Modeling and Control at the High Efficiency Limit of Internal Combustion Engines

Eric Hellstrom, Ph.D.
Research Engineer, Controls
Ford Research and Advanced Engineering

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ABSTRACT: Advanced modes of combustion in internal combustion engines promise clean and efficient combustion but are notoriously difficult to control. The operating range of many advanced combustion modes with a high ratio of residual gas recycling is limited by high combustion variability. We show that the variability is predicted by low-order deterministic instabilities mixed with stochastic noise. This perspective opens up for dynamic analysis and control design for reducing the variability and operate close to the edges of feasible operation, which is demonstrated in experimental engine results.

Bio: Erik Hellström received the M.Sc. degree in applied physics and electrical engineering and the Ph.D. degree from Linköping University, Linköping, Sweden, in 2005 and 2010, respectively. The following three years he was Research Fellow and Assistant Research Scientist with the University of Michigan in Ann Arbor. He is currently a Research Engineer with Ford Research and Advanced Engineering in Dearborn. His research interests include modeling, control, and optimal control of vehicle powertrains.