

CCC2016 Workshop 3: Model-Based Automotive Powertrain Systems: Control Design and Implementation

Speakers: Guoming Zhu (Michigan State University, USA)

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Abstract: This workshop introduces the need and the state of the art research for applying model-based control techniques to automotive powertrain systems. We first discuss the control-oriented modeling approach for automotive powertrain and after-treatment systems and how these models could be initiated and validated by real time hardware-in-loop simulation. The model-based control development process for powertrain systems will then be discussed and compared with the traditional approaches. Both model based and model-free based approaches will be presented. The application examples of the model-based control of engine mechatronic actuation subsystem and internal combustion engine systems will be discussed in detail.

The workshop will be organized as follows (Zhu and Chen)

a) Session one (Zhu – one hour)

– Control-oriented crank-resolved engine modeling and hardware-in-the-loop simulations

b) Session two (Chen – one hour)

- Extremum Seeking (ES) based engine control and estimation

c) Session three (Zhu – one hour)

- Closed loop engine combustion control and application of advanced control to engine actuation systems

d) Questions and Answers (Zhu and Chen – one hour)

Who should attend: This workshop is designed to facilitate both automotive control researchers from academic communities and engineers from automotive industry to conduct model based innovation design for automotive powertrain systems which is the trend of automotive control for internal combustion engines based powertrain systems. It is intended to share with audiences the motivation, rationale, challenges, and achievements in the model-based powertrain (internal combustion) control approach.