

A Particle Filter-Based Data Assimilation Method for Discrete Event Simulation

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Abstract : Data assimilation is a model and data hybrid-driven method that dynamically fuses new observation data with a numerical model to iteratively approach the real system state. It is widely used in state prediction and parameter inference of continuous systems. Because of the discrete event system's non-linearity and non-Gaussianity, traditional Kalman Filter based on linear and Gaussian assumptions cannot perform data assimilation for such systems, so particle filter has gradually become a technical approach for discrete event simulation data assimilation. Hence, we proposed a particle filter-based discrete event simulation data assimilation method and took the unmanned aerial vehicle (UAV) maintenance service system as a proof of concept to conduct simulation experiments. The experimental results showed that the filtered state data is closer to the real state of the system, which verifies the effectiveness of the proposed method. This research can provide a reference framework for the data assimilation process of other complex nonlinear systems, such as discrete-time and agent simulation.

Keywords : discrete event simulation, data assimilation, particle filter, model and data-driven

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