Simon Popecki  
5, March 2017  
ME 646

LAB 3 – STRAIN GAUGES AND VIBRATION

Ink Drawings
Ink Drawings
Ink Drawings
Ink Drawings
Ink Drawings
￼
￼￼￼
￼
￼
￼
￼
￼￼￼￼￼￼￼￼
￼￼￼
￼
￼￼￼￼￼
￼
￼￼￼￼￼￼
￼￼￼
Ink Drawings
BEAM AND STRAIN GAUGE RESPONSE

**Diagram of the Physical Setup:**

**Determination of Bridge Sensitivity Using Shunt Resistors:**

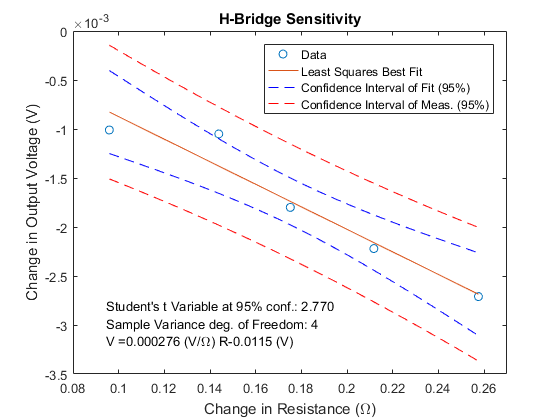


Figure – Experimental response of the Wheatstone bridge. The large confidence interval was caused by an anomalous point, data for subsequent portions of this experiment will be borrowed from Jesse Feng.

**V = .0115 (V/Ω)+2.76e-4 (V)**

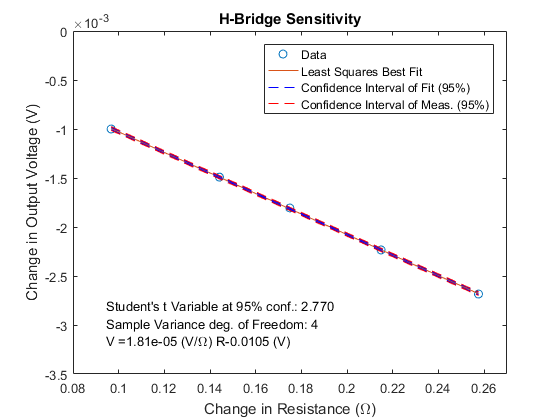


Figure – The data of Figure 1 were replaced with cleaner data.

**Comparison of Measured Bridge Sensitivity with Calculated Bridge Sensitivity**

The measurements of bridge sensitivity were taken by adding a shunt resistor to one of the legs of the Wheatstone bridge. The calculations of the bridge sensitivity are made using the quarter Wheatstone bridge model. The voltage supplied to the Wheatstone bridge was 5 V – this value is represented by Ei in the equations below. Eo represents the output voltage across the Wheatstone bridge (see equation 1).

(1)

Since only one resistor is being changed in value, the following is true:

(2)

(3)

With the introduction of changes in voltage and resistance the equation for output voltage of the Wheatstone bridge is shown as:

(4)

The input voltage is approximated as:

(5)

If the output voltage is assumed to be zero at the point where there is no change in resistance. Strain is represented by , and gauge factor is represented by GF.

(6)

Solving for the bridge sensitivity by rearranging equation 6:

(7)

The experimental bridge sensitivity had an error less than 1% using the data of Jesse Feng. Using the original data, the error percentage was 11%.