Sensor Assignment

ETSC 242

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Overview

In this assignment, you’ll select a sensor or transducer that you would like to investigate, then explore the datasheet to determine the relevant information needed in order for the sensor to be implemented into a LabVIEW data acquisition system.

Instructions

**Pick a sensor or transducer to analyze**. There are several ways to explore sensors and transducers, here are a couple options to get you started:

* + List of Sensors: <https://en.wikipedia.org/wiki/List_of_sensors>
  + List of Transducers: <https://en.wikipedia.org/wiki/Transducer>
  + Google search “sensors” or “transducers”
  + The EET program often buys sensors from Digikey, so this is a good website as well
    - <http://www.digikey.com/product-search/en/sensors-transducers>
  + Spend some time exploring different types of sensors and their datasheets, you’ll find that the information found in some datasheets can vary wildly!
  + DO NOT SELECT “SURFACE MOUNT” (SMD) SENSORS

Complete the following questions

1. Note while you are browsing that the terms “Sensor” and “Transducer” can sometimes seem interchangeable. After you’ve explored several types of each, in your own words, describe what each term means to you.
   1. Sensor:
      1. A sensor takes some measurable physical element such as light, heat, or pressure and converts it into an analog electrical signal with no modification
   2. Transducer:
      1. A transducer does everything a sensor does, except a transducer converts one form of energy into a different form. Does not produce some sort of electric output. All transducers are sensors but not all sensors are transducers
2. Provide a description of the sensor you chose, i.e. what physical phenomenon does it measure? What kind of electrical signal does it output? etc. Include model number, part number and where you found it.
   1. The sensor I want to use is the **SHT31-ARP Analog Voltage Output Humidity and Temperature Sensor. This sensor outputs analog voltage. The model number is SHT31-ARP. The link to the sensor is** <https://www.isweek.com/product/analog-voltage-output-humidity-and-temperature-sensor-sht31-arp_2324.html>.
3. Download and review the datasheet for your sensor, then refer to the Sensor Technology Handout to help you fill in the following as related to the sensor that you chose (depending on the sensor chosen, not all of the specifications below may apply). INCLUDE UNITS!
   1. Transfer Function
      1. Where Vrh/Vdd is output voltage
   2. Sensitivity
      1. V = 2.4 V 🡪 19.2 mV/% RH
      2. V = 3.3 V 🡪 26.4 mV/% RH
      3. V = 5.5 V 🡪44.0 mV/% RH
   3. Dynamic Range or Span
      1. 0 to 100 % RH
   4. Accuracy or Uncertainty
      1. +/- 2% RH
   5. Hysteresis
      1. At 25 degrees C +/- 0.8 % RH
   6. Nonlinearity (often called linearity)
      1. 0.2 % RH
   7. Noise
      1. \_\_\_\_\_\_\_\_\_\_\_\_
   8. Resolution
      1. 0.01 % RH
   9. Bandwidth
      1. 8 seconds for humidity
4. Please list any other specifications that are relevant to your sensor (if any).

This sensor also senses temperature, as it has another set of analog output pins for a typical temp sensor. This will be useful for calibrating the humidity sensor.

1. Provide a description on how you would incorporate this sensor into LabVIEW. Be as detailed as possible. Remember that your sensor output signal needs to be properly measured by the NI modules that we have on hand, thus a “conditioning circuit” may be needed to be added to the system (similar to what you’ve experienced in the Labs).

I would use two different DAQ Express VI’s, one to gather temperature data and the other to get humidity data. There will also probably be a formula VI to combine the temperature data with some conversion to calibrate the humidity sensor. Both outputs require a 5V input and have a 0-5V output, so that would be my VI range.

1. Does this sensor require a Transfer Function in order for the data to be relevant? If so, provide a description of it below. If you answer “no” then you will need to provide a detailed description and references to the datasheet for why there would not be a transfer function. For example: remember that we needed to figure out how to convert a Δ-resistance or a Δ-voltage into a Δ-temperature in the Thermistor and Thermocouple labs.

I believe so. There is a formula that converts output voltage to relative humidity, so I assume this is the transfer function. It is a linear function so it should be relatively simple to implement into the VI. The formula is as follows:

1. Upload the datasheet for your sensor and this completed document to Canvas.

<https://www.isweek.com/Uploads/20170703/5959b1375cd7b.pdf>