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The Magic of DSP

It's hard to realize how important the use of digital signal processing (DSP) already is in our audio devices. So many good-sounding products we have today have a bit—or a lot!—of DSP magic doing its part, even very high-end products. But of course, the benefit for the vast majority of people is in affordable products manufactured by the millions.

I will always remember a demonstration from my friend John Richards, from Oxford Digital, when he showed me how a pair of cheap plastic computer speakers that sounded absolutely terrible could suddenly be turned into a pretty decent sound system just by applying the company's SmartFx DSP tuning tool, running on a laptop. John Richards is a respected consultant for many consumer electronics giants and he frequently travels to Asia to follow the many OEM projects we probably already have in our homes, bags... or pockets.

Oxford Digital's SmartFx is a relatively simple but extremely effective suite of audio DSP effects designed to overcome limitations in a device's acoustic performance—particularly effective with those devices that have severe limitations. The processing acts at the crossover level to optimize the response correction, adds Low Frequency Boost by applying a compressive style Bass Enhancer to assist the loudspeaker where it has some partial response but is not functioning well and uses Dynamic Gain Control to make the signal louder, finally applying High Frequency Boost as a combination of a Limiter section to make the signal louder, combined with LoudMaster, an effect that can increase the volume without increasing peak signal level. The result is pure magic!

This is how, in large part, we can find products that seem to defy the laws of physics, like the JBL GO portable speaker. I've seen this tiny \$25 speaker being used in taxis, rickshaws, and tuk-tuks, from Europe to Africa and Asia, sometimes as the only available entertainment in remote areas of the world. And it sounds fine when there's nothing else, believe me.

No wonder that during the IFA 2019 show in Berlin, Germany, Harman announced that it set the new record with 100 million portable speakers shipped worldwide, cementing its position as leader in the category with a 34.2% volume share.

Speakers like the JBL GO are truly impressive compared with what other products costing many times more can actually do. As Harman explains, "...paying close attention to the habits and lifestyle of its users, and focusing on the real-life scenarios when people needed audio..." But this only a small sample of what it is possible to do with a little DSP magic (yes and good electronics and an excellent driver for its size...).

We are already seeing extreme examples in smartphones, headphones, and miniaturized speakers and drivers. Imagine what we will be able to do in large auditoriums and spaces, controlling hundreds of speakers in the same way, not with rack units of equipment but simply with chips that will be built-in with each driver!

In this edition of *audioXpress*, David Logvin explores the XMOS xCORE VocalFusion Speaker Linear Kit (XK-VF3100-L33), a development platform comprised by a BaseBoard built around the XVF3100-TQ128 dedicated RISC microcontroller, and a separate linear microphone array. This MCU is one of the most basic models from XMOS but is able to reach up to 2400 MIPS, supporting 32x32, 64-bit MAC instructions for DSP. This is a perfect example of an embedded solution that is available to audio developers and OEMs, supporting the features that not long ago would require extremely expensive hardware, and making sophisticated DSP features extremely affordable. This specific development kit was created to enable adding voice control to home appliances, for instance. But as David discusses in his report, and our Market Update focused on DSP and Wireless Audio Applications explores even more, there is a world of exciting possibilities waiting for audio product designers... way beyond voice recognition.

As is frequently the case when an industry or market application grows exponentially, the underlying technology also evolves at a much faster pace and solutions become much more affordable.

J. Martins
Editor-in-Chief

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