How audio and video routing aids Europe's largest audio research firm

Tuesday, May 20th 2014 at 11:15AM

Fraunhofer IIS in Erlangen, Germany is one of the most active and innovative audio research organisations in the world.

It contributes to many of the commercially successful open standards-based audio compression schemes, such as MPEG Layer-3 and AAC, and its technologies enable more than seven billion devices worldwide – licensed to over 1,000 companies.

Twenty five years ago 20-30 scientists were actively working on audio compression-related development at the Fraunhofer IIS, and over the last ten years these activities have been heavily expanded to address new topics like surround sound, binaural processing, semantic audio processing, audio communication technologies, multimedia streaming, and combined voice and music compression schemes.

The size of the team has now increased to more than 200 engineers and scientists with state-of-the-art facilities based in a 300-square-metre laboratory and studio complex, which serves the complete audio signal processing chain from recording to transmission and processing, reproduction, auditory perception and quality analysis.

The studios have developed continually since they were first constructed in 2008 and today house a wide range of equipment for recording, controlling and reproduction of audio and video. Amongst them are a recording studio, a cinema, two control rooms, two loudspeaker listening rooms, with 3D audio, headphone rooms and technical equipment rooms. They are used by a wide variety of researchers from fresh interns, software developers, scientists, sound engineers to directors, each with a different sound expertise and requirements.

More than 120 speakers are currently installed in the complex with the capability of switched connection to 15 audio playback computers and other devices including DVD and Blu-ray players. They can be operated in a range of reproduction formats: from one to 32 channels. Loudspeakers can be adjusted individually by level, delay and EQ and controlled individually or in assigned groups.

Complex routings for continuously changing experimental setups are in daily use by specialists who require the capability of adjusting the layout and configuration themselves, without the need to involve technicians; and to do so intuitively. These requirements are far beyond the user interface of a standard audio mixing console so the engineering team at Fraunhofer therefore developed a dedicated, bespoke, universal software control interface to operate a large audio routing system with multiple inputs/outputs and with massive DSP power for audio processing.

This interface, named UniCon to signify its universal connectivity connection capability, is operated from a specially designed touch panel and has the ability to seamlessly and remotely operate the audio and video routing systems; setting up connections between the banks of computer and other sources devices situated in remote computer rooms and loudspeakers in the separate studio rooms in order to achieve NR10 noise rating. It provides full control of the computers in the adjustment of parameters necessary to evaluate and test different audio concepts; smoothly and instantly.

All computers in the facility, whether operating on Windows, Linux or MacOS, are fully integrated into the audio and video chain. Each room has at least two computer screens to reproduce the video signals from the single- or dual-head graphic cards of the computers and media players. The desire to provide free assignment of video and audio inputs and outputs from every computer in the server room to every audio reproduction room drove the need for a pair of flexible and controllable KVM and video matrix switches that does not delay or affect the content in any way.

"The advantage of such a system is that every employee can use their own digital audio workstation software with a keyboard and mouse, as usual. In this way, no one is prevented from using the audio equipment, as it would be the case with a traditional mixing console, which needs extra training to use only basic functionality," explains Fraunhofer's Andreas Silzle. "The UniCon software is multi-user capable, allowing several users to work in different rooms at the same time. These users share the same resources, for example; rooms, devices, I/Os of the routing systems or DSP power. The design aim for the facility was to provide the easiest and most flexible user control of the complete set of equipment in the audio rooms."

The UniCon software caters for four different user groups: standard, listening test, presentation and power user. The different user groups are only presented with the selection buttons that are necessary for their individual tasks and the KVM and video matrix switch controlled accordingly. This prevents them from adversely affecting other users and minimises training requirements. Although the system provides control abilities, it needs hard real-time operational capability; so the routing paths have to provide delay-free control. When the master fader is moved fast, all 64 controlled channels have to react in parallel: asynchronous behaviour is easily audible.

"The innovative UniCon control allows control of a higher number of audio recording and reproduction rooms, with their complex hardware, the interconnections between rooms and different user groups," Silzle continues. "All the logic and interdependency for the different settings are included inside the software. This allows an easy-to-use interface, therefore also allowing untrained users to employ the room and permits destroying any cabling or setting of another user. The necessary logic and protection is built in the system and can be configured as required. A power user can use several rooms and devices at the same time and apply enhanced routings and settings, using their own presets."