EASE Seminar – September 16th to 20th 2019, Berlin, Germany

Instructors:	Emad Yacoub Hanna
Language:	English
Hours:	09:00 - 17:00 (please be there at 08:45)

AFMG EASE Seminars are split into two levels with Level 1 (entry level) being aimed at users of EASE JR and engineers beginning modeling with EASE. The course covers all important elements of the main program. Basic general information on acoustics and sound system design are given during the course as well but are not the main focus. Level 2 continues seamlessly from Level 1, taking modeling with EASE to the advanced level. It is intended for EASE users with some experience or for the ones who want to start immediately with higher level projects including AURA and EARS modules.

Agenda

Level 1, Day 1:

1. Introduction and overview
    a. Class objectives *Establishing an understanding of theory, capabilities, limits and efficient use*
    b. History and background of EASE
2. Concept of and need for acoustical simulation
    a. What is simulation?
    b. Why do we need simulation? *Feasible approach to predict rooms/systems behavior -vs- analytical methods*
    c. Simulation techniques *Statistical, wave-based and ray-tracing*
3. Basic program modules and general settings
    a. Main module
    b. Room editor *Items, perspectives and data checking*
    c. Database *Materials and speakers*
    d. Eyes *Rendering, performing calculations and viewing results*
    e. EARS *Auralization*
    f. Room data settings *Statistics, reverberation, noise and power settings*
4. Constructing and closing room models *Hands-on Model*
    a. EASE model items
        i. Vertices *Coordinates*
        ii. Faces *Boundary vertices, material, folds, coating*
        iii. Audience areas *Boundary nodes, shift*
        iv. Listener's seats *Coordinates, orientation*
    b. Fast Entry methods
        i. Prototypes
        ii. Three-dimensional shapes *Cuboid, cylinder, cupola, pyramid, cone*
    c. Potential causes and remedy of holes
5. Material database
    a. Format of material data
        i. Absorption coefficients
    b. Adding new materials *Interpolation*
    c. Using Excel
6. Reverberation time formulae and their limits
7. RT optimization *Employing EASE to find the right acoustical treatment Hands-on Model*

Level 1, Day 2:

8. Adding loudspeakers *Hands-on Model*
    a. Position
    b. Aiming angles and convention
    c. Model
    d. Power settings and alternatives *Broadband pink noise or multi-tone signal*
9. Looking at the rendered model and first calculations in Standard Mapping *Hands-on Model*
    a. Eyes settings and options
    b. Views
        i. Dyes *White, material, face, alpha, random*
        ii. External
        iii. Item
        iv. Walker *Jumping/wandering inside the model*
    c. Standard mapping
        i. Settings *Patch, shadow, interference*
        ii. Limits
    d. Viewing Standard Mapping results
        i. Map types *SPL, energy ratios, intelligibility*
        ii. Frequency perspective
        iii. Distribution
        iv. STI options *Standard, male/female, STIPA, with/without noise and masking*
        v. Exporting Standard Mapping results *Pictures and values*
10. Speaker database
    a. Format of speaker data
        i. Types of speaker data files *SPK, DLL and GLL*
        ii. Attenuation table *Horizontal/vertical planes and interpolation*
    b. Polar plots
    c. Balloons
        i. Interpretation of balloons
        ii. Rendering balloons *Colored globes and shaped balloons*
        iii. Phase balloons
    d. Graphical representation of speaker data
        i. Sensitivity
        ii. Directivity index
        iii. Frequency response
    e. Speaker cases
11. GLL Modeled Speakers
    a. Shortcomings of other methods *Configurable arrays, multi-way loudspeakers, ...*
    b. Advantages of the GLL solution
12. Line array simulation in EASE
    a. What are line arrays?
        i. Concept *Cylindrical radiation*
        ii. Advantages versus conventional loudspeakers *Coverage, spreading loss, steerability....*
    b. Modeling line arrays in EASE
        i. Near/far field considerations
        ii. Balloons of line arrays *Disc-shaped balloons*
        iii. Use of DLL files *Embedded programs for configuring arrays*
13. Demonstration – Loudspeaker behavior outdoors and in a room – interference and acoustic coupling.
14. Auralisation of direct sound from Standard Mapping *Hands-on Model*

Level 1, Day 3:

15. Auralisation of direct sound from Standard Mapping Hands-on Model
    a. Probe with direct sound Arrivals level and delay
    b. Using auralization of direct arrivals to check echoes
16. Advanced functions for faster and more efficient room modeling *Hands-on Model*
    a. Objects
        i. Definition *Items, reference point and angle*
        ii. Advantages of using Objects *Group actions*
    b. Tables
        i. Different types of Tables
        ii. Advantages of using Tables *Group actions*
17. Import/export functions
    a. Advantages of using AutoCad *Using architectural drawings, curved and non- uniform surfaces*
    b. 3D polylines and 3D faces
    c. Examples
18. Presentation utilizing Vision *Hands-on Model*
    a. Face texture
    b. Lamps
    c. Methods of rendering in EASE Vision
        i. Ray tracing
        ii. Scanline
        iii. OpenGL Texture Map
        iv. OpenGL Simple Map
    d. 16.04 Perspective views
        i. External
        ii. Item
        iii. Walker
19. Case study – typical problems in modeling and optimizing a sound system in a room

Level 2, Day 1:

20. Overview *Highlights on basic topics for advanced users starting with Level 2*
    a. Room entry
    b. Materials and speakers
    c. Mapping
21. Scattering coefficients
22. GLL modeled speakers
    a. Shortcomings of other methods *Configurable arrays, multi-way loudspeakers ...*
    b. Advantages of the GLL solution
23. Loudspeaker clusters and arrays
    a. Clusters
        i. Building clusters *Reference point/angle and calculation method*
        ii. Using clusters *Individual components embedded in the cluster*
    b. Arrays
        i. Building arrays
        ii. Using Arrays *Individual components still accessible*
    c. Clusters versus arrays
24. Ray tracing fundamentals
    a. Motives and limits of ray tracing
    b. Sound particles *Separatability principle*
    c. Concept
        i. Classical ray tracing
        ii. Mirror image method
        iii. Hybrid method
    d. Modeling of sources
        i. Frequency dependence
        ii. Space-angle dependence
    e. Modeling of boundaries
        i. Geometry
        ii. Absorption
        iii. Scattering
    f. Modeling of medium
        i. Spreading loss
        ii. Air absorption
    g. Modeling of receivers
25. Raytracing impacts *Hands-on Model*
    a. Concept and limits
    b. Cut-off settings
        i. Number of rays
        ii. Travelling time
        iii. Order
        iv. Loss
    c. Analysis in probe
        i. Reflectogram
        ii. Impulse response and ETC
        iii. Waterfall view
        iv. Hedgehog view
        v. Reverberation time
        vi. Energy ratios

26. AURA mapping / AURA response *Hands-on Model*
    a. AURA versus classical ray tracing impacts
    b. Calculation settings
        i. Patch size
        ii. Number of particles
        iii. Length
        iv. Maximum diameter after 1s
        v. Diffuse rain
    c. AURA Mapping results
        i. Histogram and validity of calculations
        ii. Maps
        iii. Frequency and distribution perspectives
        iv. STI options
        v. File info
        vi. Exporting results
    d. Echograms versus reflectograms

Level 2, Day 2:

27. Auralization theory and procedure
    a. Binaural hearing and HRTF
    b. Impulse response and convolution
28. EARS Hands-on Model
    a. File formats
        i. RSP files
        ii. BIR files
        iii. WAV files
    b. HRTF balloons
    c. Auralization
        i. Convolver type
        ii. FIR
        iii. Input and output
    d. Auralization of stereo systems
29. Accuracy/calculation-time trade-off for different calculation methods *Hands-on Model*
    a. Discussion of the hands-on example results
30. Exporting results from EASE to measurement programs (EASERA) for direct comparison of measurement and simulation
31. Case study – typical problems in modeling and optimizing a sound system in a room