FEATURE ARTICLE

LABORAL OF LOVE

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Assisted Resonance, Acoustic Enhancement, Electro-acoustic Systems, Virtual Acoustics, Artificial Reverberation, Electronic Architecture. There have probably been more names invented to describe the idea of such systems than there have been credible products brought to market. Paul Malpas visited on such system in Gijon, Spain and reported back on what he heard.

In all cases, the purpose and mission has been well-defined (and has been for a surprisingly long time for a 'modern' technology): to provide a system of electronics and architectural acoustics that allows the user to vary the (convincingly natural) acoustic response of a performance space. From the start, the qualification insistent on the resulting electro-acoustic system has been that the conditions created are truly multi-functional while remaining at performance-grade to the critical audiences of orchestral live music.

The auditorium at the Universidad Laboral in Gijon is a stunning piece of architecture posing some challenging acoustic problems.

If you've ever listened to singing in your lounge, or tried to understand a tour guide in a cathedral, you'll know that different presentations require different types of acoustic reverberation. There are various tools to provide degrees of variance by physical changes to the space and the finishes, and these methods have a place in the design of high quality auditoriums. Physical variance comes with its own set of practicality and architectural issues, and the solutions to these come with their own cost implications. But this article is not about those methods, it is about a method that turns to a specialised and refined form of audio technology.

To any one of us with both a keen ear for musical spaces and a professional proclivity for novel audio technology, the concept might seem deceptively within grasp: if a space lacks sufficient reverberation or musical clarity, perhaps due to shortcomings in the acoustic reflections encouraged by the form and finishes of the space, then simply use some microphones, loudspeakers and processors to provide 'reflections' and reverberation electronically. Thus, at the push of a touch-panel, the user would be able to mimic the appropriate acoustic to suit the performance presented.

However in over 40 years since the earliest example, less than ten systems have been successfully marketed, the most recent of which to appear on the scene in Europe is the Constellation system from Meyer Sound. Constellation is a development of the VRAS (Variable Room Acoustic System) technology invented and patented by Mark Poletti in 1999 and produced by LCS as a significant outcrop from their Matrix3 frame-based audio show control system used in theatres. Since then, Meyer Sound got interested in the LCS systems and products, presumably because they both worked so heavily in theatre audio, and acquired LCS in 2006, adopting and adapting the VRAS technology into an integrated, system-orientated offering, including all design, calibration, tuning, microphones, processors and, naturally, loudspeakers under the Constellation branding.

The next step was to secure the critical consultancy and commissioning elements in the mix, which led Meyer Sound to entice John Pellowe in from the world of classical recordings and live sound. John was well known as a recording and live sound engineer, most notably with Pavarotti since 1985, and brings with him a respected reputation in the classical music markets. His job has been to take the controls of the Constellation system on projects such as the auditorium at the Universidad Laboral on the outskirts of Gijón in northern Spain. The auditorium at Laboral now houses the first Constellation System to be installed in Europe, and it was there that Meyer Sound recently invited a number of Consultants and their Clients.

The Space and the Challenge

This turned out to be a revealing demonstration in what seems to be a challenging space for a virtual acoustic system. The building and the auditorium are amazing, visually, and historically, forming a centre-piece of a site taken over by the Universidad Oviedo as an annexed campus, specifically for the teaching of performing arts subjects. The 1,400 seat hall is a classic case of where virtual acoustic enhancement systems can become an invaluable tool in the successful programming of a modern venue. Given its location in this performing arts college, this hall must be a strictly multi-purpose space intended for drama through to symphonic classical music, but also with aspirations to providing fine performance qualities to engender the best students.

The 10,000m3 house is a little on the small side for the 1,400 seats, though of course the principle auditorium is very much a legacy starting point. However, the 1.2s natural RT would definitely not do for the sorts of musical performances intended. The RT is as low as it is not simply because of the room size but also because of a number of acoustic absorption methods that seem to have been incorporated into the refurbishments and/or the original architecture. Not least of this, as is typical in high quality large auditoriums, was the absorption of the comfortably upholstered seating. The acoustic consultant for the physical space was Dr Higini Arau of Arau Acustica. Dr Arau set the Reverberation Time (RT) of the empty hall without enhancement to be 1.2s, and this was pretty much achieved on the button, according to Pellowe. This RT was presumably chosen with theatrical purposes in mind, as is supported by the large and well-equipped stage house that has been added as part of these works. Some form of electro-acoustic enhancement was always included in the design, intended to broaden the usage from drama through to romantic and symphonic classical music. More technically, the brief was for a system that could achieve 125dB peak, to match the largest symphony orchestras on the stage, and could achieve this without discernible distortion and without recourse to the use of dynamics compression: essentially, something that sounded natural and not like "a bunch of loudspeakers".

Meyer Sound was then pulled in to offer the Constellation system, at a stage in the project when the auditorium construction was pretty much in place, but not the stage house. Straightaway, Pellowe recognised the potential hazard of the new and large stage housing forming an acoustically distinct space, coupled uncomfortably to the main house acoustic. Measures were proposed and put in place to control the acoustic in the tower and to moderate any variation of this dependent on the existence or otherwise of scenery, cloths etc. This is an example of how it is so important in any electro-acoustic enhancement project that the real-acoustic and virtual-acoustic designs benefit from hand-in-hand development.

Architecturally, the hall is more than good enough to support a programme of high quality performances and, on the (visual) face of it, could well be an excellent 1,400 seat auditorium for classical concerts. As many Consultants know, 1,400 seats is a good number to have: anything over 2,000 seats introduces considerable architectural/acoustic challenges and above 2,400 usually means aural compromise somewhere in the house. But

John Pellowe adjusts the system's settings in real time during the demonstration

at 7.1m3 per seat and 1.2s RT, the case for something to extend the RT and, ideally, increase the apparent room volume is pretty clear.

The Hearing Proof

You could think of electro-acoustic enhancement as a case of 'topping up' the natural acoustic, but in a way that doesn't overly dilute the credibility of the sound heard in the space. In that case, it is easy to understand that the 'blend' between physical and electronic is all important. I have heard a number of systems where adding around 50% to the natural RT would seem to produce a perfectly credible and enjoyable acoustic performance. I have also heard some that have gone beyond adding 100% to the RT, ie more than doubling it, and still just about remain in or around the category of 'world-class', but this is rare. Somewhere between adding 50% and doubling the RT it is expected that the performance-grade acoustic quality will begin to noticeably suffer. In the settings demonstrated by Pellowe, the RT was stretched from 1.2s to 2.2s, an addition of around 90%. So it would be expected that any system would be struggling at that point, and, in such a large space, this seems to have been a slightly uncomfortable stretch.

It's pretty clear that, without the system on, the players' conditions on stage are unpleasant to play in and hardly conducive to learning good performance skills. So, on stage, the system is a definite asset. This view is supported by the conductors and musicians who have used the space, with Yuri Nasúshkin of the Asturias Youth Symphony Orchestra commenting that "…we all feel more comfortable performing on stage. No one can complain about the acoustics in this room any longer."

Similarly, in the house itself, with the system 'on', the acoustic was, on-balance, much better than without, in terms of the musical reverberance. However, there was a perceivable problem with clarity under the system that seemed to go beyond the effects naturally expected from extending the reverberation time. It was not that a discrete late reflection could be heard, but the reverberation tail seemed to suffer from some late energy 'lumps'. To my ears, and in the context of a demonstration to a large gathering, I concluded that his might be due to an over-zealous attention to the on-stage acoustic conditions, understandable perhaps given the prime purpose of the hall. Perhaps the lack of an audience of any size did not help, and maybe the newly added stage tower was causing some remnant acoustic coupling, despite the heavy treatments, that the virtual acoustic system was conspiring to exaggerate.

As demonstrated by John, in the speech/drama setting there was a preference for adding 'voice lift', which itself added an amount of reverberance. As there didn't seem to be a purpose where leaving the system off was considered the most appropriate setting, my money would have been on a strategy that sets the natural RT a little higher, perhaps with deployable drapes to be drawn where necessary for more critical speech presentations, making it more feasible to jump the 0.7s or so to a high quality symphonic hall setting.

These may be seen by some as 'fine tune' observation, and it has to be said that the types of criticisms that may be levelled may just as well be put up against some 'natural' (i.e. physical) acoustic spaces, except that in those spaces there is not the same scope to make adjustments in the electronics domain. So in a way, the system has achieved an authentic level of 'naturalness' even if there are still some important improvements to be made to the careful commissioning of this particular installation. Pellowe readily recognises this and understands fully the critical nature of such fine tuning; and how these concerns would be of high significance to the arts facility managers who had come to listen.

Classical audiences, I would suggest, are far more sceptical of electro-acoustic systems than modern theatre audiences, and have a highly developed sense of aural 'reference' back to the top quality instruments they come close to on a regular basis. In modern theatre, fidelity to the 'original' (whatever that may be) is perhaps secondary to the art in the net result, whereas in highly regarded concert halls the attitudes are less ready to put authenticity aside. Tough gig!

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