five switches, four different color lights, a speaker, a start button, and an on/off switch. Figure 1 shows a commercially available Simon Says game.

Figure 1
A commercially available Simon Says game. The four colored panels (green, red, blue, and yellow) a covers for push button switches. There is also a switch in the middle to start the game.

In the commercially available game each of the four colored panels is translucent and covers a light and a push button switch. The game begins when the player pushes the middle button to start. A sequence of lights appear and each light is accompanied by a distinctive tone. After a short pause the player is supposed to repeat the sequence by pushing the panel buttons in the right order. If the player succeeds, the game repeats with a slightly more complex sequence. It continues until the player fails.

The game which you build should meet the following specifications:
1. The game should be small enough to fit inside a box whose dimensions at 6" x 6" x 1.5".
2. The game must be completely self-contained and battery operated.
3. The game must be sturdy enough to survive a four foot drop onto a concrete floor.
4. You must use the AT89C51CC03 processor to drive your game.
5. You must have at least two pushbutton switches and lights (plus the start switch and the on/off button). You may have as many as many as eight pushbutton switches and lights.
6. Your switches must be in distinctive colors other than purple.
7. The tones which your game produces must have fundamental frequencies between 65 Hz and 1065 Hz. All tones must be clearly audible at a distance of 20 feet when the game is setting on a flat surface.
8. Your game must have an LCD display to show the game status and indicate the player's progress.
9. Your software must contain at least one subprogram in C and at least one subprogram in 8051 assembler.
10. Your project must consider the following factors in the design: safety, manufacturability, economic, environmental, and reliability. Variations on the original game are encouraged as are multiple playing modes.

**Grading:**

This project will be done individually and a single grade will be given for each project. A total of 100 points is available for the project and will be awarded on the following basis:

<table>
<thead>
<tr>
<th>Points</th>
<th>Item</th>
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</thead>
<tbody>
<tr>
<td>25 points</td>
<td>Does your project work and meet specifications</td>
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<tr>
<td>15 points</td>
<td>Creativity and novel added features</td>
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<tr>
<td>15 points</td>
<td>Finished product quality</td>
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<tr>
<td>15 points</td>
<td>Documentation of software</td>
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<tr>
<td>15 points</td>
<td>Documentation of hardware</td>
</tr>
<tr>
<td>15 points</td>
<td>Other documentation</td>
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The project report should consist of:

- A cover sheet with your name, the project number and title, and the date turned in.
- A list of novel features. Creativity may consist of novel hardware or software implemented features or a novel packaging technique.
- A list of those items you were able to demonstrate as working to the instructor.
- A discussion of how you considered safety, reliability, economic, manufacturability, and environmental factors.
- An estimate based on theoretical and empirical data as to the power requirements.
- Hardware documentation.
- Software documentation.

At a minimum your hardware documentation must consist of a system diagram, a complete circuit diagram (with pin numbers), and a mechanical sketch or photo of your project done to a level of detail such that another person in the class could build your project from your diagram. At a minimum your software documentation should consist of fully commented source code for all of the modules in your program and a pseudocode design with enough detail that another person in the class could duplicate the function of your software.

The grade for this project will be based on what is complete and handed in as of **11:00am on October 23, 2015. No late grades will be given.**