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ON-LINE ESTIMATION OF BOUNDARY HEAT FLUX OF PARTICIPATING MEDIA BY AN EXTENDED KALMAN FILTERING TECHNIQUE

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ABSTRACT The non-intrusive inverse heat transfer technique for retrieving the time-dependent heat flux on the boundary, and internal temperature distribution of the participating medium simultaneously is proposed. The nonlinear conduction-radiation heat transfer in the emitting, absorbing, and scattering medium is resolve by the finite volume method (FVM) method combined with discrete ordinate method (DOM) to obtain the measured signal. In the present study, two different types of reconstruction algorithms have been proposed: (1) the linear Kalman filter (KF) for the linear system, and (2) the extended Kalman filter (EKF) for the nonlinear system. All algorithms are tested in detail. All the reconstructed results show that EKF technique is robust to reconstruct the time-dependent heat flux, and internal temperature distribution in real time in coupled nonlinear conduction-radiation heat transfer systems.