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Editorial:

The Acoustic Characteristics of Religious Buildings

The acoustical experience of people in places of worship is not accurately captured by physical measures of building acoustics. While many studies concentrate on the acoustics of buildings, aural architecture analysis which provides a more thorough knowledge of the aural experience by considering perceptual and cultural factors in addition to physical ones receives less attention. Worship areas need intricate acoustical settings that enable both clear sound perception and the enjoyment of aesthetic sound. There is a need for more research on the relationship between the qualitative and quantitative acoustical features of religious buildings since this experience can have emotional consequences through the sense of sound. The audio experience is not exactly captured by architectural acoustics measures. This is evident when comparing two concert halls that have distinct acoustical properties but the same reverberation time, which can be explained by differentiating between architectural acoustics and aural architecture. Aural architecture encompasses perceptual and cultural elements, whereas architectural acoustics primarily focuses on the physical measures of sound inside the space. Current trends in contemporary architecture, such as transparency, openness, and preference for bare sound-reflecting surfaces, continue to push the very limits of functional acoustics. A holistic approach in terms of research and practice is the best way to solve the perplexing problems in the design or refurbishment of spaces. This special issue aims at bringing together recent breakthroughs in architectural acoustics, especially acoustics of worship spaces (e.g., temples, mosques, churches, etc.), so we will motivate academics and acousticians to pursue new avenues in this era of scientific convergence.

The first paper [1] in the special issue investigates the optimal reverberation time in masjids (mosques) from worshippers' viewpoint for two modes performance: recitation and sermon/speech. The age and gender effect on worshippers were examined. The authors used five audio clips (five acoustics setup) for each mode and uploaded to google drive. In the study, approximately 300 Arabic speaking participants listened to these clips. Two quality indices QR and QS used to judge the quality of the clips. Males preferred the longer reverberation time while females preferred shorter reverberation time in listening. After lifting Covid-19 restrictions, and in light of the previous results, this work will be followed by a second part in which the participants should have personal attendance in the acoustic lab to validate, verify, and confirm these results.

The second paper [2] concentrated on investigation of the eigenfrequencies and eigenmodes of the space using (FEM) finite element method (COMSOL Multiphysics software) for acoustical modeling utilizing ISO 3382-1. The experimental measurements performed using Impulse response and frequency response of the space by Fourier analysis. This study is a part of renovation works for the monument of Neoria in the city of Chania. Neoria is one of the most important cultural heritage monuments of the island of Crete, Greece. Various acoustic measurements were performed and acoustic models were created. Eigen frequencies (or resonant frequencies) inside a space have a great effect on its acoustic characteristics and the reproduction of music especially below the Schroeder frequency in the low frequency range. The results of the measurements and the acoustic modelling of this study show that the frequencies that have the greatest effect on the space are 86.1 Hz, 150.7 Hz and 204.6 Hz. This study is a starting point for future investigations and acoustic interventions in the Neoria monument.

The third paper [3] presented the acoustical evaluation of a representative evangelical church in Rio de Janeiro, Brazil. The acoustical analysis was performed experimentally using impulse response using REV software, omnidirectional microphone and a pair of loudspeakers. Brazilian room acoustic simulator BRASS was selected for simulation, the surface area was firstly molded in CAD software and then export data in DXF format using 3DPolyline. Then BRASS software imported from DXF file with the geometry entities and materials according to corresponding layer. This acoustic simulation was a good practice to ensure the geometrical and acoustical aspects. The reverberation time and clarity factors were the important acoustical parameters to be stated. The simulation and experimental results were compared. An acoustic intervention was proposed and evaluated using simulated data. The results obtained with the proposed changes, which considered the inclusion of perforated panels and carpet in some walls, were adequate, providing reverberation time per the standards and significant improvement to clarity for music and speech.

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