

短文与研究通讯

数字助听器中多通道响度补偿方法的研究

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摘要:

目前数字助听器中的多通道响度补偿方法,通常是对严重衰减的部分进行高增益,这不但对听损患者的言语辨识没有作用,反而会产生负面影响。为了减轻响度补偿时产生的负面影响,提高高频严重损失的听损患者的听辨率,本文将压缩移频技术用于多通道响度补偿。首先对语音信号高频部分按比例压缩并搬移到目标频段,然后进行非等宽划分,再在各频段进行响度补偿和增益控制,最后对响度补偿后的信号进行重构。该方法使得补偿后语音的响度完全映射到听者的听觉范围内,高频严重损失的听损患者对清辅音的听辨率比传统方法提高了近30%。实验结果表明,该方法有效提高听力患者的听力水平及言语辨识率,特别对高频分量明显的清辅音的辨识率有较大的提高,具有较高的实际应用价值。

关键词: 响度补偿; 压缩移频; 正交镜像滤波器组; 增益控制

Research on Multi-channel Loudness Compensation in Digital Hearing Aids

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Abstract:

At the present, most of digital hearing aids use the technology of multi-channel compensation. But high compensation will reduce hearing comfort, even lead to negative influence when attenuation is serious. In order to improve the listening identification of hearing-impaired listeners whose listening ability severely lost in high frequency, frequency compression and shift techniques are used for multi-channel loudness compensation. Firstly, high frequency of voice signal is compressed and shifted to the target frequency band. Then, the signal is divided into four unequal size bands via Quadrature Mirror Filter Bank. According to different hearing-impaired listeners, the identity of the signal on each band is compensated and controlled. At last, the processed signal is reconstruct using perfect reconstruction filter banks. After loudness compensation, the identity of the signal is enhanced obviously and restricted within earshot of the hearing-impaired listeners. The result of the actual test of Ling' 6 tone shows that the recognition rate of the voiceless increases 30 percents than traditional method. The experiment and simulation indicate that the new method has high practical value and improves hearing level and identification of hearing-impaired listeners, especially for voice with abundant high frequency.

Keywords: loudness compensation frequency compression and shift Quadrature Mirror Filter Bank gain control

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