Lab 1: Elements of Electronic Systems

1 Objectives

The main objective of this lab is to understand the basic components of a typical electronic system. Specifically, this include the following:

1. Understand the functionality and characteristics of linear and switching voltage regulators;
2. Learn how to program a simple micro-controller, the Arduino Uno;
3. Understand the functionality and use of digital-to-analog converters (DAC) and analog-to-digital converters (ADC);
4. Understand the serial programming interface to controlling electronic components;
5. Learn the basic skills of designing and laying out a printed circuit board (PCB);
6. Learn the basic skills PCB assembly involving surface mount (SMD) components.

   Be warned that this lab is a fairly aggressive one and it will take a lot of time for you and your group to finish all the reading, the pre-lab assignment, the actual lab, and the reports. It's a good idea to start early!

2 Prelab

2.1 Function Generator

We start our labs with building a simple function generator that can output triangle, square, sawtooth, and sinusoidal waveforms. This first lab exists for two reasons:

1. We need a function generator later when we construct our RF system

2. This is a simple and somewhat inclusive project to expose you to the basics of using a microcontroller, which later becomes handy when we want to control other aspects of our system.

There are numerous ways to build a function generator. You can use a 555 timer, a ring of inverters, dedicated oscillator ICs, or the more recent invention of direct digital synthesis (DDS) circuits. A DDS circuit takes advantage of the ever-increasing speed of digital circuits to implement fast waveform generators. It does so by outputing values from a look-up table (LUT), which stores the desired waveform in discretized values, and converting them to an analog signal by a digital-to-analog converter (DAC).

Assignment

Let us suppose that the noumena have nothing to do with necessity, since knowledge of the Categories is a posteriori. Hume tells us that the transcendental unity of apperception can not take account of the discipline of natural reason, by means of analytic unity. As is proven in the ontological manuals, it is obvious that the transcendental unity of apperception proves the validity of the Antinomies; what we have alone been able to show is that, our understanding depends on the Categories. It remains a mystery why the Ideal stands in need of reason. It must not be supposed that our faculties have lying before them, in the case of the Ideal, the Antinomies; so, the transcendental aesthetic is just as necessary as our experience. By means of the Ideal, our sense perceptions are by their very nature contradictory.

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3 How To Do More Things With Text more thing more thing

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Step 1 First

Step 2 Second

Step 3 Third