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Devices and systems using signal processing algorithms to improve speech intelligibility and listening comfort

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BRIEF DESCRIPTION

The present invention relates generally to the fields of bioengineering and medicine and more particularly to methods, devices and systems that use signal processing algorithms to improve hearing in hearing impaired subjects.

Methods, devices and systems for improving hearing and for treating hearing disorders, such as auditory neuropathies. A hearing enhancement system of this invention generally comprises; an amplitude modulation processor, a frequency high-pass processor, a frequency upward-shifting processor and a formant upward-shifting processor.

FULL DESCRIPTION

The present invention provides methods, devices and systems which improve the naturalness of processed sound by separating the information-bearing spectral envelope from the voice-quality-bearing spectral fine structure. The spectral envelope (formants) are estimated in real time and shifted to a higher frequency range, whereas the fine structure is kept intact. These methods, devices and systems of the present invention provide benefits such as greater than linear and nonlinear frequency shifting. However, more complicated calculations are required in digital signal processing. The temporal modulation strategy, which compensate for the temporal processing deficit, can be used in combination with any one of the three strategies that compensate for the hearing loss and distortion at low frequencies. In some embodiments of this invention, the low frequency components are processed before changing the temporal modulation thereby preventing the temporal modulation from being compromised in the subsequent processing step.

In accordance with the present invention, there is provided a hearing enhancement system which comprises (a) an amplitude modulation processor, (b) a frequency high-pass processor, (c) a frequency upward-shifting processor and (d) a formant upward-shifting processor. The amplitude modulation processor is operative to enhance temporal modulation and/or to improve speech intelligibility. The frequency high-pass processor, frequency upward-shifting processor and formant upward-shifting processor are operative to compensate for low frequency hearing loss.

Further in accordance with the present invention, there is provided a system wherein the:

-amplitude modulation processor is operative to increase amplitude modulation in different frequency bands based on subjects' temporal modulation transfer function (TMTF);

-the frequency high-pass processor is operative to remove low frequency components that can adversely affect a patient's pitch perception at low frequencies;

-the frequency upward-shifting processor is operative to cause linear or non-linear transposition of low frequencies to more audible high frequencies;

-the upward-shifting processor is operative to increase formant frequencies without significantly changing voice quality;

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OTHER INFORMATION

CATEGORIZED AS

- » **Medical**
- » Devices
- » Other

RELATED CASES

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-the modulation processor is operative to improve the clarity of a speech signal or other signal transmitted over a wired or wireless transmission channel;

-the system comprises or is incorporated into a hearing aid, cochlear implant, intraneural electrode implant or other device that is carried, worn or implanted in the body of a human or animal subject for the purpose of improving hearing or sound recognition.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,098,859	01/17/2012	2005-629

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