



Peltier Temperature Controller

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Objective

This project is designed and built for student lab in neurobiology as a feedback controller to control the bath temperature of the petri dish.

Motivation



Price of Existing products on market is expensive(>1000\$)



Student lab needs the device to conduct experiments this summer



An easy-to-use interface is needed for the device

Background

Fruit flies can be engineered to have thermo sensitive channels, which are useful for turning off and on function in biological experiments.

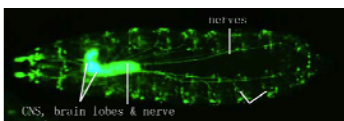


Figure 1. larva observed under the dissection scope.

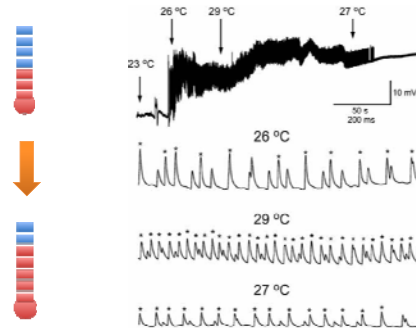
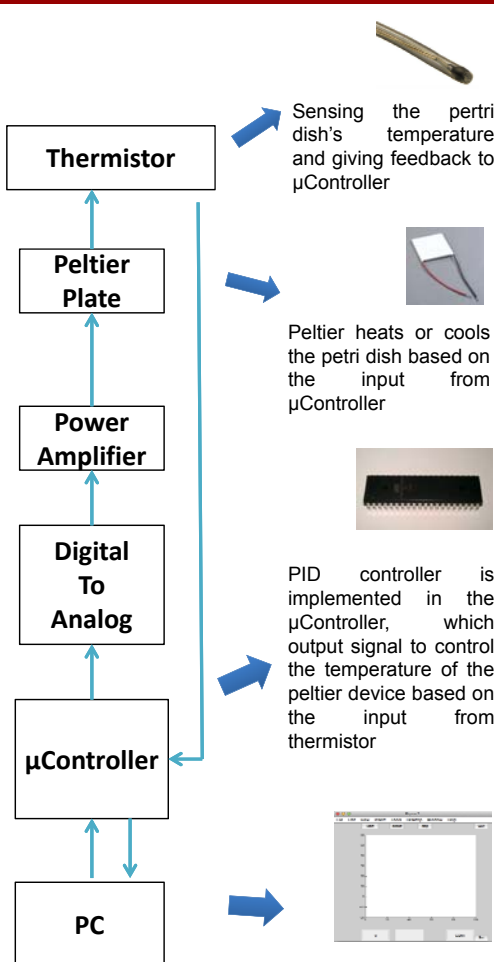


Figure 2. Warming evokes EIPs in larvae expressing TRPA1 in motor neurons.

Methods



Results

Advantage:

- The total cost is less than 100\$.
- The MATLAB based interface is easy to use. No training is required before using the device.
- The first version has finished and ready to use. (rising time 20 s/ $^{\circ}$ C, settle time 5s)

Future Improvement:

- Improve the heat distribute system to increase the device's performance.
- Embed the user interface in the device to make it computer independent.

References

- Jimena Berni, Alistair M. Muldal, Stefan R. Pulver. (2010). "Using Neurogenetics and the Warmth-Gated Ion Channel TRPA1 to Study the Neural Basis of Behavior in Drosophila."
- Hidetaka Morimitsu, Seiichiro Katsura. (2010) "A Method to Control a Peltier Device Based on Heat Disturbance Observer"

Acknowledgements

I would like to thank professor Bruce Land and professor Bruce Johnson for their guidance through the whole academic year.