NoizLetter

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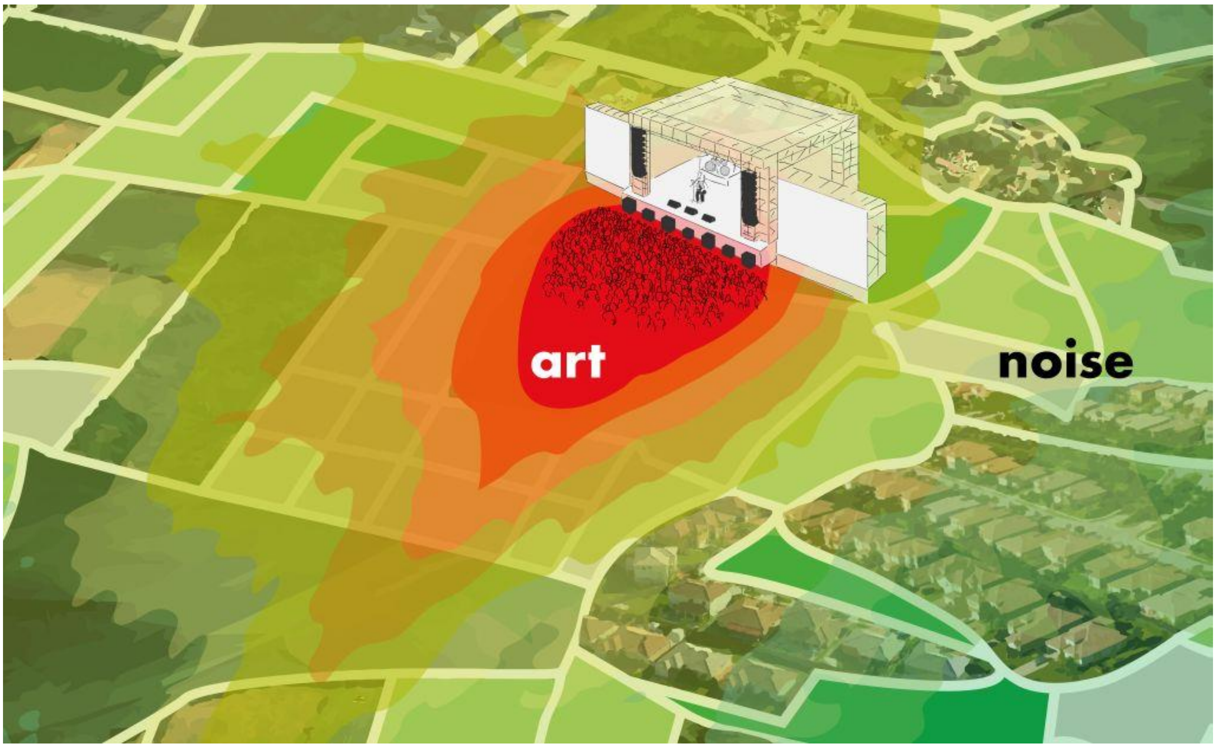

A new version of NoizCalc is available to download via the integrated update function. NoizCalc V1.0 update 04.04.2017 is also available to download on the d&b website, alongside the d&b ArrayCalc and the R1 Remote control software downloads.

Technical updates and bug fixes

- **The TI 386 has been updated.**
  The NoizCalc manual has been updated, including an extended quick guide. A few tips and tricks have been added. The TI 386 document is also available to download from www.dbaudio.com.

- **Complex summation, always!**
  In the previous versions, NoizCalc would perform the calculations without complex summation if the interference button in the 3D plot view within ArrayCalc was off. This meant that the NoizCalc results were less realistic. To avoid this issue, the latest version of NoizCalc always uses complex summation for the calculations, regardless of the settings used in ArrayCalc.

- **New emission spectra.**
  The emission spectra library has been revised. The spectra are now grouped into three categories for a better overview: Reference, Saxon study and Measured. In addition, a description of each spectrum is included. The Heavy metal spectrum was changed from a short-term to a long-term average, which better represents these types of events.

  Two new average spectra were added – both were measured at several open-air events:
  - Live bands
  - Electronic music

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- A few minor bug fixes and improvements have enhanced the graphical user interface.

- The demo projects in NoizCalc have been updated to ArrayCalc V9. These demo projects are also available to download separately from www.dbaudio.com.

- A new dialog will appear with a warning if the model was changed without recalculating the graphic plot.

To install the new version of NoizCalc with the revised emission spectra library, the previous version should be removed from the computer. NoizCalc is available for registered download from the d&b website.

Experiences and validation of NoizCalc - one year later.
Introduction

The d&b NoizCalc immission modelling software is the tool to simulate the noise impact in residential areas surrounding open air events. It calculates the sound propagation in the far field from one or more stages equipped with d&b sound reinforcement systems. The sources are modelled in the d&b ArrayCalc simulation software, the tool to design, predict and optimise a d&b loudspeaker system, calculating the direct sound from the system within the audience listening area. The calculations are in accordance with the international ISO 9613-2 or Nord2000 standards on sound propagation. NoizCalc takes the following into account:

- Complex balloon data from the sound system (magnitude, phase and directivity)
- Complex summation of sound waves
- Terrain (topography, elevation)
- Acoustical ground characteristics
- Obstacles (buildings, walls, foliage)
- Meteorological conditions
- Signal spectrum

The result is a grid noise map that is layered over a terrain map of the venue and its surrounding areas.

The calculation engine within NoizCalc originates from SoundPLANnoise, which is a comprehensive noise simulation software for all types of noise sources (that occur for example in traffic and industry). In a cooperation between SoundPLAN and d&b, this engine was extended to model the effects of a complex loudspeaker system in two ways:

- Importing loudspeaker systems from ArrayCalc
  Source modelling is done efficiently within d&b ArrayCalc. By importing a loudspeaker system into NoizCalc, all positions and complex balloon data of every single loudspeaker source is automatically transferred as one stage object into the NoizCalc project.

- Complex summation
  Simulation software for calculating environmental noise did not consider complex summation of sound, because typical noise sources in traffic or industry are incoherent. Sound reinforcement systems with line arrays and subwoofer arrays effectively use coherence to achieve high directivity.

Although SoundPLANnoise and ArrayCalc are both verified individually, there was little experience with propagation calculations with these extensions. Therefore, to accurately verify NoizCalc, several festivals were accompanied with noise measurements in 2016 to compare them with corresponding calculations.

Noise measurements

Measuring environmental noise has its own difficulties, inadequacies and obstacles. For undisturbed measurements, the background noises must be at least 10 dB less than the signal. In addition to typical noises from traffic and industry, other stages at the event should be considered as potential background noise as well.

The noise measurements were done with a XL2 handheld acoustic analyser from NTi. All relevant boundary conditions including the precise locations and heights of stages and measurement positions, weather conditions, as well as date and time were documented.

Meteorological conditions increasingly affect sound propagation with distance. At some distant measuring positions, sudden changes of the sound pressure level (SPL) of up to 8 dB were observed. The meteorological conditions were recorded with a Vantage Vue weather station that is wirelessly connected to a console with a detailed overview screen.

The level at front of house (FoH) was measured in parallel with a second acoustic analyser, especially when live music was performed. For each noise measurement in the environment, an individual time synchronous average spectra and SPL was extracted from the FoH measurements.

The measurement data for the comparison was acquired at three outdoor music events: Flow Festival in Helsinki (Finland), Das Fest in Karlsruhe (Germany) and Summer Breeze near Dinkelsbühl (Germany).

Propagation calculations

After the measurements at the festivals, precise models were created using the actual system that was deployed with the goal of a detailed comparison. The accuracy of a sound propagation calculation obviously depends on the quality of the data used to create the model. Sources, terrain and noise relevant objects need to be modelled and source signals and meteorological conditions entered. NoizCalc offers import functionalities for the loudspeaker sources and the terrain. Buildings, structures and acoustical ground properties are added manually.

The main part of the source modelling is done within ArrayCalc. The actual files that the sound engineers had created for and used at the events were used. The position and orientation of each stage was entered into NoizCalc according to on-site and aerial images.

The extracted average spectra and SPLs from the FoH measurements were entered for the stages in the calculation models. They are the target for which NoizCalc recalibrates the sound system at the reference point. As in most cases, the reference points were defined at the FoH locations.

The topography was imported from Google Earth and checked against on-site impression. Depending on the elevation, it can become necessary to change the data locally, but in these cases, it was sufficiently precise. Modelling objects, especially buildings in urban areas can be laborious. Thus, the focus lies on detailed and accurate modelling at the source, along the sound path to and at areas of interest, in this case the measurement positions. The acoustical properties of the different grounds were defined. They mainly affect the sound wave's interaction with the ground at the sources and receivers.

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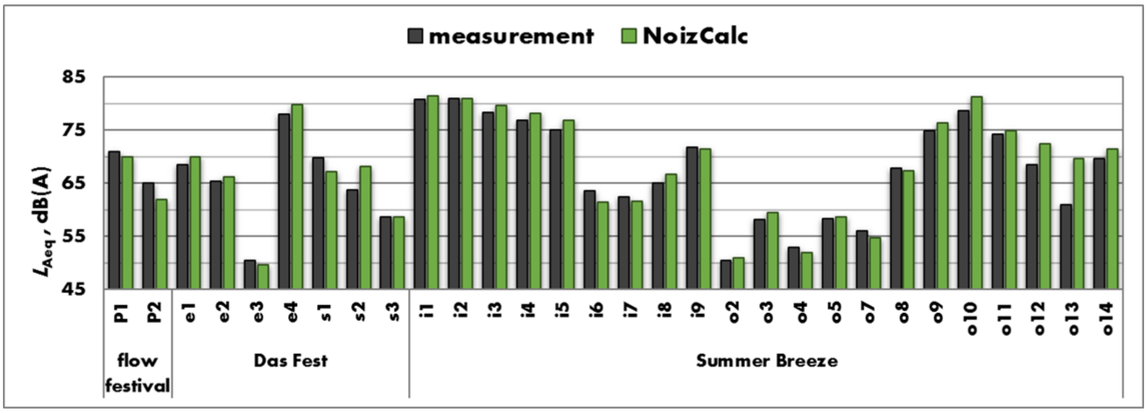
Due to the effects that meteorology has on noise propagation, a representative average for the weather conditions during the time of measurements was used for the calculations. At one event a complication occurred where the wind changed during and between measurements. In this case, the wind parameters were slightly adjusted for the calculation of single measuring positions.

The detail of the models used for these calculations is most probably higher than in an average prediction scenario where the simulation is done before the event. For the purpose of gaining experience with NoizCalc and testing its accuracy and limits, the additional effort was required and insightful.

Comparison

Generally, the feedback on NoizCalc from users around the world has been positive. Some of the feedback compared measured levels with a NoizCalc prediction. At the Flow festival in Helsinki, the differences between the prediction and measurements at the defined points were around 1 - 3 dB(A). The graphic at the bottom shows the comparison of measured (grey) with calculated (green) levels. Ideally, the columns of one measurement position have the same height. On average the simulation slightly overestimates the measurement by nearly 1 dB(A) with an uncertainty of about 2 dB(A).

Considering the nature of the implemented standards this outcome is somewhat welcomed. The ISO 9613-2 and Nord2000 standards use simplified mathematical descriptions of the actual physical reality, which cause systematic deviations. Within the range of these deviations, the regulations are adjusted towards "being on the safe side" regarding the affected residential areas, rather than underestimating the potential impact.



Outlook

Further analysis shows that the deltas spread out with increasing attenuation. The attenuation is the level decrease from FoH to the measuring positions. Mainly the distance and angle to the stage, as well as obstacles determine the attenuation. This means that measurement positions at longer distances from the stage and those which have more obstacles are more likely to have potential discrepancies in the simulations. A paper will be published within the coming months.

For all questions and queries, please contact support@dbaudio.com

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