ELL301

20.03.2019

Temperature Sensors

- RTD's
  - **T**emperature **D**ependent **R**esistance
  - METALS: Platinum, Nickel, Copper

$R = \rho \frac{l}{A}$

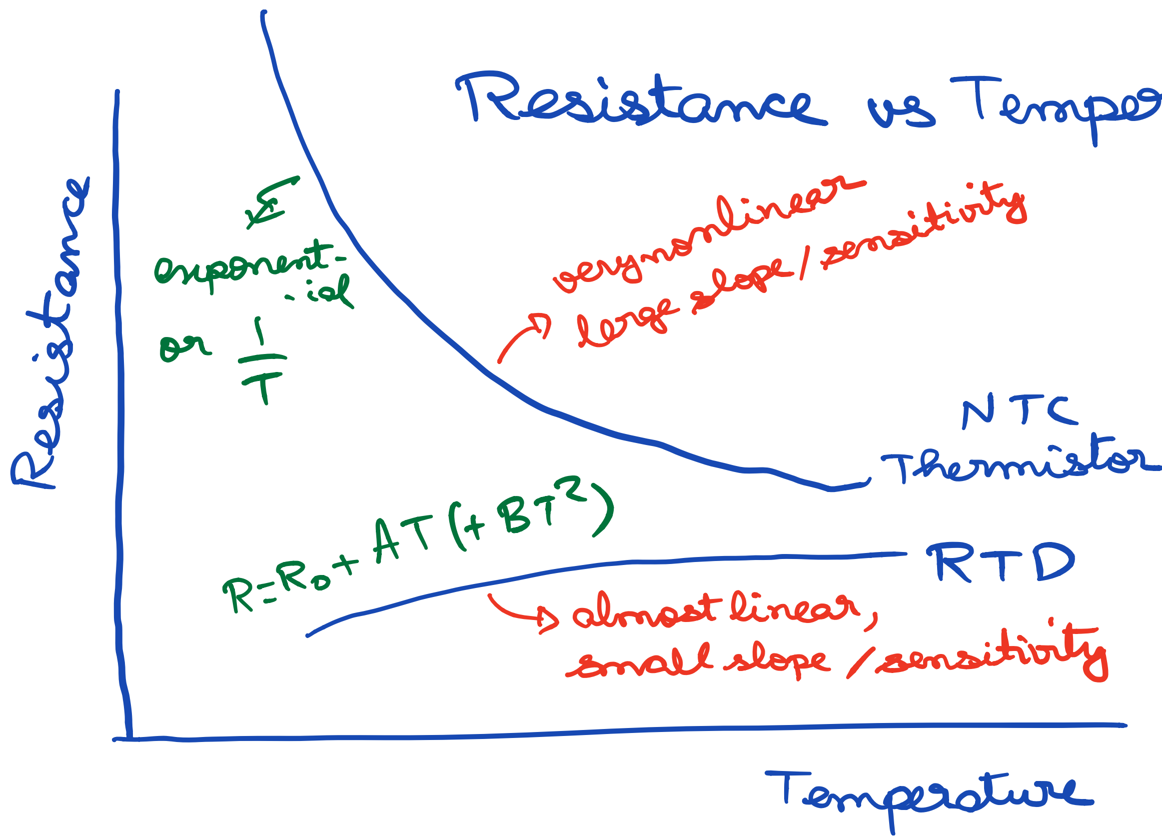
↳ Resistivity changes with temperature, mostly increases

- Thermistors
  - **Therm**al Res**istors**
  - Semiconductor-based

NTC: Negative Temperature Co-efficient

PTC: Positive Temperature Co-efficient

Resistance vs Temperature

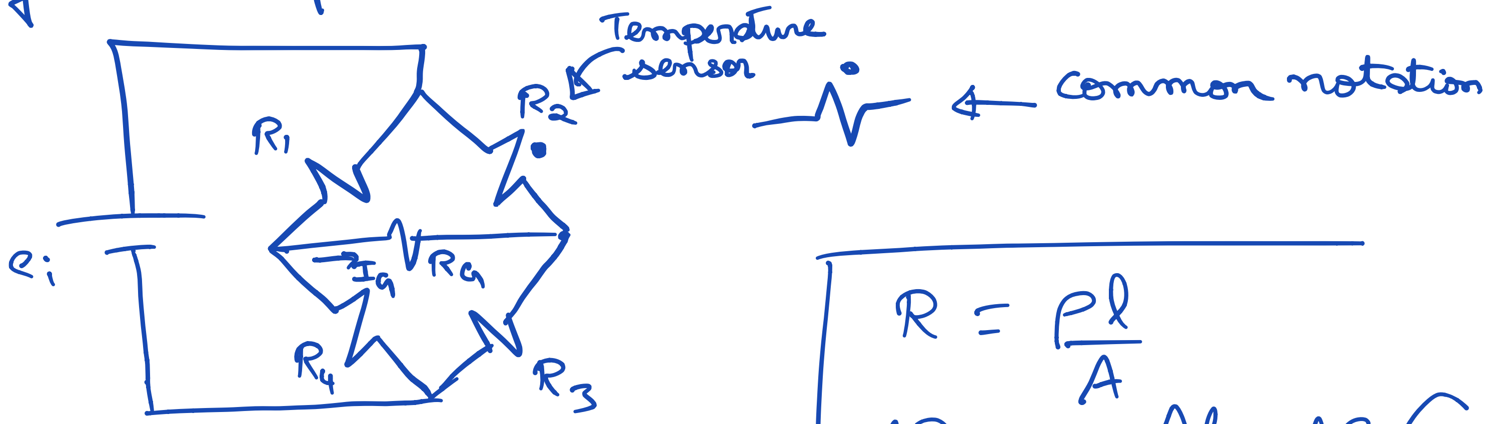


Reminor Test (Q3, last year)

$aR_0 = 0.1195\ \Omega$

$b = 2842.8\ K$

Wheatstone Bridges commonly used for temperature sensors also.



$R = \frac{\rho l}{A}$

$\frac{\Delta R}{R}$ $\frac{\Delta l}{l}$, $\frac{\Delta \rho}{\rho}$, $\frac{\Delta A}{A}$

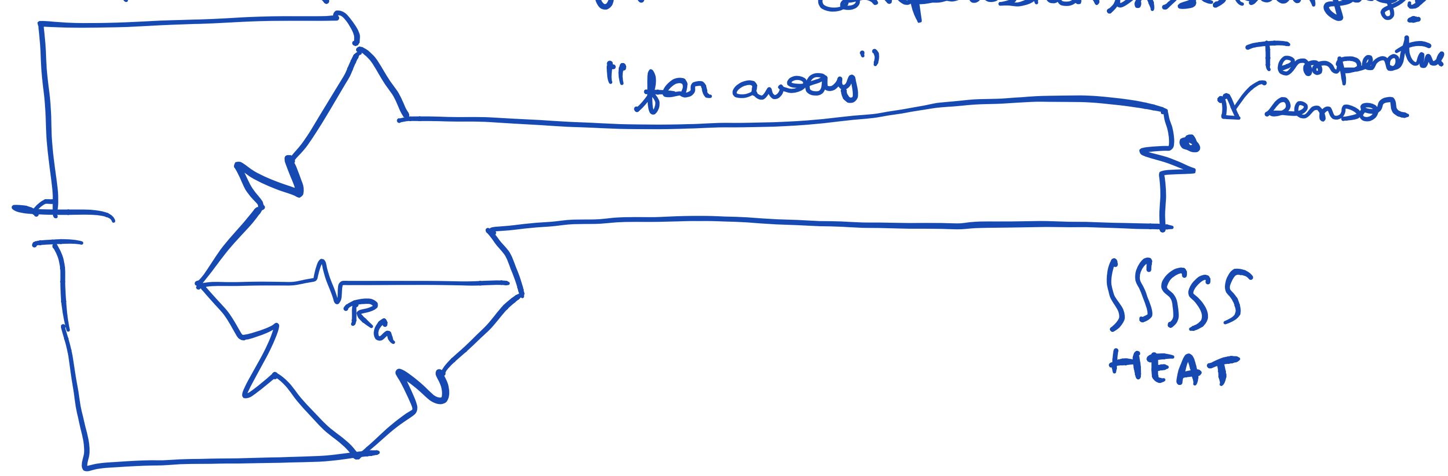
Same idea as strain sensor-based bridges:

- Initially, bridge is balanced
- When temperature changes, then bridge is unbalanced, $I_G \neq 0$
- Extent of I_G is used to estimate temperature change.

For RTD

$\Delta T \xrightarrow[\text{linearly}]{\sim} \Delta R \xrightarrow[\text{is it linear?}]{?} I_G$ (assuming initially $I_G = 0$)

Long leads may introduce errors. How to compensate for their effect? (Just like temperature compensation in strain gauges)



One solution: Three-wire solution