

Control-Oriented Enhanced Zero-Dimensional Two-Zone Combustion Modelling of Internal Combustion Engines

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Abstract : This paper investigates an efficient combustion modeling for cycle simulation of internal combustion engine (ICE) studies. The term “efficient model” means that the models must generate desired simulation results while having fast simulation time. In other words, the efficient model is defined based on the application of the model. The objective of this study is to develop math-based models for control applications or shortly control-oriented models. This study compares different modeling approaches used to model the ICEs such as mean-value models, zero dimensional, quasi-dimensional, and multi-dimensional models for control applications. Mean-value models have been widely used for model-based control applications, but recently by developing advanced simulation tools (e.g. Maple/MapleSim) the higher order models (more complex) could be considered as control-oriented models. This paper presents the enhanced zero-dimensional cycle-by-cycle modeling and simulation of a spark ignition engine with a two-zone combustion model. The simulation results are cross-validated against the simulation results from GT-Power package and show a good agreement in terms of trends and values.

Keywords : Two-zone combustion, control-oriented model, wiebe function, internal combustion engine

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