Neural Network Based Compressor Flow Estimator in an Aircraft Vapor Cycle System

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Abstract : In Vapor Cycle Systems, the flow sensor plays a key role in different monitoring and control purposes. However, physical sensors can be expensive, inaccurate, heavy, cumbersome, or highly sensitive to vibrations, which is especially problematic when embedded into an aircraft. The conception of a virtual sensor based on other standard sensors is a good alternative. In this paper, a data-driven model using a Convolutional Neural Network is proposed to estimate the flow of the compressor. To fit the model to our dataset, we tested different loss functions. We show in our application that a Dynamic Time Warping based loss function called DILATE leads to better dynamical performance than the vanilla mean squared error (MSE) loss function. DILATE allows choosing a trade-off between static and dynamic performance.
Keywords : deep learning, dynamic time warping, vapor cycle system, virtual sensor
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