Specifications@Odeon
Computer system

Operating Systems: Odeon is a 32 bit Windows® application running on Windows® XP, Windows®Vista (32 bit version as well as 64 bit version) and Windows® 7 (32 bit version as well as 64 bit version).

RAM: Minimum 64 MB, recommended 1 GB.

Free Disk Space: Minimum 20 GB, recommended 300 GB.

CPU: Minimum 500 MHz Pentium® recommended. Multicore processors are recommended for fast parallel calculations.

Graphics Hardware: SVGA graphics display/adaptor.

Sound Hardware: DirectX sound card (for surround loudspeaker playback the sound card must support 5.1 and/or 7.1 configurations).

Auxiliary Hardware: CD-ROM drive, DVD drive and mouse or other pointing device.

Calculation Algorithms

Hybrid reflection method: A combination between the image source method, raytracing and ray radiosity. **Early reflections** are defined by image sources and ray-radiosity. **Late reflections** are defined by a special ray-tracing/ radiosity method. The **transition order** desides at which reflection order the reflections goes from early to late reflection method.

A reflection based scattering coefficient s, ensures that scattering depends on surface roughness defined by a surface scattering, frequency, size of surface and distance between surface and source/receiver. **Vector based scattering:** Includes vector based scattering in the ray-tracing algorithm. If s = 0 the ray is reflected in the specular direction, if s = 1 it is reflected in a random direction and in between the ray is reflected as a resulting vector of a specular vector, weighted 1-s and a random vector, weighted s. **Oblique Lambert scattering:** in raytracing a number of secondary sources are placed at the reflection point if visible to the source and receiver, distributing the reflections with an oblique lambert, which can include specular as well as scattered energy.

Read more about the Odeon algorithms in a paper, from Forum Acousticum 2005 by Claus Lynge Christensen, Jens Holger Rindel:

Model tools

Odeon editor: Text editor supporting parametric modelling.

Import Facility: Import of DXF (Drawing Exchange Format) and 3DS format files from CAD software such as: AutoCAD®, Microstation®, 3DS max, IntelliCAD®, Google-Skechup and Rhino.

Geometry verification: Automatic check for warped and overlapping surfaces, with problematic surfaces. automatically displayed in 3D. 3D raytracing finding holes in geometry with lost rays, 3D view for visual check.

Patch Tools: Missing surfaces in geometry can be created using the integrated 3DView.

Extrusion Modeller Drawing tools for fast modelling of geometries such as industrial work rooms and offices.

Surface input properties

Absorption coefficient: User defined sound absorption for each type of surface in 1 octave bands (63 - 8000 Hz) as a value between 0 and 1.

Scattering coefficient: User defined scattering from the shape or texture, roughness of a surface. scattering s is a value between 0 and 1.

Transparency: User defined transparency of a surface as a value between 0 and 1.

Sound reduction index For simulating sound transmission a user defined sound reduction index R, in 1/3 octave-bands (50-10.000 Hz) can be specified. Can be imported directly from the Insul software or Excel.

Source input Properties

Point sources: Directivity patterns created from within Odeon in the .s08 format.

Natural directivity pattern, such as a singer or a trompet. Typically used for auralisation purpose.

Loudspeakers, supported by the **C**ommon **L**oudspeaker **F**ormat: .CF1 and .CF2, available from the CLFgroup homepage.

Generic directivity pattern, such as semi- or omni- directional sourses, defined by mathematical expression. Typically used for calculating room acoustical paramtres.

line sources. E.g. used for simulation of trains or roads.

surface sources. Used for large sound generators.

Results

Quick Estimate: Fast estimate of reverberation time, and effect from different absorbing materials, based on diffuse field assumptions (Sabine, Eyring, and Arau-Purchades).

Global Estimate: Estimate of reverberation time taking room shape, position of absorbing materials and sources into account.

Single point response: Detailed results of acoustical parameters and auralisation option for a selected receiver.

Multi point response: Acoustical parameters for a specified number of receivers.

Grid Maps: Map of room-acoustical parameters and statistics for the grid receivers.

Grid Maps of Direct Sound: Fast displayed grid map of direct sound to check the loudspeaker coverage before the room acoustical parameters are calculated.

Reflector Coverage: 1st and 2nd order reflector coverage.

Ray-Tracing: Dynamic display of raytracing from selected source.

3D billiard: Interactive display for visualisation of wavefronts to demonstrate scattering, flutter echoes, focusing and coupling effects.

Auralisation

Input: Anechoic or semi-anechoic sound file in .wav format. Mono, stereo as well as multichannel recordings can be handled in the following input file formats: 16 bit PCM, 24 bit PCM, 32 bit PCM (32 bit float 16 bit aligned!), 32 bit IEEE float, 8 bit PCM, Extensible, 16 bit PCM, Extensible, 24 bit PCM, Extensible, 32 bit PCM, Extensible, 32 bit IEEEfloat, Extensible or 8 bit PCM.

Mixer: Multiple sources and multiple signals can be included in one simulation.

Processing: Convolution of sound files with BRIRs (Binaural Room Impulse Responses), BFormat impulse responses and/or Surround impulse responses. All types of impulse responses are filtered using full filtering in nine-octave bands. For the binaural filtering a set of HRTFs (Head Related Transfer Functions) is applied for each reflection.

Output: Binaural (2-channel) .wav file optimised for headphone playback. 1st and 2nd order BFormat files (Ambisonics) output is an option for the advanced user.

N-channel surround-sound for standard systems such as 4.1, 5.1, 6.1 and 7.1 as defined by sound card/loudspeaker system and specified in the setup by user.

SuperStereo special made for standard stereo loudspeaker setup as specified in the setup by user.

The output files can be generated in following formats: 16 bit PCM, 24 bit PCM, 32 bit PCM (32 bit float 16 bit aligned!), 32 bit IEEE float, 8 bit PCM, Extensible, 16 bit PCM, Extensible, 24 bit PCM, Extensible, 32 bit PCM, Extensible, 32 bit IEEEfloat, Extensible or 8 bit PCM.

Sound Card Minimum Requirements: Stereo, Duplex, 16 bits, 44100Hz sampling.

Printout, Graphs and Export

Graphs and tables can be exported via clipboard or file in several formats. (.wmf, .emf., .bmp., .gif., .jpg, .pcx, .png), or printed. Results, including **parameters, reflection data, curves, etc.**, can be exported in ASCII (text) format for further processing in other programs.

Exports **animations in GIF format** from any of the displays in the program, single-shot as well as sequence-shooting are available. An editing tool for animations is included.