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Development of Advanced Linear Calibration Technique for Air Flow Sensing by Using CTA-Based Hot Wire Anemometry

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Abstract : The purpose of this study is to develop an Advanced linear calibration Technique for air flow sensing by using CTA-based Hot wire Anemometry. It contains a host PC with Human Machine Interface, a wind tunnel, a wind speed controller, an automatic data acquisition module, and nonlinear calibration model. To improve the fitting error by using single fitting polynomial, this study proposes a Multiple three-order Polynomial Fitting Method (MPFM) for fitting the non-linear output of a CTA-based Hot wire Anemometry. The CTA-based anemometer with built-in fitting parameters is installed in the wind tunnel, and the wind speed is controlled by the PC-based controller. The Hot-Wire anemometer's thermistor resistance change is converted into a voltage signal or temperature differences, and then sent to the PC through a DAQ card. After completion measurements of original signal, the Multiple polynomial mathematical coefficients can be automatically calculated, and then sent into the micro-processor in the Hot-Wire anemometer. Finally, the corrected Hot-Wire anemometer is verified for the linearity, the repeatability, error percentage, and the system outputs quality control reports.

Keywords : flow rate sensing, hot wire, constant temperature anemometry (CTA), linear calibration, multiple three-order polynomial fitting method (MPFM), temperature compensation
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