SpeechZone 2

Difficulty understanding speech in noisy environments is the biggest complaint for those with hearing loss. In the real world, important speech doesn’t always come from in front of the listener. People often have conversations with those positioned at their side, even when their focus and attention needs to remain straight ahead. It was this insight that led to the development of SpeechZone™ 2, advanced technology that allows hearing instrument wearers to automatically hear speech coming from any direction in noisy environments.

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Favorite sound: wind chimes
The traditional approach to speech in noise

In situations where background noise is not an issue, omni-directional microphones can be used without losing audibility of the person speaking from the side. However, when background noise is present, the traditional approach is to use a directional microphone strategy to help the wearer clearly hear sounds from the front. In fact, when directional microphones were first introduced to hearing instruments, they made the greatest single contribution to providing better speech intelligibility in noise\(^2\) and the industry enthusiastically embraced the technology.

Limitations of directional microphones

A directional microphone strategy is usually engaged in both hearing instruments. This provides maximum audibility for sounds directly in front of the hearing instrument wearer, while minimizing the background noise. Unfortunately, this also dampens the voice of the person speaking from the side or back. Since the listener can’t always look directly at the talker, the industry has recently started developing technologies which address speech from the sides or back.

SpeechZone 2 is the ultimate evolution

Inspired by the real-life needs of hearing instrument wearers, SpeechZone 2 is a unique feature that determines which microphone strategy to engage in each hearing instrument to ensure that the wearer experiences the best speech perception from different directions in a noisy listening environment.

In the past, our technology only allowed one type of response: both hearing instruments had to be in either omni or directional mode. When hearing instruments were in directional mode they always focused towards the front. While there are situations where having the same single polar pattern applied to both hearing instruments makes sense, there are plenty of real-world scenarios where it doesn’t. SpeechZone 2 has the ability to intelligently and automatically address these situations. It provides either a symmetric or asymmetric directional response based on where the dominant speech is coming from, making it more flexible for providing patient benefit, even when there is background noise present.
Benefits of an asymmetric approach

Some technologies allow for directional strategies (cardioid/hyper-cardioid patterns) that focus on the back or to the side of the listener at the expense of taking the focus away from in front of the listener. These strategies should really only be applied when the listener is stationary and environmental awareness is not a factor. Manufacturers using these types of directional strategies typically limit them to manual programs.

One of the great benefits of the asymmetric approach in SpeechZone 2 is that it can engage automatically when the conditions are deemed appropriate, without the risk of missing speech from the front. It locates the dominant speaker from any direction and maintains audibility without sacrificing environmental awareness or requiring the listener to stay in one place.

Wireless makes it possible

When wireless first appeared on the scene, it initially provided simple extras, like connecting hearing instruments to televisions, cell phones, and mp3 players, or the ability to synchronize volume control changes between hearing instruments. In reality, wireless allowed us to move the hearing instrument wearer from manually configured and accessible choices, to features that use automatically synchronized microphone strategies to deliver great benefits. We now know that wireless can also be applied to the universal challenge of helping hearing instrument wearers with understanding speech in noise.

SpeechZone 2 is a strong example of how we are leveraging wireless technology to help people hear better in real and practical ways. Although the outcome that is demonstrated by SpeechZone 2 is primarily a response in microphone strategy, the intelligence of the response is dependent upon the right and left hearing instruments wirelessly communicating with one another regarding the detection and location of speech. This communication happens by wirelessly transferring data between instruments when speech is detected. The system then responds based on the outcome—specifically, whether or not both instruments agree on the location of speech. When there is agreement between the instruments the outcome is a microphone strategy, either symmetric or asymmetric, that targets speech.
The power of binaural spatial processing

Binaural spatial processing is the technology that allows SpeechZone 2 to know where speech is coming from and it depends on wireless communication. In the first generation of SpeechZone, binaural spatial processing was used to confirm when speech was in the front of the wearer. The second generation binaural spatial processing in SpeechZone 2 has expanded this approach. It first uses the speech detectors to identify when a dominant speaker is present from any angle, where less than 90 degrees indicates speech is in front and greater than 90 degrees indicates that speech is coming from the back. It then goes even further, using detectors to look at the signal-to-noise ratio (SNR) difference between the instruments. While an agreement on the presence of speech with equal SNR is consistent with a front or back location (Figure A), a higher, more favorable SNR in one instrument indicates speech is present on that side (Figures B and C).

Although the system uses wireless to confirm and agree on the location of speech, the system is “event driven” meaning the wireless communication is initiated when a certain event occurs (i.e., the detection of speech). The fact that the wireless communication isn’t constant conserves hearing instrument battery power.
A seamless system provides the best speech understanding in noise

SpeechZone 2 works in combination with two key Unitron signature features: the Automatic Program and SmartFocus™ 2. All of these components are designed and optimized to work together as a seamless system to provide the best speech understanding in noise.

Automatic Program

The multi-destination Automatic Program has four unique end points optimized for different listening objectives: quiet (including speech in quiet), speech in noise, noise and music. The classifier uses a sophisticated system of 46 detectors to sample the acoustic environment and determine the probability that the instruments are in any one of the four environments. SpeechZone 2 is at work when the classification of the Automatic Program is in the speech in noise environment.

SmartFocus 2

SmartFocus 2 is the key feature at work within the Automatic Program that has been proven to provide an improvement in speech intelligibility in noise\(^3\) and less distraction from everyday noise, in all environments. SmartFocus 2 has an optimal setting for each of the four environments within the Automatic Program, applying appropriate amounts of directionality, gain offset, level dependent noise reduction and speech enhancement+.

While the Automatic Program and SmartFocus 2 provide the foundation for understanding speech from the front in noisy environments, SpeechZone 2 adds a layer of sophistication that empowers wearers to clearly hear speech coming from any direction.
SpeechZone 2

SpeechZone 2 uses binaural spatial processing to determine the exact location of speech, whether it’s coming from the front, back, left or right. SpeechZone 2 leverages advanced technologies to provide an intelligent response, automatically selecting a symmetric or asymmetric synchronized microphone strategy to ensure the best speech understanding in noisy environments. This is all done automatically within the speech in noise destination of the Automatic Program.

- When speech is from the front the response is a symmetric maximum multi-band adaptive directionality
- When speech is from the side the response is asymmetric, applying omni directional with Pinna Effect on the side targeting speech and adaptive directional on the side with noise
- When speech is from the back the response is symmetric with both instruments in omni directional mode

360° speech detection
Hear speech from every direction

The Automatic Program provides intelligent classification, identifying when wearers are in a speech in noise environment. SmartFocus 2 provides a synergistic approach to adaptive features proven to provide the best speech intelligibility in noise since directional microphones. SpeechZone 2 takes it to a new level by enabling wearers to hear speech coming from 360°.

Speech from the front

**Listening situation:** Checking out at the grocery store

**Patient goal:** Make their purchase while engaging in conversation with the cashier

**SpeechZone 2 response:** Maximum multi-band adaptive directionality in both instruments

Speech from the back

**Listening situation:** Wearer is in a wheelchair and unable to turn around

**Patient goal:** Clearly hear the person behind them

**SpeechZone 2 response:** Omni directional in both instruments
Hear speech from every direction

Speech from the side

**Listening situation:** Out shopping with friends

**Patient goal:** Carry on a conversation while watching where they are going

**SpeechZone 2 response:** Omni with Pinna Effect on the speech side; maximum multi-band adaptive directionality on the noise side

No dominant speech

**Listening situation:** Sitting alone in a busy airport or coffee shop

**Patient goal:** Comfortable listening without sacrificing awareness or audibility

**SpeechZone 2 response:** Fixed directionality in both instruments

from the right side

from the left side
The future of speech in noise

Understanding speech in noise continues to be the biggest challenge for hearing instrument wearers everywhere. The industry’s traditional solutions of directional microphones and/or noise cancelling algorithms for improving speech in noise focused only on speech from the front resulting in lost audibility for speech from other directions.

SpeechZone 2 makes it possible for the wearer to achieve better speech understanding in situations that would normally be addressed by applying the traditional approaches. Inspired by real-life patient needs, SpeechZone 2 is an incredibly advanced solution that was only made possible by combining traditional directional microphone technology with the latest in wireless innovations. As new technologies continue to surface, the industry remains committed to engineering solutions that build on the benefits provided by innovations like SpeechZone 2 to solve the everyday challenges of those who wear hearing instruments.

References:

At Unitron, we care deeply about people with hearing loss. We work closely with hearing healthcare professionals to provide hearing solutions that improve lives in meaningful ways. Because hearing matters.