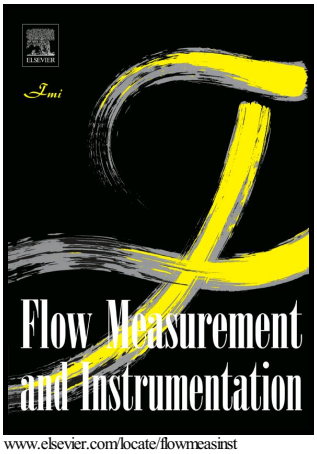

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Support-vector-regression-based prediction of water holdup in horizontal oil-water flow by using a bicircular conductance probe array

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Abstract

This paper presents a water holdup prediction method based on support vector regression (SVR) for horizontal oil-water two-phase flow when using a bicircular conductance probe array that consists of 24 conductance probes. The support vector machine (SVM) was employed to establish a nonlinear SVR model mapping the probe array responses into water holdup directly. Experiments were carried out in the 16 m long and 125 mm inner diameter horizontal pipe of an industrial scale experimental setup. The experimental data obtained under 220 flow conditions were first divided into modeling data set and comparing data set. The modeling data set is used for establishing a nonlinear SVR and a linear least squares regression (LSR) models, while the comparing data set is used for comparing both models with the equi-weight and optimal weight estimate methods. Comparison results obtained by using the comparing data set show that when the binary data of the probes' responses are used only, the measurement accuracy of the optimal weight estimate method is the best. If the analog data can be obtained, the measurement accuracy of both regression methods are better than those of both weighting estimate methods, especially, the nonlinear SVR method provide the best measurement accuracy.

Key words: water holdup, bicircular conductance probe array, horizontal oil-water flow, support vector regression (SVR)