modelling, testing, psychoacoustics, community impact, noise reduction strategies, measurement techniques, and uses of both UAS/UAVs and aerial mobility.

1:00 PM   05-Aug-2021   **IN21_2911.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-2911

Protecting national park soundscapes: summary of the 2012 NAE workshop

Gregg Fleming, Karen Trevino, Robert D. Hellweg

After reviewing the 2010 National Academy of Engineering (NAE) report "Technology for a Quieter America", the National Park Service (NPS) asked the NAE to undertake a consensus study on the importance of quiet to both visitors and wildlife in its hundreds of properties. The aim of the workshop was to provide best practices to assist NPS park managers, contractors, and concessionaires in protecting park soundscapes. The workshop was hosted by the NPS in Fort Collins, Colorado in October 2012 and was attended by twenty-four participants including park personnel and noise control specialists from government, academia, industry and consulting firms. The NAE report published in cooperation with the NPS and the Volpe National Transportation Systems Center identified seventeen cost-effective actions for reducing noise in our national parks. This paper describes and summarizes the issues raised at the workshop and those recommendations.

1:20 PM   05-Aug-2021   **IN21_3033.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-3033

Reducing employee noise exposure in manufacturing: a review of the 2014 workshop

William Murphy

In 2014, the Institute for Noise Control Engineering (INCE) Foundation, the Noise Control Foundation and the National Institute for Occupational Safety and Health organized a meeting of industry, government, and academic experts to discuss "Reducing Noise Exposures in the Manufacturing: Best Practices, Innovative Techniques, and the Workplace of the Future." This presentation will review the content of the recommendations for hearing loss prevention programs, successful implementations for noise control engineering, and new techniques to predict noise exposures in the workplace. Efforts to develop Buy Quiet programs and to promote the Safe-in-Sound Excellence in Hearing Loss Prevention and Innovation will be reviewed.

Workshop: I-INCE Young Professionals
Channel 1

2:00 PM   05-Aug-2021   **Oral Only**

I-INCE Young Professional Workshop

Patricia Davies, Taha Sen

Young Professionals Workshop & I-INCE Young Professionals and Latin American Young Professionals Awards Events. Awards presented by I-INCE President Robert Bernhard.

Session: 04.01 Acoustic Holography, Beamforming and Array Techniques
Channel 2

6:00 AM   05-Aug-2021   **IN21_3095.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-3095

Sensor placement for sound field reconstruction in enclosures.

Samuel A. Verburg, Efren Fernandez-Grande

Sampling spatio-temporal acoustic fields is a challenging problem since it demands a large number of sensors. Typically, to characterize the pressure field inside an enclosure, the number of measurements required increases linearly with frequency and cubically with volume, becoming an intractable problem for rooms of moderate size even at low and mid frequencies. Sparse representation techniques, such as Compressed Sensing, rely on the sparsity of natural signals in certain representation domain to drastically reduce the number of measurements needed to sample such signals. In this study, we optimize the placement of sensors inside an enclosure in order to reduce the measurements required for a given reconstruction accuracy. The proposed methodology selects a sparse set of sensor positions from predefined grid via the QR factorization of the sensing matrix. Numerical results show an effective reduction in the required number of measurements when their positions are optimized, in contrast to standard random positioning. Unlike the majority of existing approaches, we study the placement problem for wide-band acoustic fields.

6:20 AM   05-Aug-2021   **IN21_1898.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-1898

Optimization of underdetermined hologram points in reconstructing the vibro-acoustic source field based on ESM

Laixu Jiang, Jeong-Guon Ih

The distribution of measurement points is important in reconstructing the vibro-acoustic source field using the near-field acoustical holography (NAH) based on the equivalent source method (ESM). Because too close measurement impose a limit in the implementation of ESM, an optimal arrangement of the hologram data is needed to enable a longer distance measurement although the points are still within the near field. In this work, the optimal measurement positions are determined by adopting the method that assures the independence among the measuring positions as far as possible. Singular value decomposition of the transfer matrix is employed in the loop-iteration calculation fashion, in which

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Session Number 04.00 Signal Processing, Measurements, Sound Reproduction, Diagnostics for Noise and Vibration Engineering, General, Part 1 -
Channel 1

6:40 AM   01-Aug-2021   **IN21_1136.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-1136

Distortion measurements of sound pressure level generated by a pistonphone

Thiago Antônio Bacelar Milhomem, Zemar Martins Defilippo Soares, Gustavo Palmeira Ripper, Peter Hanes, Adrian Solano Mena, Federico Ariel Serrano, Giancarlos Miguel Guevara Chuquillanqui, Juan Pablo Ayala Breña

A supplementary interlaboratory comparison on pistonphone calibration was performed between 2018 and 2020 under the auspices of the Inter-American Metrology System. Seven national metrology institutes took part in this comparison. One pistonphone was circulated among the participants for measurement of the generated sound pressure level, frequency, total distortion + noise and total harmonic distortion. This paper presents the results of distortion measurements and analyzes them. From the stability check, notable variances with respect to reported measurement uncertainty were observed. From reported results, a large difference between the estimated uncertainties by the participants was noted. Convergence between results was found when measurements were performed using one-inch microphone while some divergence between results was found when measurements were performed using half-inch microphone. In addition, these results (using one-inch and half-inch microphones), even when obtained by the same institute, sometimes were different. Reasons for these findings are discussed and suggestions for future comparisons are presented.

7:00 AM   01-Aug-2021   **IN21_2557.pdf**   **DOI:** https://doi.org/10.3397/IN-2021-2557

MEMS digital microphone and Arduino compatible microcontroller: an embedded system for noise monitoring

Felipe Ramos de Mello, William D'Andrea Fonseca, Paulo Henrique Mareze

Noise assessment and monitoring are essential parts of an acoustician's work since it helps to understand the environment and propose better solutions for noise control and urban noise management. Traditionally, equipment to carry out this task is standardized, and, eventually, expensive for the early career professional. This work develops a high-quality (and cost-effective) prototype for an embedded noise monitoring device based upon a digital I2S MEMS microphone and an Arduino compatible microcontroller, named Teensy. Its small size and low power consumption are also advantages designed for the project. The system captures and processes sound in real-time, computes A and C frequency-weighted equivalent sound levels, along with time-weighted instant levels with a logging interval of 125 ms. Part of the software handles the audio environment, while the biquadratic IIR filters present in the Cortex Microcontroller library are responsible for the frequency-