Binaural hearing aids significantly improve sound quality
Corporate Technology and Healthcare

Because most hearing losses cannot be treated surgically or with medication, it is that much more important for hearing aid development to progress based on the latest research findings. The new binaural technology is based on complex processes of natural hearing. In binaural hearing systems, a radio link connects the hearing aids in the left and the right ear, making it possible for the two units to communicate and providing for continuous coordination. State-of-the-art hearing aid technology is able to compensate for the majority of hearing impairments and provides for a harmonious and pleasant auditory experience.

Collaboration partners:
Auditory Valley / University of Oldenburg

Introduction:
• The development of hearing aids has a long tradition at Siemens. The company introduced the first hearing aids to the market about 100 years ago, and at the time they were roughly the size of a small handbag. Since then, technological progress has been reflected in more than just the size of the hearing aids: The first behind-the-ear hearing aid was introduced in 1959 and was followed by the first in-the-ear device in 1966. Digital technology introduced in 1997 optimizes the auditory experience.
• In 2004, a Siemens research team led by Dr. Torsten Niederdränk achieved a major breakthrough by, for the first time, linking two hearing aids via what was at the time the smallest radio system in the world. This technology made it possible for both hearing aids to synchronously adjust themselves to new auditory situations.
• In the years that followed, Siemens built on the knowledge it had gained to develop numerous new functions that now form an integral part of what is called BestSound Technology, which in current Siemens hearing aids provides for a pleasant and realistic auditory experience. For example, an active feedback management system now suppresses annoying peeping sounds at lightning speed, while intelligent filter functions dampen distracting background noises.
• Major challenges facing the development of new hearing aids include achieving the best possible speech transmission while also reproducing homogenous spatial sound.

Description of the technology:
• Binaural technology is based on the auditory perception of both ears. Only through the interaction and the exchange of information, similar to vision, is it possible for the brain to generate an authentic stereophonic sound.
• Binaural hearing systems use a wireless data connection to exchange data between the right and the left hearing aid, process that infor-
information, and adjust the settings to the specific auditory situation. This technology significantly improves speech comprehension, particularly in loud environments.

- The individual hearing systems in the left and the right ear exchange data wirelessly and coordinate their functions. If the volume is adjusted on one unit, for example, the other hearing aid automatically adjusts volume as well. This also applies to other functions, such as noise reduction and individual sound preferences.

- Wireless transceivers have to meet high requirements and yet cannot exceed a certain size in order to fit on tiny hearing aid chips. In addition, these chips need to have sufficient capacity to process ever greater amounts of data. All of this is necessary to create the most realistic auditory spectrum that corresponds to the acoustic sound field. At the same time, hearing aids have to be able to use small batteries and hence operate very energy efficiently.

Outlook:

- Researchers see tremendous future potential in the optimization of the chip design, the “computer center” in hearing aids, and in the increased integration of psychoacoustical models for an increasingly customized auditory experience that takes into account the different hearing requirements of each person.

- The sound quality should be further optimized through the ongoing development of binaural hearing systems with integrated radio technology.

- Siemens scientists are already testing new hearing models and classification algorithms in the laboratory which should further improve selective hearing in acoustically challenging environments.

- In the future, intelligent hearing aids will automatically identify and respond to more and more auditory situations to better duplicate the natural hearing process.

For additional information, please visit: www.siemens.com/press/futureprize2012