

Developing Arduino-Based Equipment for Low-Cost, Low-Skill Environmental Monitoring

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Abstract

Open-source monitoring equipment has been adopted by environmental scientists. A popular development platform is Arduino. However, most existing Arduino-based datalogger designs are complicated for environmental scientists whose main duties are outside equipment development. This research aimed to develop a low-cost and low-skill datalogger for the purpose of environmental monitoring. An Arduino-based datalogger called Delayable Latching Logging Module (DE-LA-LO-MO) was developed. A small circuit board called Compact Air Sensor (COMPASOR) was also developed. The data-logging parameters, namely the logging interval and the delay until the first logging event can be configured by modifying the text files in the MicroSD on DE-LA-LO-MO. Using the square-wave output from the real-time clock and the external interrupt service routine of the microcontroller, DE-LA-LO-MO achieved a low power consumption down to 0.21 mA outside data-logging episodes. An equipment test was conducted from 18:15:00, 26th September 2024 to 18:15:00, 27th September 2024. 23 COMPASORs were used in tandem with reference sensors. The latter provided reference measurements so that mean absolute error, mean absolute percentage error, and root mean square error were computed. Although the stated accuracy of the sensors on COMPASOR was 0.20 °C, 1.8%, and 1.0 hPa for air temperature, relative humidity, and barometric pressure respectively, the empirically determined mean absolute error was 0.22 °C, 0.88%, and 0.05 hPa respectively. DE-LA-LO-MO and COMPASOR can be deployed for environmental monitoring.