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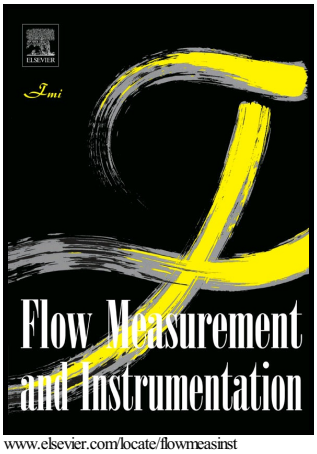

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Application of Soft Computing Techniques to Multiphase Flow Measurement: A Review

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Abstract:

After extensive research and development over the past three decades, a range of techniques have been proposed and developed for online continuous measurement of multiphase flow. In recent years, with the rapid development of computer hardware and machine learning, soft computing techniques have been applied in many engineering disciplines, including indirect measurement of multiphase flow. This paper presents a comprehensive review of the soft computing techniques for multiphase flow metering with a particular focus on the measurement of individual phase flowrates and phase fractions. The paper describes the sensors used and the working principle, modelling and example applications of various soft computing techniques in addition to their merits and limitations. Trends and future developments of soft computing techniques in the field of multiphase flow measurement are also discussed.

Keywords: Multiphase flow measurement; Soft computing; Machine learning; Computational intelligence; Sensor fusion; Data-driven model

Nomenclature

a	Bias
b	Bias
C	User-specified parameter
C_b	Concentration of biomass
C_c	Concentration of coal
C_j	The centre vector for the j^{th} hidden node
d	A constant
$f(x)$	Transfer function
H_i	The i^{th} hidden neuron
L	Number of hidden nodes
m	Number of input variables
n	Number of training samples
O	Node in the adaptive neuro-fuzzy inference system
q_m	Mass flow rate of the mixture

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