研討會邀請 LECTURE INVITATION

電聲系統的建模、測量和非線性控制 KCS

MODELING, MEASUREMENT, AND NONLINEAR CONTROL OF AUDIO SYSTEMS

The University course will be presented as a block seminar

主講者 PRESENTED BY:

Dr. Stefan Irrgang
Jonathan Gerbet
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日期 DATE:
12th to 13th November, 2024 (9:00 a.m. – 5:00 p.m.)

地點 LOCATION: 逢甲大學 Feng Chia University, Taichung, Taiwan
No. 951, Sec. 1, Dongda Rd, Taichung

語言 LANGUAGE: English

報名費用 REGISTRATION FEE: NTD 6,000 (Students NTD1,000)

邀請對象 PARTICIPANTS:

研發端、製造和品質控制領域的電聲產業工程師、電聲學研究學程學生

Engineers of the audio industry active in research & development, manufacturing and quality control students in the graduate program of the Electro-Acoustics

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研討會大綱 ABSTRACT:

邀請您參加 2024 Klippel 逢甲大學研討會。

Klippel分析儀是一個功能強大的工具，針對電聲產品設計做有效的評估及改善，以最佳的成本效益設計生產出高效率及高品質的揚聲器系統。

研討會以小組實務研討的方式進行，在基礎上可以補強學術理論，經過小組中實務分析將實證導入應用， 相較其它地區 Klippel 研討會以講座方式更為有實質幫助之研討課程。著重於如何利用硬體量測設備與感知方式來評估揚聲器系統，由淺入深探討電聲量測技術，新增實務上最新自動控制 KCS主題, 並以理論搭配實務操作。課程將以實際設計流程循序漸進介紹如何測得揚聲器的基礎規格. 透過演算的補償線路以 IC 程式將揚聲器保護優化並節省耗電的方式設計出一個” 綠能 “ 的揚聲器系統。

研討會將討論聲音系統的基本測量、進階評估以及主動控制 ; 透過具有集總和分佈參數的線性、非線性和時變系統進行訊號失真的建模。提出了新的參數測量技術。
並討論了對感知音質的影響。這些知識對於設計和製造小型、輕巧且高效的電聲產品非常重要，始能設計出具備高效率和高品質的電聲產品。

研討會將詳細解釋了主動、自適應和非線性控制並進行了實際評估。提出能提高效率、增加穩定度和減少功率損耗的揚聲器設計目標的準確方法。

The lecture addresses the measurement, evaluation, and active control of sound systems. The generation of signal distortion is modelled by linear, nonlinear and time-variant systems with lumped and distributed parameters.

New parameter measurement techniques are presented. The relationship between symptoms and physical causes of the distortion is made transparent, and the impact on the perceived sound quality is discussed. This knowledge is important for designing and manufacturing small, light and cost-effective transducers that reproduce the sound at high efficiency and sufficient sound quality.

Active, adaptive, and nonlinear control is explained in detail and practically evaluated. Consequences for speaker design for higher efficiency, high robustness, and less resources are presented.

研討內容 CONTENT:

電聲建模 ELECTRO-ACOUSTICAL MODELLING:

- 基礎 - 傳導、振動、輻射 Fundamentals - transduction, vibration, radiation
- 抽象化 - 具有集總和分佈參數的模型Abstraction - models with lumped and distributed parameters
- 小訊號效能 - 線性逼近與傳遞函數 Small Signal Performance - linear approximation and transfer function
- 大訊號性能 - 熱動力學和非線性 Large Signal Performance - thermal dynamics and nonlinearities
- 隨時間變化的特性 - 氣候和老化的影響 Time-varying properties - influence of climate and aging

測量與分析 MEASUREMENTS AND ANALYSIS:

- 新的快速參數測量 New fast parameter measurement
- 監控訊號 - 電氣、機械和聲學感測器 Monitored signals - electrical, mechanical, and acoustic sensors
- 複雜結構 - 數位和類比組件 (IEC 60268-21,22,23) Complex structures - digital and analog components (IEC 60268-21,22,23)
- 音場 - 近場與遠場 (EID) 的測量 Sound field - measurements in the near and far field (EID)
- 測量時間 - 超快速和長期（功率）測試 Measurement time - ultra-fast and long-term (power) testing
- 失真分析 - 線性與非線性分量 Distortion analysis - linear and nonlinear components
- 系統辨識 - 最佳擬合和參數估計 System identification - optimal fitting and parameter estimation

解釋與判斷 INTERPRETATION AND DIAGNOSTICS:

- 解釋 - 測量的特徵和物理原因 Interpretation - measured symptoms and physical causes
- 感知 - 可聽度以及對感知音質的影響 Perception - audibility, and impact on perceived sound quality
- 評估 - 為系統設計選擇最佳驅動單元 Evaluation - selection of optimal drive units for system design
- 規範 - 最小但全面的資料集 Specification - minimal but comprehensive set of data
- 公差 - 參數的變化和影響 Tolerances - variation of parameters and influences

主動式揚聲器控制 KCS / ACTIVE SPEAKER CONTROL:

- 線性和非線性失真補償 Compensation of linear and nonlinear distortion
- 揚聲器保護 – 堅固性和可靠性 Speaker protection – robustness and reliability
- 最大化輸出 – 充分利用單體工作範圍 Maximizing output – exploit the full working range
- 在整個產品週期中保持穩定的性能 – 應對老化、氣候、生產差異 Constant performance over the lifetime – cope with aging, climate, production variance
- 透過測試激發和音樂進行實際評估 Practical evaluation with test stimuli and music
- 新型智慧放大器 IC 的實作實驗 Hands-on experiments on a new smart amplifier IC

若有其它希望討論案例或是主題, 請與 Emma Yu 提出. 將安排在課程中進一步研討
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The KLIPPEL engineers will address other important topics in this lecture for your work.
Please send your wish list or detailed questions to emma.yu@somaacoustic.com.tw.