

## Advanced Algorithms in SoundEasy

### **1. FEM (Finite Element Method )**

1. Enclosure (Room/vehicle) and loudspeaker modes .
2. SPL in-room – transfer function from loudspeaker to microphone.
3. Driving-point impedance of the loudspeaker cone.

### **2. Delaunay Triangulation (quite complex)**

1. Generating 3D triangular mesh for FEM algorithm.

### **3. FFT/iFFT (Complex version of Fast Fourier Transform)**

1. Enclosure + CAD + System design in time domain
2. MLS measurement system
3. Spectrum Analyser
4. Partitioned Convolution - all instances

### **4. HBT (Hilbert-Bode Transform)**

1. Phase response calculation for loudspeakers.
2. Loudspeaker/room equalization (DE / DRE).
3. Phase generation in Analogue Measurement system.
4. Acoustic Centre evaluation.
5. MLS time marker positioning.
6. Phase generation for EQ systems
7. Cepstral Deconvolution

### **5. Partitioned Convolution**

1. Digital Filter
2. Digital Equalizer.
3. Digital Room Equalizer

### **6. Rosenbrock Optimization Method**

1. CAD optimizations
2. TS Parameters extraction.
3. Non-linear parameters extraction.
4. RLC component measurements.
5. Enclosure optimization.

### **7. Modified Nodal Method**

1. CAD transfer functions in time domain
2. CAD transfer functions in frequency domain

### **8. FHT (Fast Hadamard Transform)**

1. MLS measurement system

### **9. Fast Complex Matrix Inversion Algorithms**

1. CAD transfer functions
2. FEM

### **10. Truncated Volterra Series Expansion**

1. Extraction of non-linear parameters

### **11. Second-order Runge-Kutta Method**

1. Solves first order differential equations for simple components and integro-differential equations for lumped components in CAD
2. Extraction of non-linear parameters

### **12. Image Method**

1. Room acoustics/room modes and SPL

**13. Piece-wise Linear Approximation Method (quite complex)**

1. Large-Signal analysis of all loudspeaker enclosures.

**14. Cepstral Deconvolution**

1. Removal of room reflections from SPL measurements.

**15. Matching Filter technique**

1. Removal of room reflections from SPL measurements.

**16. Forward-backward FIR filtering**

1. Used in DSP section for Equalizers.