au programme des séminaires ICARE…

Analysis of imaging data of combustion processes via decomposition techniques

par

Dr Katarzyna Danuta BIZON

Department of Engineering,
University of Sannio, Benevento, Italy

le mardi 24 septembre 2013 à 11h
salle de réunion ICARE

Nowadays, various optical systems allow for two- or even three-dimensional measurements of in-cylinder variables during experiments on the optically accessible internal combustion engines. The fast development of these systems today permits the investigation of the entire spectral range of flame light emission, with high spatial and temporal resolution. The amount of data collected can be impressive and computational methods for data reduction and analysis are being developed and used. Most literature focuses on the application of the decomposition methods to velocity measurements; however it appears that these techniques can be also applied for the analysis of the light emission measurements taken during the combustion process.

This talk illustrates principles and application of a method of Proper Orthogonal Decomposition (POD) to the 2D line-of-sight averaged measurements of flame emission taken during experiments conducted in optically accessible spark ignition and Diesel engines. The procedure is first introduced and demonstrated by means of a ‘‘synthetic” example. Then, it is shown how POD permits the analysis of cycle variability. The main advantages of POD is that analysis can be reduced to a small number of scalar coefficients, rather than conducting it on a full data set of pixel luminosity values.

Moreover, alternative decompositions are considered, in which the components are chosen according to different criteria. In this view, Independent Component Analysis (ICA), provide an extension to POD. It is based on the simple assumption that if different signals come from different physical processes, then those signals are statistically independent. Application of ICA aims here at separating spatial structures related to different combustion events, and is coupled with the analysis of the statistics of the coefficients of the independent components, and of the measured in-cylinder parameters.

Pour tout renseignement complémentaire, ou proposition de séminaire par un thésard ou un chercheur invité, contacter Ivan Fedioun, fedioun@cnrs-orleans.fr, poste 5520, 06.62.81.23.08