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低延迟低码率语音编码研究

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摘要 现有的低延迟语音编码算法（LD-CELP）需要16 kb/s比特率，无疑会妨碍它的应用。提出了一种采用两阶段码书搜索的方法可以在提高低延迟语音编码算法性能的同时降低码率。首先构造了两个子码书：一个后向更新的自适应码书和一个具有代数结构的固定码书；然后设计了两阶段码书搜索方法使滤波后的激励矢量和目标矢量之间的均方误差保持最小。这样就得到了一个在8 kHz采样率下具有2.5 ms延迟的10 kb/s两阶段码书搜索的CELP编码器。用平均分段信噪比（SSNR）和感知语音质量评价（PESQ）测试，本算法具有和16 kb/s的G.728相当的编码质量。

关键词 语音编码 低延迟 低延迟语音编码算法 自适应码书 代数码书

分类号

Research on low delay low bit rate speech coding algorithm

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Abstract

The 16 kb/s Low Delay Code-Excited Linear Prediction（LD-CELP） has been used in many environments，however，the high bit rate required in this work have been a handicap in using it for some condition.In this paper，a speech coder using two stages code book search schemes is proposed to improve the performance of LD-CELP and reduce its bit rate.To develop the proposed speech coder with a low bit rate，two sub code books are explored：a backward updated adaptive sub code book and a fix sub code book with algebraic structure.Second，a two stages target vector search scheme is proposed to minimize the mean squared error between the filtered excitation vector and the target vector.As a result，a 10 kb/s dual code book CELP coder is proposed with a delay of 2.5 ms in sampling rate of 8 kHz.It is shown that the proposed speech coder has a comparable speech quality to 16 kb/s G.728 in Segmented Signal-to-Noise Ratio（SSNR） and Perceptual Evaluation of Speech Quality（PESQ）.

Key words speech coding low delay Low Delay Code-Excited Linear Prediction（LD-CELP） self-adaptive codebook algebraic codebook

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