Team 1817:Electrical Plug, Connector, and Receptacle Temperature Sensor

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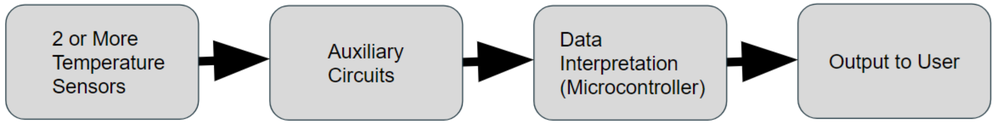
Abstract

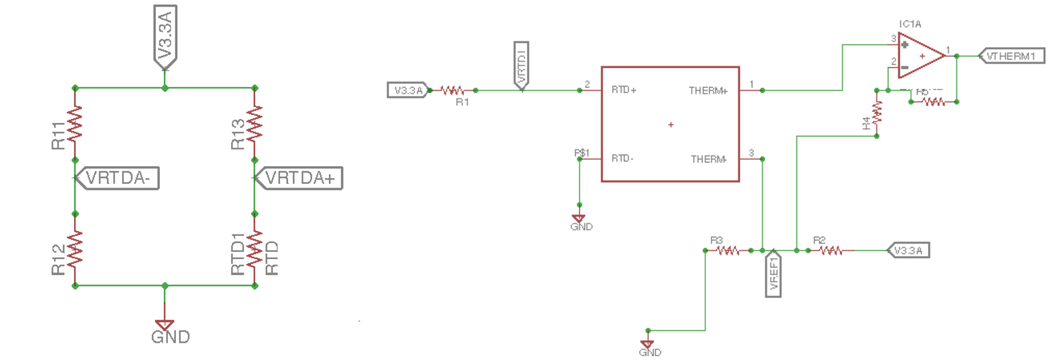
Hubbell has tasked the team with researching existing temperature sensing technologies and looking to design, miniaturize, and optimize a small temperature sensing system.
The design must be adaptable to different conditions; including environment and targets of measurement.

The design must be able to have a flexible form factor for various implementations. There must be data interpretation built into the design to take information from multiple temperature sensors, perform any necessary computation, and output the data to the user. Overall, the goal is to optimize a temperature sensing system by miniaturizing a sensor array.

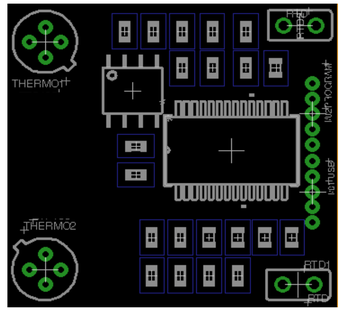
System Setup

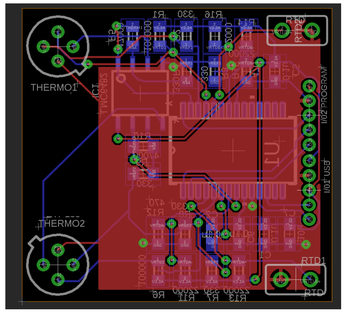


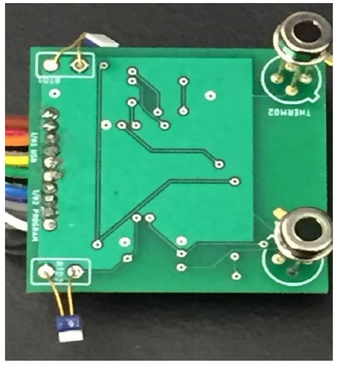
Circuit Implementations

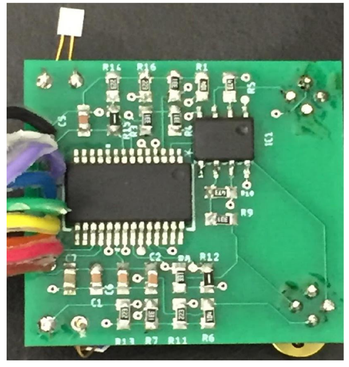


PCB Layout





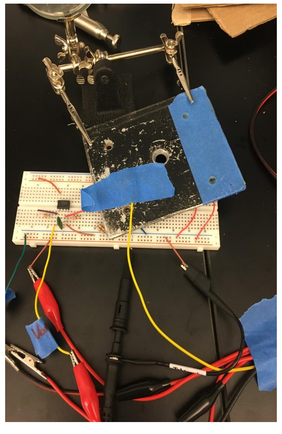


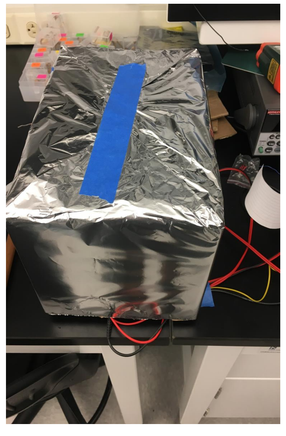


Requirements

- Two or more sensors
- 1 inch x 1 inch component density
- Temperature range: -20°C to 80°C
- Minimum Accuracy: ±1°C
- Onboard Microcontroller for data interpretation
- Final design cost $6-8

Test Setup





Thermopile testing: Aluminum Circuit Shielding from IR/EMI

Budget Analysis

Parts	Components	1000 Unit Price
Sensors	RTD	0.837
	Thermopile	2.36205
Passive Components	Resistors	0.2297
	Capacitors	0.18078
OP AMP	OPAMP	0.74526
Microcontroller	8 Bit Microcontroller	1.6995

Total Cost

RTD Design	$3.95
IR Design	$7.97
IR & RTD Design	$10.46

Conclusion

The overall circuitry performs as intended to meet the requirements stated previously. Through the use of the microcontroller, many variables can be adjusted for better accuracy with a range of measurement targets. While the cost is slightly above the intended budget per board, this design is done as a prototype and can therefore be adjusted.

Improvements

Some improvements to this design are to utilize a voltage regulator for the bias voltage applied and outsource the soldering to reduce component size