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Technology Offer

Hot-wire anemometer with high temporal resolution

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Abstract

The Differential Temperature Anemometry (DTA) is a cutting-edge technique that enhances the temporal resolution of flow velocity measurements in thermal anemometry. By leveraging the instantaneous temperature gradient of the sensor, DTA provides rapid and continuous data without the need for thermal equilibrium. This innovation represents a significant leap forward, offering high-speed, accurate flow detection for dynamic applications.

Advantages

- Increased measurement speed due to instantaneous response to temperature gradients.
- Continuous data acquisition, enabling real-time monitoring of flow changes.
- Elimination of the need for thermal equilibrium, reducing downtime.
- Compatibility with existing thermal anemometer hardware.
- Compatibility with existing calibration process.
- High accuracy with temperature-dependent loss compensation.

Applications

The new technique can be applied to all thermal anemometer applications, where temporal resolution beyond the thermal time constant of the sensor element is required, like …

- wind speed monitors,
- alarm in case of flow failure, e.g. cooling water,
- rapid changes of flows, e.g. vehicle crosswind stabilization

Background

Thermal anemometry is a well-established field, crucial for measuring fluid flow in numerous scientific and industrial applications. Traditional methods rely on the sensor reaching thermal equilibrium, which can be time-consuming and less responsive to rapid changes. DTA builds upon this foundation, addressing the limitations of prior art by introducing a method that significantly accelerates response time and maintains continuous measurement capabilities.

Technology

DTA technology utilizes a novel approach to thermal anemometry by focusing on the sensor's temperature gradient rather than its equilibrium state. This method measures the imbalance between electrical heating and convective cooling, yielding flow velocity data with unprecedented temporal resolution. The DTA's innovative calibration and data processing techniques facilitate its integration into various industrial and research settings.

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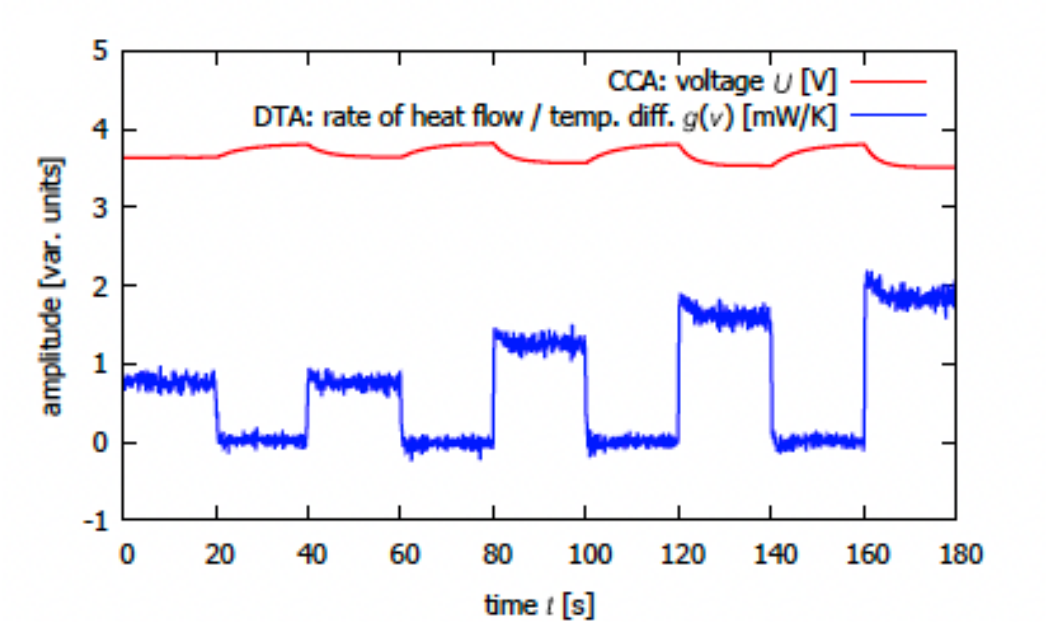

Fig. 1: Comparison of the signals for the new technique (blue color) and a state-to-the-art (CCA) anemometer (red color), using identical hardware. This test has been done with a PT100 chip resistor with a thermal time constant of 10s resulting in an appropriately slow CCA response, while DTA resolves the stepwise flow changes (increasing in amplitude between steps).

Patent Information

PCT, EP

Publications

H. Nobach, “Differential Temperature Anemometer”, submitted on Aug 7, 2023, https://arxiv.org/abs/2308.03435

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