

PEER-REVIEWED CONTRIBUTIONS

Taking the Well-beaten Path in Alien Shoes

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In the rapidly expanding world of technology, engineering can refer to an extremely wide range of subjects. Consequently, young engineers seem to be focusing on very specific fields more than ever. This is by no means a bad thing. With the never ending expansion of knowledge, it is nearly impossible to become an expert in every aspect of engineering, but very possible to master a specific area.

Sometimes diving deep into a specific field will ultimately lead to research in very different disciplines. This has been my experience working in audio engineering. At the very root of audio engineering is electrical engineering. This includes audio recording, storage, transmission, signal processing and source reproduction. Electrical engineering, though, is only the tip of the iceberg.

Take a minute to think about the challenges faced by audio engineers. It is reasonably safe to say that there has never been an audio related product that has been loved by all. The human ear's physical structure is as unique as a fingerprint. No two sets of ears are the same. Therefore, no two people will hear something in exactly the same way. Add anatomy of the human hearing mechanism into the mix, and we have two fields necessary to explore.

Next, consider the final destination for received audio signals; the most unique part of any person: the brain. The brain can play

many different, and sometimes unfortunate, roles in the perception of sound. One important perceptual role the brain plays is an unconscious one. We filter as much irrelevant data out of the received audio signal as possible to get the clearest representation of what we are hearing. This includes dealing with significant frequency and temporal masking effects occurring at the basilar membrane in the inner ear. It may also include filtering out unwanted environmental noise (to a point) for better intelligibility.

Another role that is rarely addressed in audio engineering (or possibly just ignored), is the effect our experiences/expectations play into sound perception. Imagine going to a friend's house to hear his new home stereo system. Your friend paid top dollar for this system with all the bells and whistles. Having heard a few systems in your day, you immediately cringe when he fires it up. In his mind, though, it is the best thing since sliced bread. It must be; just look at that price tag!

The interesting point here is that your friend perceives this system to sound great. This does not mean that he has a bad ear; just that he has an altered perception of this specific system influenced by his expectations. No matter how "perfect" a system may be there is no telling what tricks our brains may play on us! Now on top of electrical engineering and anatomy, we must consider psychology and psychoacoustics.

There is no reason to stop there. Imagine a home speaker system which included robotics and internal navigation. All you would have to do is take it out of the box and switch it on. The system would automatically position and calibrate itself to give optimum performance. How could the system take psychological aspects of perception into account you might ask? How about a little artificial intelligence?

This outside the box thinking is what excites me in my work. These extreme ideas



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may not be possible quite yet, but thoughts like these can lead to more realistic original ideas in your field. It is certainly possible to make accomplishments by sticking strictly to your chosen field of expertise, but I believe it is far more rewarding to also reach out to other disciplines for additional ideas and inspiration.

For the audio world, the band The Black Keys may have put it best in the intro to their song, "The Breaks":

Lean forward slightly. Look straight at the speaker and listen with a sparkle in your eye; as though you may be thinking, "Gee, this is the most wonderful thing I've ever heard in all my life!"

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