Module: SIK Guided Investigation

Module Outline

You have probably already taken many devices from your ECE110 SparkFun kit. Without the chassis, the microcontroller board and mounting hardware your box is a lot emptier. But some of the best parts of the entire kit remain – many sensors, two servo-motors, lots of LEDs, piezo-electric motion sensors and a really cool speaker, to name a few! The official SparkFun Inventors’ Kit guide is a good place to start experimenting with these other devices. Where to begin?

Never fear! For those of you who want to begin exploring, the SIK guide is a great resource. It has 16 guided experiments leading you to explore many interesting items with many fun applications like the servomotor. In the past, once students get the servomotors out, they always have lots of fun with them. For instance, one ECE110 team used a servo motor to create a rotating platform where an ultra-sonic sensor scanned to detect nearby objects/targets for a game of laser tag. Another ECE110 team used a servo-motor in the creation of a Skittle-sorting machine. With only a servomotor, two paper plates, a color sensor, and lots of tape they were able to successfully sort the green Skittles from a packet. So let the fun begin...
Procedures

There are no formal questions for this module. Instead, we will follow a structure similar to that used to document circuit designs and experiments thus making these module report more project-like. Instead of the “do-this-procedure-and-then-answer-these questions” format you will be asked for more open-ended descriptions, diagrams, and insights, things you would write down for yourself if you were working on your own project.

✓ Choose one experiment in the SIK guide from this list – the experiments are ordered so that you learn a little bit about building circuits and using the Arduino/RedBoard each experiment so those who have not worked with this type of micro-processing platform might want to go through them in order at first.
  □ Experiment 1
  □ Experiment 2
  □ Experiment 3
  □ Experiment 4
  □ Experiment 6
  □ Experiment 7
  □ Experiment 8
  □ Experiment 9
  □ Experiment 10
  □ Experiment 11
  □ Experiment 12
  □ Experiment 13
  □ Experiment 14
  □ Experiment 16 – this experiment incorporates several devices to construct the memory game SIMON

The SIK guide was written for a different suite of parts so if you want to do an experiment and the parts are not in your kit we will loan you any required parts.

✓ Do the experiment as described in the guide.
✓ Fill in the sections that follow.

Repeat using another experiment in the SIK Guide – each as a separate module earning you additional points.
Project Description and Motivation

This section is used to describe in words what the experiment is, how it works, and what you expect to learn.

Try to answer these questions:

- What did I learn about this new device?
- What new things did I learn about building circuits?
- What new things (if any) did I learn about interfacing hardware to the Arduino?
- What new skills (if any) did I gain in programming the Arduino?

If you start from the beginning, the SIK guided exercises are very well organized. Their flow is intended to teach you about successively more sophisticated hardware and more sophisticated programming. Use the information in the SIK guide to help you explain what you learned. But please explain IN YOUR OWN WORDS.
Block Diagram of the Circuit Design

This section is used to support the descriptions of the circuit you described in the previous section. A block diagram is intended to be a higher level visualization of the circuit than either a physical diagram or a schematic.
Block Diagram or Flow Chart of Code

This section is exactly the same except you will be providing a flowchart of the Arduino code used during your experiment. If you are not sure what a flowchart looks like, check this out: http://xkcd.com/518/
Schematic of the Circuit
Notes to Self - Describe what you learned

Use this section to keep notes.

- Describe what you learned by doing the experiment. This may or may not be the same as the stated purpose in the guide.
- Procedures often leave out details obvious to the person writing the experiment but is not at all obvious to the person doing the experiment – write down any missing details you had to self-discover!
- Did a cool idea or application go through your mind while doing the experiment? – write it down.
- Frustrations? – write them down.
- Moments of enlightenment? – write them down.

Think of this page as notes to your future self who wants to continue with the project.
Future Work

To complete these modules, you need you to take the device you just studied and come up with a way to use it in a circuit that to DO SOMETHING. Maybe it will help drive your car autonomously (photocell would give the car the ability to drive toward the light), or to make your car do something entertaining (the piezo-electric buzzer can buzz out a song), OR you can do some research on the Internet and find an interesting project and use that design here. If you build it, it can be submitted for additional module points. Best of all, you might imagine your own use for the device without imitating something you found on the Internet!

Write a short but informative description IN YOUR OWN WORDS about your ideas or the projects you discovered on the web.

Cool “idea” sites:

www.sparkfun.com
www.adafruit.com
http://makezine.com
Appendix A

Include the datasheet of the device and any other parts that you think need to be documented.

Often experiments and projects provide a circuit design and description but not much about why the circuit was built in the chosen configuration with the chosen parts. You want to be able understand why the design decisions were made so that you can expand the circuit or apply the same design in a different setting.

To this end, highlight the important parameters that helped drive the design and interface circuitry used during the experiment.

For example, two common reasons for adding resistors to the interface circuitry are to provide a point for supplying a voltage, and to protect parts that cannot handle much power by reducing the current flowing through the device.

Ask your TA for help with this if you are having trouble.
Appendix B

Include any Arduino Code that you used.