Hi Bing,

Good to hear from you and I'm glad to hear about your progress! (And would you mind sharing an image of your cooling device? Just curious to see what you've done.)

I'm now at Simon Fraser university in Canada, but in any case, I'm ccing my colleague, Adam, who worked most closely with our latest algorithm. He may be able to give you starting values, but we found that with each new setup we would need to regenerate starting values **by trial and error.** We would then seed our algorithm with these before each cooling session in an animal. In practice, these factors will affect what parameters to start with if you want a quick approach to target temperature while avoiding oscillations (a potential problem with any PID algorithm): temporal delay and frequency of control loop (depends on your hardware and software), distance of thermocouple from coolant (which will also cause a delay), speed of coolant from ice bath to brain (another song race of delay), insulation properties of coolant tubes,  rewarming properties of brain (e.g., big vs small animal).

Starting values from us may help, but the first calibration of your algorithm will probably take a lot of trial and error. Then you'll need to make smaller adjustments for each new cooling chip. I believe we tested chips with a "fake brain" (agar in hot water bath) before use in an animal. Once we started laser-cutting channels in our chips (rather than embedding tubing in pdms) we needed less calibration because our chips were more uniform.

I'm sure Adam will have something to add, as he knows how to to calibrate  the algorithm much better than me.  If you have a plot of your brain temperature as a function of time, that might help us diagnose you problem.

Best of luck and keep in touch,

Dylan

Hi Bing,

Can you send me your parameter definitions so I know how they relate to the variable names we used?

Based on what you've described, it sounds like you need to set you initial speed parameter to a value that closely matches the speed at which you've previously obtained a desired target temperature. This can only be determined empirically. Run the pump manually and determine the approximate pump speed that results in your desired amount of cooling. That should be the initial speed value you use for that target temperature.

As Dylan says, though, every setup is different. Usually in an experiment we start with an initial value that worked in a previous experiment and then change it based on the pump speed to brain temperature relationship we observe for that particular experiment. Usually this can be accomplished within the first one or two cooling runs in an experiment.

Best,

-Adam

Hi Bing,

Sorry it's taken so long to get back to you. We've been busy with a few grants.

To answer your question, here are some values we had used in previous setups to achieve a brain temp of 20 deg. at 1000 microns deep:

Recursive term:=50,

Kd:=5, (if this is the term that's multiplied by the slope of the temperature trace)

Kx:=0.04 (if this is the term that's multiplied by the mean temperature difference and added to the recursive term)

ki:=500 (if this is the term you multiply with the temperature prediction term which you've taken the natural log of).

Hope this helps!

-Adam