

ISO/TS 12913-3:2019, *Acoustics – Soundscape – Part 3: Data analysis*

By Philip Dunbavin

By the time you read this, the Technical Specification ISO/TS 12913-3:2019 should have been published or at any rate is about to be published. It is notoriously difficult to predict exact publication dates for new ISO documents but I am reliably informed that this will be published in time for Christmas.

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Introduction

The introduction to ISO/TS 12913-3 says:

“The series ISO 12913 on soundscape was developed in order to enable a broad international consensus and to provide a foundation for communication across disciplines and professions with an interest in soundscape. The first part of this series of standards, ISO 12913-1, provides the definition of and a conceptual framework for the term ‘soundscape’. This was then followed by ISO/TS 12913-2 which provides information about data collection and reporting requirements regarding soundscape studies, investigations and applications. Finally, ISO/TS 12913-3 provides guidance on how to analyse data collected in agreement with ISO/TS 12913-2.”

Health warning

For those acousticians who are only familiar with physical acoustics this standard will introduce them to psychoacoustic analysis with a prevalence of new concepts. The unwary might consider that this is akin to a black art, fortunately there are some sixty-five references in the bibliography. These are in fact essential reading for those who want to understand the analysis methods. This is not light bed time reading and is fully capable of introducing significant brain melt down to the uninitiated. Please bear this in mind and you have been warned.

For psycho-acousticians this will be plain sailing and everyday simple stuff. All of the following analysis techniques can be used and for each one there are references to text books and/or papers in the bibliography.

Analysis of quantitative data

The quantitative data from questionnaires can be analysed by a range of measures including central tendency, measure of dispersion, correlation analysis, and statistical hypothesis testing methods.

Analysis of qualitative data

Qualitative data can be analysed by scientifically proven systematic text analysis methods, such as Grounded Theory, Qualitative Content Analysis or Social Network Analysis as part of mixed-methods design.

In addition to established text analysis methods, other methods to gather and analyse qualitative data such as behavioural mapping, observational analyses, analysis of social interaction, and walking patterns, are available and can be used.

Analysis of binaural data

The analysis of binaural recordings can use different metrics e.g. $L_{Aeq,T}$, $L_{Ceq,T}$, $LAF5,T$, $LAF95,T$, $N5$, $N95$, N_{rmc} , $S50$, IACC that can be linked to the people's perceptual response to sound.

This also comes with some sage words of wisdom in the standard:

“It is of course possible to predict precisely the sound pressure level depending on the distance to a sound source or to calculate the resulting sound pressure level of a number of sound sources, such methods of calculation cannot be applied to psychoacoustic parameters such as loudness, sharpness, roughness, or fluctuation strength.”

Triangulation

Triangulation is not as daunting as might be expected and the standard says:

“Soundscape studies make use of a variety of data collection and measurement methods which relate to human perception, the acoustic environment and the context. The use of several different measurement methods is known as triangulation. The term triangulation is borrowed from navigation and is used to establish the precise location of an object by taking readings or measurement from several directions.”

There is little doubt that triangulation increases the validity and reduces the uncertainty of the measurements.

Laboratory studies

ISO/TS 12913-3 elaborates on laboratory studies as follows:

“The performance of a laboratory study can assist in detailed analyses of specific phenomena related to soundscape. However, they are difficult to design and aspects including instruction, scale, and context have to be selected according to the purpose of an investigation. In principle, methods like paired comparison, ranking, category scaling, semantic differential, magnitude estimation and interview methods can all be useful.”

“One method is the free sorting task, it allows for identifying “natural” verbal descriptors that are meaningful for participants. Methods, like Intermittent Thinking Aloud (ITA) or Subsequent Thinking Aloud (STA), are other ways to collect data without predefined questions guiding an interview.”

Health warning revisited

Now if your brain is not spinning then well done, you clearly are a psychologist or a psycho-acoustician. The rest of us mere mortals will need to embark on some serious additional education to be fully conversant with the analysis methods in this standard. That is why there is such a large bibliography.

Author

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