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Monitoring Laboratory Conditions with an Inexpensive Custom Data Acquisition System JOSHUA BOMAN, MEGAN LOVELAND, JR DENNISON, Utah State University — A standardized hardware and software package has been developed to monitor and record laboratory conditions. Changing physical conditions can subtly influence precise experimental devices and measurements. The computer-interfaced system is based around an inexpensive Raspberry Pi microcomputer and commercially available sensors. This system is capable of monitoring ambient temperature, atmospheric pressure, relative humidity, visible and UV light intensity, and motion. The Raspberry Pi runs a Python program that reads data from the sensors, checks sensor data for outlying data points, and uploads the sensor data to a text file at user-defined intervals. The text file is used by a LabVIEW program on a host computer to further analyze, plot, and display the calibrated sensor data in real time and to trigger alarms. This allows laboratory users to determine the influence of varying conditions on experiments and identify physical conditions that require better control to improve the precision and accuracy of experimental data. Specific examples from the Materials Physics Group (MPG) labs are presented. For example, minor temperature fluctuations of 0.5 K were found to affect current measurements of highly insulating materials taken with MPG's constant voltage conductivity chamber. Sensor accuracy and resolution are also addressed, including cross-calibration to the Utah State Climatology campus weather station. Additional sensors can be readily accommodated in the program structure, for example to monitor vibrations, sound intensity, or AC power and voltage fluctuations.

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