Tensilica HiFi 5 DSP

Isolating sound into bubbles

The world of audio processing exploded during the mid-2000s, with many new algorithms to digitally transform audio playback. Then always-on applications were introduced that listen for keywords to wake them up. These always-on applications took audio processing away from the host processor to conserve battery life. Instead, specialized digital signal processors (DSPs), like the Cadence® Tensilica® HiFi Mini, were used to offload the host processor and perform the always listening function most efficiently.

Next came the ability to "tune" an environment for sound. For example, the sound systems in your car are very advanced compared to the stereos installed 20 or 30 years ago. Very few cars come with just two speakers for sound. The cabin in the modern automobile might have as many as nine speakers or even more, each one tuned specifically to give passengers the best listening environment.

But this is nothing compared to what is going to happen now that even more functions are being designed into processors, such as the Tensilica HiFi 5 DSP. With better, more efficient hardware capabilities to execute the most advanced algorithms, these processors will open up a much more enhanced user experience. By using speech neural network processing, more functions can be voice-enabled in your car and around your home and office. And that's not all.

Vehicles

Imagine being able to listen to what you want to hear in your car—not just what your kids want. Currently, unless your kids put on headsets, you get to listen to kids' music again (and again and again). And if your teen likes music you can't stand, it can turn into a music war.

By creating "sound bubbles", or distinct audio zones for each passenger, advanced audio processors will allow each passenger to pick their own audio stream—no headsets required. The sound you want will be beamed directly to you in a way that won't disturb anyone else. Using noise-cancellation techniques plus advanced rendering, tomorrow's vehicles will be able to wirelessly stream the audio you want directly to you. No more fights over which audio stream everyone will listen to!

And your car will make sure you, as the driver, can still pay attention to the road noise you need to hear to be safe. Your passengers don't need to hear that noise, but you certainly do.

Offices and Other Busy Environments

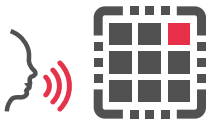
Many of us have experienced the challenge of trying to concentrate in a busy, open office environment. You've seen those offices—everyone is wearing a headset, trying to block out the noise. Without the headsets, no one can concentrate, people are stressed, and often it's very hard to hear when you're talking to someone in person or on the phone. Often noise is so loud, everyone starts talking louder, just to try to communicate over all the distractions. Productivity suffers. With the headset, you are isolated and need to be poked when someone needs your attention. Plus, it's tiring to wear a headset all day.

Already, people are working on sound masking to overcome the challenges created by too much noise in the office, hospital, bank, hotel, library, and other environments. This introduces a neutral, almost inaudible sound to cover most sound distractions. Sound engineers set up speakers to create a "white noise" that is naturally tuned out by your mind. But it's still not good enough.

In the not-so-distant future, your chair or desktop might include "sound bubble" technology that would let you answer the phone and talk to a business associate without bothering the person next to you. Today's newest sound-masking technology can be greatly enhanced with real-time audio processing to tune the speakers and work environment to changes in volume levels, voices, and areas where people are congregating, depending on exactly where you are in the room. Low-power processors like the Tensilica HiFi 5 DSP promise to bring these capabilities to battery-operated consumer devices.

This technology can be employed in airplanes, trains, or even busy transportation terminals, giving passengers some peace and quiet or allowing them to listen to just the audio stream they want.

Next-Generation Voice Processors



Typically, general-purpose CPUs are not ideal for special-function processing like voice or audio because they consume too much power. That's why specialized processors have been in development for years. Specialized DSPs can process audio, voice, pixels, communications, and much more with their customized datapaths for the exact data widths and processing requirements. This specialization is essential to keep the power requirements as low as possible, as many applications are battery operated.

Some of the things you should look for when evaluating a new processor—particularly DSPs that you can add to your system-on-chip (SoC) design—include:

- Efficient 16-bit instructions optimized for voice and audio codecs
- An extensive library of software for audio and voice processing
- Proven support for neural network-assisted speech recognition (ASR) processing
- Fully programmable in C so you can add special software
- Performance to spare, as new applications are rapidly evolving and often need additional processing power

Even in the world of audio and voice processors, there's no one-size-fits-all solution. Look for a family of compatible processors so you have the flexibility to pick just the features you need for your application. Cadence has already introduced several Tensilica HiFi DSPs—and you can expect that we will continue enhancing them to meet the computational requirements in the years ahead.

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