



What's Next in Wearables: In-Ear Technology

MARCH 8, 2016 KARL MOTHEY WEARABLES



Today, the term “wearables” brings to mind wrist-based mini-computers such as the Apple Watch or FitBit products. However, there are many other applications being developed in this category. One area that we need to keep an eye on is in-ear technology, which has both consumer and medical/scientific applications.

Stanford University’s CRRMA a hot bed of innovation

We recently attended a presentation at Stanford University’s acclaimed Center for Computer Research in Music and Acoustics (CCRMA). The presenter was Jérémie Voix, who is an Acoustics Engineer with experience in industrial noise reduction projects (Bachelor’s in Fundamental Physics, Master’s in Applied Sciences in Acoustics and a Ph.D). He is the CTO and VP of Scientific Research at [Sonomax](#), where he works on the development of a “smart earplug”, the bionic ear, and many other exciting new hearing-based technologies. He now leads the Sonomax-ÉTS Industrial Research Chair in In-Ear Technologies (CRITIAS). TechnoMontréal, Montreal’s communication and information technologies cluster, recognized Professor Voix as one of the [five most innovative researchers in communication and information technology](#).

CRITIAS is developing various important

technologies designed to complement the human ear

New technology for in-ear applications

CRITIAS is targeting applications such as “intelligent” protection for professional musicians, advanced inter-individual communication systems, otoacoustic emission (OAE) monitoring devices and in-ear EEG Brain Computer Interface (BCI). While much more research is being conducted in this area, especially on the micro-harvesting of electrical power from inside the ear canal to power future auditory wearables, CRITIAS has been making solid progress.

One important development is the Auditory Research Platform. This platform offers versatility and portability for immersive in-ear audio processing applications and wearables. It consists of a pair of earpieces that are custom-fitted for the user, using the technology developed by Sonomax. At its core, the heavy lifting is done by dedicated hardware, which includes semiconductor technologies such as DSP, MCU and I/O’s.

Multiple target applications

The 4 areas where this technology can be applied are below:

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Hearing Protection	Objective attenuation measurement in real time Continuous dosimetry (24 hours) Individual susceptibility to hearing loss
Hearing Aid	Measurement of hearing fatigue and recovery Selective amplification Speech enhancement
Communication	In-ear microphone capture Onboard radio-communication system Virtual radio-acoustic environment
Power Generation	Energy micro-harvesting with the use of microelectromechanical systems (MEMS)

This platform is being further optimized and prepared for introduction into commercial applications. The platform will be brought to market soon, including complete hardware and software support. Ear technologies have been around for many years, and there are several other companies developing “hearable” products. Critical features such as form factor, size, communication, and transmission are all important aspects of any in-ear device being brought to market. There will be both consumer and medical/scientific applications for these devices (e.g. musicians, older people with hearing difficulty). Clearly, with in-ear technology being at this early stage of development, the market is still developing. However, given the large number of application areas, we see the potential for a large and growing market opportunity for this technology.

BitNavi is a blog conceived by Karl Motey in the heart of Silicon Valley, dedicated to emerging technologies and strategic business issues challenging the industry.

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