SoundPLANnoise
Contents of the individual modules

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Base Module

- Data modelling via georeferenced bitmaps or import data from DXF, ASCII and QSI, if desired the import data can be split into multiple files, e.g., using district borders. The number of entered / imported objects is not limited.

- Data adaptation to various data situations via automated geometry, building and elevation tools, e.g., create parallel objects, bridge recognition from the terrain, assign inhabitants to buildings, unite areas, ...

- Transformation between different coordinate systems e.g., Transversal-Mercator coordinates to UTM) at import or during project editing.

- The Property Explorer lists all properties of an object type (e.g., buildings, roads) as a table. Object properties can be changed for several or all objects together - also via formulas.

- Free properties that can be created as required, for example, to read in additional information during import or to consider preloads at receivers.

- Import elevation points (ASCII files, ESRI ASCII Grid, ESRI Binary Grid, GeoTIFF, LAS/LAZ) with intelligent thinning of dense elevation information.

- Creation of digital ground models (DGM) for the elevation supply of the geometry and the calculation.

- Import and export of digital ground models available in the ITF format.

- Calculation of berms and sources in a DGM including calculation of embankments.

- Front view, side view and a 3D wire model data control during input.

- The geometry preflight jumps directly to conflicts in the input data, which could lead to problems in the calculation.

- Various libraries filled with a lot of data for example for emission, sound transmission, directivity, train tables, day histogram.

- Assessment library with lots of predefined elements for different assessment standards if required with the limit values for the corresponding area usages / classes and time slices as well as rest period additions. E.g., EU standard 2002/49/EG – LDEN, day/night with and without maximum levels and other country dependent assessments.

- Powerful and fast calculation core supports multi-core and multiprocessor PCs including the unlimited use of all cores /threads of a PC for the calculation.

- Calculation of single receiver points – either assigned to buildings or free field receivers. One receiver may have any number of floors that are simultaneously calculated.

- Batch calculation – by simply clicking on the calculation runs in the calculation run table, they are processed one after the other. Calculation run tables from different projects can also be appended.

- Calculation and evaluation of the statistical accuracy according to DIN 45687, Annex F.

- Documentation of results in different levels of detail (e.g., sum levels, source contributions at the receiver, source contribution spectra, sound propagation parameters, detailed protocol).

- Result display of the contribution levels or the sum level as well as individual frequencies or groups.

- An integrated spreadsheet adapted to the special requirements of noise calculation.

- Tabular documentation of noise protection measures including coordinates, height, segment length and volume.

- Graphical representation of the results as level tables and as level charts

- Flexible graphical plan output with title block, color scale, length scale, north arrow and individual design of the displayed geometry data and geometry bitmaps together with the calculated results (including DGM triangles) in 2D. Display of the objects and scale colors according to DIN 45682.

Cartography

- Google Maps, Google Earth and OSM open with a mouse click in the area of the entered geometry data.

- If the project does not yet contain any geodata, simply select the desired area via the address search and deposit a georeferenced bitmap as a basis with a single click.

- Elevation import from Google Maps and MapQuest

- Access to WMS servers for data input and plan output. The section automatically adapts to the selected geometry section. If desired, a bitmap can also be included in the project.

- Export of geometry and contour bands of a grid noise map to kml

- Import of photo points with GPS data. Representation of the photo points with view direction in a map and clear tabular photo documentation with number, picture and description.

- Any columns from the integrated spreadsheet can be output in a map as small tables with reference to the receiver point.

- Conflict maps and sum conflict maps for noise maps.

- Own layouts of the objects for the output in the plan. For example, different representation of different road types (highway, federal road, ...), to distinguish existing and planned noise protection measures or for individual labeling of different area types.

- With the symbol editor you can create your own symbols, for example traffic signs, which make the thematic maps even more meaningful.

- Graphical representation of a DGM with colored scale and a continuous color flow; Output of the elevation lines resulting from a DGM with different layouts.

- Extended object representation, for example individual line, chain and surface definitions.

- Automated map description (e. g. reference kilometers of a wall, wall heights, source number, kilometer marking).

- Map sections and overview map for the effective presentation of results of, for example, motorway and noise remediation projects, including automated generation of maps, bitmaps and export data for all map sections.

- Import of measured values (ASCII) into a table or as an aerial measurement map, for example to superimpose results from other programs with SoundPLAN results or to consider a preload.

Road / Railway noise propagation

Standards road: ASJ-RTN Model 2003 · ASJ-RTN Model 2013 · BUB:2021/2018· CNOSSOS-EU Road:2021/2015· CoRTN:1988 · CoRTN [AU-NSW]:2013 · DIN 18005 Strasse:1987 · EMPA StL 86 · EMPA StL 86+ · EMPA StL 97 · FHWA:1978 · HJ2.Road:2009 · Hungarian Road · NMPB 96 · NMPB 2008 · Nord2000 Road · ODM 218.2.013:2011 · ÖAL 28:2021/2019 (RVS 4.02.11:2021/2019) ·RLS-90 · RLS-

19 · RTN: 1996 · Russian Road · RVS 3.02 · RVS 4.02 · sonRoad18 · Standaardrekenmethode2:2012 · Statens planverk Report no.48: 1980 · TNM 2.5 · TNM 3.0 · VBUS:2006 · VRSS:1975

Standards railway: BUB:2021/2018 · CNOSSOS-EU Rail:2021/2015 · CoRN:1995 · DIN 18005 Schiene:1987 · FTA:2018 / FRA-HSGT: 2005 · GOST R 54933:2912 · HS2 Phase 2b · Israeli Rail:2006 · Japan Narrow Gauge Railways:2008 · Kilde Report 67/130 · NFS 31-133 Rail:2007 · NMT:1996 · Nord2000 Rail · ÖAL 28:2021/2019 (RVE 4.01.02:2021/2019) · ONR 305011:2004 · ONR 305011:2009 · RMR:2002 (EU Interim) · Russian Rail · Schall 03:1990 · Schall 03:2012 · SEMIBEL · Transrapid · VBUSch:2006

- All properties of roads and railways may change from coordinate to coordinate, for example bridge addition, curve radius or speed limit of 70 km/h. Thus, there is no need to manage individual source segments.

- The coordinates with property changes are specially marked and are thus easy to find.

- The distance between the emission bands and the road edges from defined cross sections can be conveniently graphically adjusted, for example, if a turning lane is added.

- The base line of a noise barrier can be generated directly from the edge of the roadway.

- The road day histogram library allows the direct allocation of hourly traffic volumes from road planning software.

- Automated import of train assignments from the Excel data sheets of Deutsche Bahn for Schall 03:012

- Project in neighboring country? All standards - one price.

- New directives, such as currently CNOSSOS-EU, are incorporated into the current version and are free of charge with warranty and maintenance.

- Roads and railways can be combined to different source groups, e.g., roads in the responsibility of different authorities and later optionally evaluated and displayed in groups.

- Parking lots according to RLS-90, RLS-19 and Bavarian Parking Lot Study 2007.

- Tunnel opening and bridge as structures.

- Road edges, rail tracks, tunnels and bridges can be included in the DGM calculation so that the emission bands are not buried.

- Calculation of single points, grid maps, cross-sectional noise maps, facade noise maps.

Industry noise propagation

Standards industry noise: ASJ CN-Model:2007 · BS 5228-1:2009 · BUB: 2021/2018 · CNOSSOS-EU Industry:2021/2015 · Concawe (international standard of the petrol industry) · DIN 18005:1987 · DIN 45691 · General Prediction Method:2019 · General Prediction Method:1982 · HJ 2.4: 2009 · HMRI-II.8: 1999 · Industry Noise Model – based on TNM 1998 · ISO 9613-1:1996 · ISO 9613-2:1996 · Japan Industry Model:2003 · NF S 31-133: 2011 · Nord2000 · ÖAL 28: 2021/2019 · ÖAL 28 · ÖNORM ISO 9613-2:2008 · Schall 03:2012 (RuLII3hf) · TA Lärm einfaches Verfahren · VBUI · VDI 2714/2720:1988

Standards wind turbines: IoA GPG Wind Turbine Noise · ISO 9613-2 interim:2015-05.1 (LAI Windkraftanlagen) · Danish Statutory Order No. 1284

- Input and calculation of point, line and area sources (also vertical and on the facade), industrial buildings, parking lots, wind turbines and open-air concerts.

- Noise at Workplace (powerful tool to calculate and document the noise exposure of workers at different workplaces (indoor or outdoor) over the working period.)

- All standards - one price. Also holds for calculations according to the meteorologically and physically demanding Nord 2000

- Open-air events with one or more stages are calculated according to ISO 9613-2 or Nord 2000, taking into account the relevant coherence effects.

- Line sources, area sources and parking lots with relative elevation can be defined as "following the terrain".

- The height of a source above ground can already be given in the emission spectrum in the library, for example for wind turbines where the hub height is type-dependent or the truck where the emission is always 1 meter above ground.

- Exposure time as hourly day histogram in different units, e.g., minutes, percent, events or via direct input of a dB value

- Calculation of low-frequency noise including G-weighting.

- Frequency bands in thirds and octaves from 1 - 20,000 Hz.

- Sound pressure levels can be converted into sound power levels at the push of a button.

- Rest period surcharges are automatically evaluated for the calculation on the basis of the selected assessment and the usages.

- Sources can be combined into source groups, for example the sources of each company separately and later optionally evaluated and graphically documented in groups.

- For grid maps, individual frequency bands can be graphically documented in addition to the sum level.

- The industrial building is a special building in which all outer surfaces, including the shed roof and saddle roof, can radiate sound. In the industrial building editor, the components are conveniently entered, duplicated and provided with properties.

- Unique: Outdoor noise can be calculated in one step using the sound pressure level inside, taking into account the sound transmission values of facades, gates and windows.

- Frequency-dependent 2D and full 3D directivity library.

- Interface to freely available loudspeaker data imports spectrum and full 3D directivity.

- Detailed tabular documentation of results and input data.

- Calculation of single points, grid noise maps, cross-sectional noise maps, façade noise maps.

Indoor Noise

Sound propagation in the interior according to VDI 3760 and an advanced sound particle model with diffraction for the calculation of noise in the workplace and room acoustics.

- Calculation in halls, offices, auditoriums, etc., taking into account any room shapes and facilities.

- The equipment, for example interior sources, absorption surfaces, walls, intermediate ceilings, desks, cupboards, machines, baffles, etc. are intuitively entered in the industrial building editor and provided with source and material properties.

- "Hallout" is a calculation that calculates the internal level at the enveloping surfaces from the properties of the indoor sources and stores the corresponding spectrum as a day histogram in the library.

- Calculation of single points, grid maps, cross-sectional maps and "Hallout"; the results are assessment levels, sound propagation curves and horizontal and vertical noise maps.

Room Acoustics

Indoor noise module required

Calculation of reverberation times and various room acoustic parameters, such as speech intelligibility STI, distraction distance or privacy distance according to ISO 3382-3:2012 and E VDI 2569

Implemented room acoustics parameters: Reverberation time (T60, via T20 or T30 method) · Speech Transmission Index (STI) - male voice, female voice and averaged · Early Decay Time (EDT) · Clarity (C80, C50) · Clarity (D50) · Center Time (CT) · Strength (G) · Early Lateral Energy Ratio (LF and LFC)

- Calculation of measurement paths, single receivers, grid maps and vertical grid maps.

- Automatic print-ready room classification according to E VDI 2569 or an assessment according to DIN 18041.

- Auralization.

- Graphical representation of all calculated room acoustic parameters via color-coded receivers, small tables or horizontal or vertical propagation maps.

Aircraft Noise

Calculation and data input according to AzB 2008 · AzB 1975 · AzB 1975 DIN 45643 · AzB 1975 Hungary · AzB 1975 ÖAL 24 · BUF:2021 / 2018 · CNOSSOS-EU AirNoise:2021 / 2015 · CNOSSOS-AT: 2021 / 2019 · DIN 45684-1: 2013-07 · DIN 45689:2020 · ECAC 2nd, 3rd and 4th Edition · ÖAL 24:2004 · SANC · VBUF

- Complete integration of the current German Fluglärmschutzgesetz (Aircraft Noise Protection Act), checked for accuracy by the German Federal Environment Agency

- Import of a complete model via QSI

- Import of aircraft databases from Eurocontrol and INM data

- Calculation of any descriptors, such as Leq, maximum level, NAT exceedance frequency, threshold value acc. to NAT, wake-up probability, ANEF (Australian Noise Exposure Forecast)

- Detailed result documentation of the results including frequency and distribution function of the maximum level for a selected receiver.

- Maximum level statistics for the individual aircraft classes or the sum of aircraft classes.

- Automated graphical output of aircraft noise protection zones and passive noise protection measures.

- Quick and easy combination with any other noise type on the basis of VDI 3722-2

- Calculation of single points, grid noise maps, cross-sectional noise maps, façade noise maps

- Graphical presentation of the protection zones according to AzB:2008

Radar Tracks

Aircraft noise module required

- Import of radar tracks of the data formats Stanly, Fanomos and Topsonic

- Aircraft database for automatic allocation of emission data

- Convenient processing and data control of radar data during import

- The stored ANP database of Eurocontrol allows the selection of procedural height profiles and fixed point profiles.

BA Facade

Calculation of the required evaluated sound insulation value R'w of components or the relevant outdoor noise level according to 24th BImSchV, VDI 2719, DIN 4109:1989/2016/2018, 2nd Aircraft Noise Protection Ordinance and in single values according to EN 12354-3.

- Optimization of the acoustic properties of the room enveloping surfaces

- Manual input or transfer of the SoundPLAN results and geometry

- Flexible, structured representation of the buildings, depending on the building structure up to the subdivision into building - floor - apartment - room

- Visualization of the individual object levels via photos and floor plans

- A room can have one or more facades with different exterior levels.

- Many relevant sound insulation dimensions of the components are already contained in the extensive sound insulation library, which can be supplemented at will.

- Efficient handling of large and small projects, also ideal for noise remediation and acoustical building planning to protect against external noise

- Flexible result documentation of the indoor level calculation and the measure list with sketches and pictures.

Window dimensioning

Simple solution for calculating the sound insulation window classes in the integrated spreadsheet for rooms with one external wall. Calculation of costs for windows and fans according to 24th BImSchV, VDI 2719, DIN 4109:1989.

Wall Design

- Dimensioning of noise barriers and noise berms on the basis of the location of a planned structure with different wall/berm heights

- Calculation for individual receiver locations or with the module Façade Noise Map for entire areas

- Various optimization strategies - compliance with limit values, minimization of facade lengths above limit values, finding the optimal cost-benefit ratio, costs per solved protection case (EBA), efficiency and effectiveness according to the Swiss economic viability index

- The database, which contains the level reduction for each receiver and each wall element, is read by Wall Design and, depending on the optimization strategy selected, builds the wall elements in the order of use.

- The results can be called interactively for each optimization step in the wall construction diagram.

Tools Industrial Noise

Consideration of special tasks in industrial noise

- The analysis tool for noise protection concepts of complex industrial plants helps to identify reduction potentials and to select the most suitable reduction measure, also with regard to cost/benefit aspects.

- The frequency-dependent sound power levels of individual noise sources can be calculated from the measured sound pressure levels, which is helpful, for example, if there are no manufacturer specifications for the sound sources.

- Sound power can be calculated using formulas from any technical parameters, such as the internal level of a pipeline and its external noise emission.

- Optimization concepts to ensure the greatest possible efficiency while complying with the limit values, for example for the optimum control of the individual wind turbines of a wind farm.

Noise Mapping Toolbox

Tools for the preparation of strategic noise maps - EU Environmental Noise Directive and action planning

- Tile projects - loading of data only in the area of selected tiles / areas - minimizes first of all the calculation times, additionally, loading times, for example during data preparation or graphics creation are also minimized.

- Annoyance analyses

- Inhabitants and area statistics in intervals or above thresholds

- Statistical evaluation according to CNOSSOS-EU, BEB and Commission Directive (EU) 2020/367 (assessment methods for harmful effects of environmental noise)

- Comparison of variants on the basis of affected inhabitants or areas via level statistics

- Export of the building center of gravity with the highest level per building

- Hotspot calculation using noise indicators

- VDI 3722-2 - Overall noise assessment

- Automated generation of map sections for large investigation areas

Distributed Computing

- Computing in the network with all free resources using all cores / threads of the connected PCs.

- With only one license you can equip an unlimited number of computers with SoundPLANnoise and start calculating.

- Automatically temporarily integrate computers, e.g., overnight.

- Completely automated sending of tasks and collection of results in the original project.

- So easy to set up that it's worth even for small projects.

- Work through calculations from different projects one after the other.

Noise Allotment

DIN 45691 · ÖAL 41

- Optimization of noise quotas for different company sites within an area, so that the individual industrial sites are restricted as little as possible.

- Consideration of noise pre-pollution manually entered or automated from pre-pollution calculation

- Optimal utilization of immission values via additional allotments for individual directional sectors

- Expression optimized for fixing in the zoning plan

- Graphical representation of the sectors and as a noise map of the whole area

Façade Noise Map

- Using the building facades selected at the push of a button, receivers are automatically set according to various criteria, e.g., one receiver in the middle of the facade, according to the specifications of CNOSSOS-EU or with an indentation from the facade corners.

- Floor-by-floor calculation and calculation at a fixed height above terrain.

- The number of receiver points above each other (floors) and the height of the first calculation point are automatically taken from the building.

- Representation of facade levels as color marks, colored facades or colored buildings in 2D and 3D. In 3D the color changes according to the level on the respective floor.

- Display of results processed further via the integrated spreadsheet (e.g., decisive level from different variants).

- Building reference points in accordance with RE-2012 with reference to a receiver table from the integrated spreadsheet.

- Texts in the color marks in 2D and 3D, for example the number of the receiver point as reference to the table or the level value.

- Output of difference maps and other arithmetic links such as the designation of noise level ranges.

- Calculations of the economic damage caused by noise according to the Swiss WTI ("Economic feasibility and proportionality of noise abatement measures", Series 301, Federal Agency for the Environment BAFU)

- Evaluation according to parameters for wall optimization, e.g., cost ratio of active to passive noise protection measures, efficiency, effectiveness, WTI (BAFU) and costs per solved protection case (German Federal Railway Authority)

- Freely definable color scale for graphic output. The scale intervals can be arranged ascending or descending and can be equidistant or non-equidistant, e.g., for highlighting special thresholds.

- Output of the sum level or individual groups for the calculated time slices, additionally selection whether the highest / lowest level or a certain floor should be displayed.

Grid Noise Map (also indoor grid map)

- Calculation of a receiver grid at a user-defined height above ground level. The grid size can be selected at will.

- Display as isophone map with contour line labelling or grid map, also with color gradient

- Output of difference maps and other arithmetic operations e.g., sum maps, maximum value maps or addition of constant values or levels

- Freely definable color scale for graphic output. The scale intervals can be arranged ascending or descending and can be equidistant or non-equidistant, e.g., for highlighting special thresholds.

- Output of the sum level or individual frequencies and groups for the calculated time slices.

Grid Noise Map and Façade Noise Map

- Calculation and presentation of a triangular noise map. The density of the receiver grid varies according to the model data - closely meshed at sources, buildings and walls, larger mesh width in free field.

- Output of the sum level or individual frequencies, frequency bands and groups for the calculated time slices.

Cross-sectional Noise Map (vertical grid noise map)

Grid Noise Map required

In addition to the properties of the Grid Noise Map:

- Shows the effect of noise barriers in a particularly meaningful way.

- Especially impressive as 3D cross-sectional noise map with semi-transparent areas and non-transparent contour lines.

3D Graphics

- The 3D Module is accessible already during data entry to check the data with regards to the consistency of the 3-dimensional location of the objects in the terrain.

- Individual design of the displayed geometry data and geometry bitmaps together with the calculated results of grid maps and façade noise maps in 3D.

- Switch the graphic object type to the object types supplied as standard - roof ridge, different tree species for a more realistic 3D view,

- 3D wall with posts [Prerequisite: Cartography].

- 3D effects - perspective or orthogonal view, changing the light source, fog, etc.

3D Animation

3D Graphics required

- Driving along any road or railway axis in the project, for example to check the position in the terrain.

- Enter any animation path and fly over the 3D investigation area, for example.

- Animated train pass-by via a Grid Noise Map, 2D and 3D display.

- Level-time chart at each point of the calculated noise map, also as a graphic box with reference to the location in the map.

- Arithmetic operations of animated noise maps with several trains, for example from different directions or trains running at a certain time interval.

GIS interface

- Import of ESRI shapefiles with any geometry properties.

- Open dbf files (property tables of Shapefiles), edit, supplement, modify using formulas, create and save columns with additional properties.

- Shapefile export of the geometry with any property data.

- Shapefile export of the receiver results with any desired columns (also the columns calculated in the SoundPLAN spreadsheet).

- Shapefile export of the grid values, the contour lines (as line, surface or band) and the triangle points, for the DGM data also the triangles themselves.

- Import of CityGML with building properties included in the data (e.g., address data, building heights).

- Import of OSM geometry within the map viewport with properties included in the data (e.g., address data, road names) [Cartography required].

- Import of OSM XML.

- Import of grid maps of other software products.

Interface from German road planning software

- Import from the road planning programs CARD/1, STRATIS and VERBUND.

- The original data is automatically converted into SoundPLAN objects and completely read into a SoundPLAN project.

TNM interface (FHWA Traffic Noise Model)

- Import TNM v2.5 project into the Geo-Database

- Preparation of SoundPLAN_{noise} model for TNM Export

- Exporting SoundPLAN_{noise} Models from the Geo-Database back to TNM v2.5 project