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Infrared image filtering applied to the restoration of the convective heat transfer coefficient distribution in coiled tubes

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Abstract:

This paper presents and assesses an inverse heat conduction problem (IHCP) solution procedure which was developed to determine the local convective heat transfer coefficient along the circumferential coordinate at the inner wall of a coiled pipe by applying the filtering technique approach to infrared temperature maps acquired on the outer tube's wall. The data-processing procedure filters out the unwanted noise from the raw temperature data to enable the direct calculation of its Laplacian which is embedded in the formulation of the inverse heat conduction problem. The presented technique is experimentally verified using data that were acquired in the laminar flow regime that is frequently found in coiled-tube heat-exchanger applications. The estimated convective heat transfer coefficient distributions are substantially consistent with the available numerical results in the scientific literature.