Applus IDIADA

YOUR DEVELOPMENT PARTNER

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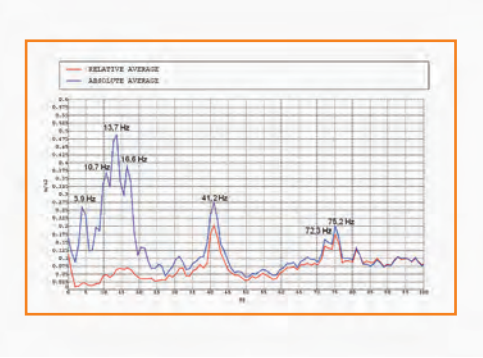
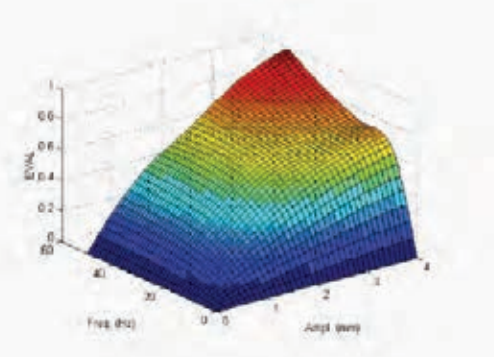




IDIADA Technical Courses

Course on Signal processing for Automotive Engineers

23rd and 24th April 2014

Contents

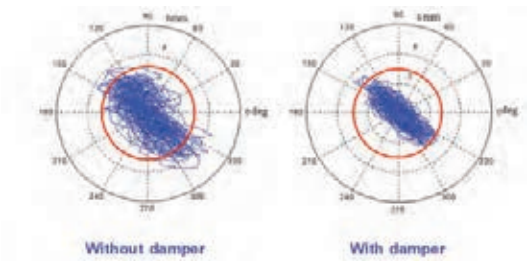
Signal processing is the name given to the procedures used on measured data to reveal the information contained in the measurements. These procedures essentially rely on various transformations that are mathematically based and which are implemented using digital techniques. The wide availability of software to carry out digital signal processing with such ease now pervades all areas of engineering. This ease can sometimes result in the analyst using tools or interpreting results incorrectly because of a lack of understanding of the assumptions or limitations.

This course is directed at providing a user's guide to both fundamental and more advanced concepts in signal processing. In order to reach that end we need to cover the groundwork of Fourier methods, random processes and system response. The aim is to present the material from a user's viewpoint. Theoretical concepts are followed by examples and case studies

The course provides training in applied digital signal processing for automotive engineers providing attendants with the theoretical and practical knowledge needed for their professional applications. The course does not assume prior knowledge of the subject rather its objective is to give a detailed and rigorous overview of the techniques and experimental applications available in digital signal processing.

The presentations have been designed for professional engineers in the automotive and transportation industry involved in the analysis of simulation or experimental vehicle data who are interested in learning more about the general methodology for signal processing

Attendance to this seminar will be an interesting experience for those engineers wishing to get a basic knowledge in the field of signal processing. Engineers with previous digital signal processing experience will also find that the seminars offer a solid starting point for more advanced discussions.



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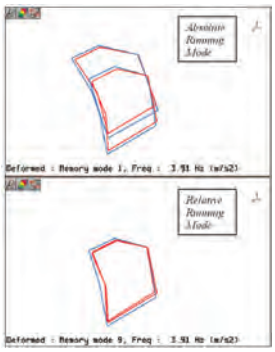

Attendees

The course is aimed at professionals in the automotive and transport industry whose work is related to the measu-rement and signal analysis of vehicle data.

The course provides an intensive presentation of funda-mental principles and applications of signal processing applicable in all types of vehicle performance analysis, such as NVH, vehicle dynamics, fatigue and durability, in-service vehicle body dynamics, powertrain, etc; and thus it will be of great interest to technical personnel that need to reinforce their understanding and command of modern automotive signal processing.

Course Material

Unpublished high-quality technical documentation on the application of the techniques to practical problems of automotive signal processing.

Fee

The enrolment fee is 1600 EUR (VAT not included). This fee includes the unpublished course literature, coffee breaks services and lunches at Applus IDIADA.

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Wednesday 23rd of April	
09:00	Reception and delivery of the course material
09:30	Classification of typical automotive data
10:30	Coffee break
11:00	Data acquisition and instrumentation. Time sampling & aliasing
12:00	Time and frequency analysis. Integration, derivation and Fourier analysis. Windowing
13:00	Lunch
14:00	Application of digital filters in automotive applica-tions. Characteristics and structure of FIR & IIR filters.
15:00 – 17:30	Laboratory and practical demonstrations: **a) Presentation and visit to IDIADA's Proving Ground:** NVH, vehicle dynamics and fatigue tracks, Comfort tracks (stochastic & deterministic surfaces) **b) Practical demonstrations of in-vehicle data acquisition and processing:** Sensors and analysers. In-vehicle data acquisition in chassis-dyna-mo-meter and proving ground. Order analysis and filtering.

Thursday 24th of April	
09:00	Applications of power spectral density (PSD)and cross-spectral density. Case studies for automotive applications
10:00	System identification. Transfer functions and FRF. Estimators H1, H2 and H3 and coherence function. Case studies
11:00	Coffee break
11:30	Combination of Euclidian space calculations and conventional signal processing in vehicle performance investigations. Application examples
12:30	Integration of geometric and spatial movement data to break down complex in-service dynamic response of vehicle systems. Case study: virtual laser technique
13:30	Lunch
14:30	Signal processing for 3D in-service movement decomposition of vehicle components Case study: breakdown of in-service closure movement
15:30	Laboratories and practical demonstrations: **a) System identification. Practical measurements of transfer functions:** Practical demonstration of measurement of frequency response functions, Power spectral density and coherence functions with application to body design. **b) Test for vehicle model correlation (vehicle dynamics and fatigue applications):** Measurements of VTF, suspension resonances, rigid body engine resonances and four-poster and K&C rig tests for model correlation
17:30	Conclusions and close