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The Costanera controller: a modular open-hardware project for and by undergrads

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This project aims at developing a low-cost open-hardware alternative to commercial temperature controllers with parts costing less than 100U$S that meets the performance parameters for diverse applications. As a demonstrator, we used a 40W output power version to regulate the temperature at (130+/-0.5)K in different scientific CCD testing stations equipped with cryocoolers with unregulated cooling capacity. The heating power is set by a PID algorithm that reads the temperature using a PT-100 and an analog-to-digital converter. The controller is powered by a Raspberry Pi Pico, and the status is displayed on an OLED screen. Both hardware and software are modular, making them easily scalable to new capabilities. PCB fabrication files, schematics, and firmware-client software are available in a public repository. Building, implementing, and assessing the controller performance in the laboratory is an ideal project for undergraduate students who wish to learn instrumentation techniques and new skills such as PCB design, SPI/I2C communication protocols, python and multi-thread programming, serial communication, soldering, electronics, etc.

Submitted on behalf of a Collaboration?

No

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