

研究论文

利用两级时域联合的包层语音质量评价模型

江亮亮;杨付正;任光亮

(西安电子科技大学 综合业务网理论及关键技术国家重点实验室, 陕西 西安 710071)

摘要:

针对相同丢包率下不同丢包模式对应的语音质量存在差异的情况,提出了一种能够反映丢包模式对语音质量影响的包层语音质量评价模型.首先通过分析数据包头获取编码速率和丢包位置等信息,在此基础上,结合静音检测技术及误码传播结果预测每一帧的质量;然后根据人的感知特性将语音序列自由划分为变长帧组,并联合各帧的质量得到帧组质量;最后,综合各帧组的质量得到语音序列的总质量.提出的模型在两级时域联合过程中,为失真严重的区域分配更大的权重,从而有效反映丢包模式对语音质量的影响.实验结果表明,相比于国际标准G.107中的E-model,所提模型的评分与语音质量感知评估方法的评分相比,皮尔森相关系数平均提高了0.0129,同时均方根误差平均降低了0.0234.

关键词: 语音质量评价 时域联合 丢包 服务质量

Packet-layer model for voice quality assessment using two-level temporal pooling scheme

JIANG Liangliang; YANG Fuzheng; REN Guangliang

(State Key Lab. of Integrated Service Networks, Xidian Univ., Xi'an 710071, China)

Abstract:

Aiming at the problem that the voice qualities corresponding to different packet loss patterns show significant differences at the same packet loss rate, a packet-layer model for voice quality assessment, which well reflects the effect of the packet loss patterns on the voice quality, is presented. First, the information about the coding bit-rate and packet loss is obtained by analyzing the packet header, on the basis of which the frame quality is measured with the further information about silence detection and error propagation. Then the voice sequence is divided into groups of frames (GOFs) with a variable length and a short-term temporal pooling method is employed to obtain the GOF quality. Finally, the overall voice quality is determined by the long-term temporal pooling of the GOF qualities. The proposed two-level temporal pooling scheme well describes the effect of different packet loss patterns on the voice quality since the strongest impairments are predominately emphasized. Experimental results show that the presented model can lead to an increment of about 0.0129 in the Pearson Correlation coefficient (PCC) and a decrement of about 0.0234 in the Root Mean Squared Error (RMSE) compared with the E-model in ITU-T recommendation G.107.

Keywords: voice quality assessment temporal pooling packet loss quality of service

收稿日期 2012-10-08 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-2400.2013.03.003

基金项目:

国家自然科学基金资助项目(60902081,60902052);高等学校学科创新引智计划资助项目(B08038)

通讯作者: 江亮亮

作者简介: 江亮亮(1988-),男,西安电子科技大学博士研究生, E-mail: lljiang@stu.xidian.edu.cn.

作者Email: lljiang@stu.xidian.edu.cn

参考文献:

[1] Daengsi T, Preechayasomboon A, Wutiwivatthai C, et al. A Study of VoIP Quality Evaluation: User Perception of Voice Quality from G.729, G.711 and G.722 [C] //Proc of the 9th Annual IEEE Consumer Communications and Networking Conference. Piscataway: IEEE Computer Society, 2012: 342-345.

扩展功能

本文信息

- Supporting info
- PDF(512KB)
- [HTML全文]
- 参考文献[PDF]
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert
- 文章反馈
- 浏览反馈信息

本文关键词相关文章

- 语音质量评价
- 时域联合
- 丢包
- 服务质量

本文作者相关文章

- 江亮亮
- 任光亮
- 杨付正

PubMed

- Article by Jiang,L.L
- Article by Ren,G.L
- Article by Yang,F.Z

- [2] Jelassi S, Rubino G, Melvin H, et al. Quality of Experience of VoIP Service: a Survey of Assessment Approaches and Open Issues [J]. IEEE Communications Surveys & Tutorials, 2012, 14(2): 491-513.
- [3] Rix A W, Beerends J G, Kim D S, et al. Objective Assessment of Speech and Audio Quality: Technology and Applications [J]. IEEE Trans on Audio, Speech, and Language Processing, 2006, 14(6): 1890-1901.
- [4] ITU-T Recommendation P.861. Objective Quality Measurement of Telephone-band (300-3400 Hz) Speech Codecs [S]. Geneva: Telecommunication Standardization Sector, 1996.
- [5] ITU-T Recommendation P.862. Perceptual Evaluation of Speech Quality (PESQ), an Objective Method for End to End Speech Quality Assessment of Narrowband Telephone Networks and Speech Codecs [S]. Geneva: Telecommunication Standardization Sector, 2001.
- [6] Moller S, Chan W, Cote N, et al. Speech Quality Estimation: Models and Trends [J]. IEEE Signal Processing Magazine, 2011, 28(6): 18-28.
- [7] Narwaria M, Lin W, McLoughlin I V, et al. Nonintrusive Quality Assessment of Noise Suppressed Speech with Mel-Filtered Energies and Support Vector Regression [J]. IEEE Trans on Audio, Speech, and Language Processing, 2012, 20(4): 1217-1232.
- [8] Takahashi A, Yoshino H, Kitawaki N. Perceptual QoS Assessment Technologies for VoIP [J]. IEEE Communications Magazine, 2004, 42(7): 28-34.
- [9] Clark A. Modeling the Effects of Burst Packet Loss and Recency on Subjective Voice Quality [C] //Proc of IP-Telephony Workshop. New York: IEEE, 2001: 123-127.
- [10] ITU-T SG12 Temporary Document TD 297. Updated Draft Terms of Reference for P.NAMS [S]. Geneva: Telecommunication Standardization Sector, 2010.
- [11] ITU-T Recommendation G.107. The E-model, a Computational Model for Use in Transmission Planning [S]. Geneva: Telecommunication Standardization Sector, 2002.
- [12] Jelassi S, Rubino G. A Comparison Study of Automatic Speech Quality Assessors Sensitive to Packet Loss Burstiness [C] //Proc of the 8th Annual IEEE Consumer Communications and Networking Conference. Piscataway: IEEE Computer Society, 2011: 415-420.
- [13] Yang Fuzheng, Jiang Liangliang, Li Xiao. Real-time Quality Assessment for Voice over IP [J]. Concurrency and Computation: Practice and Experience, 2012, 24(11): 1192-1199.
- [14] Radhakrishnan K, Larijani H, Buggy T. A Non-intrusive Method to Assess Voice Quality over Internet [C] //Proc of the 2010 International Symposium on Performance Evaluation of Computer and Telecommunication Systems. Piscataway: IEEE Computer Society, 2010: 380-386.
- [15] 李维, 杨付正. 考虑包内容特性的网络语音质量评价模型 [J]. 西安电子科技大学学报, 2011, 38(2): 23-28.
- Li Wei, Yang Fuzheng. No-reference Quality Assessment Model for Networked Speech Based on the Content Feature of Packets [J]. Journal of Xidian University, 2011, 38(2): 23-28.
- [16] Rohaly A M, Lu J, Franzen N R, et al. Comparison of Temporal Pooling Methods for Estimating the Quality of Complex Video Sequences [C] //Proc of SPIE Human Vision and Electronic Imaging Conference. Bellingham: SPIE, 1999: 218-226.
- [17] Rix A, Beerends J, Hollier M, et al. Perceptual Evaluation of Speech Quality (PESQ)-a New Method for Speech Quality Assessment of Telephone Networks and Codecs [C] //Proc of IEEE International Conference on Acoustics, Speech, and Signal Processing. Salt Lake City: IEEE, 2001: 749-752.
- [18] ITU Rep. COM12-D97-E. Packet Loss Distributions and Packet Loss Models [S]. Geneva: ITU-T Study Group 12, 2003.

本刊中的类似文章

1. 李屹;纪红.无线局域网中一种支持QoS的协作分集算法 [J]. 西安电子科技大学学报, 2008,35(1): 162-166
2. 李晓辉;易克初;刘乃安;田斌.基于块对角算法的MIMO系统资源调度策略 [J]. 西安电子科技大学学报, 2006,33(5): 754-758
3. 孙献璞;赵力;田甜.适合于多频道移动Ad Hoc网络的媒体接入控制协议研究[J]. 西安电子科技大学学报, 2006,33(2): 215-217
4. 暂时无作者信息.AAL2话音分组的最优长度[J]. 西安电子科技大学学报, 2002,29(5): 669-676
5. 暂时无作者信息.无比特丢弃的AAL2分组话音复接器模型及性能分析[J]. 西安电子科技大学学报, 2002,29(4): 499-504
6. 王斌;刘增基;李红滨.空间相关丢包条件下基本可靠组播传输协议研究[J]. 西安电子科技大学学报, 2001,28(5): 557-562
7. 李汉兵;喻建平;黄建雄.基于时延限制的Bellman-Ford算法[J]. 西安电子科技大学学报, 2000,27(3): 330-335
8. 徐展琦;刘焕峰;刘增基.基于IP的通用陆地无线接入网服务质量控制及性能[J]. 西安电子科技大学学报, 2003,30(2): 233-238
9. 暂时无作者信息.IP网络QoS的研究现状[J]. 西安电子科技大学学报, 2002,29(2): 163-169
10. 王凯东;易克初;田斌.一种新颖的用于宽带多媒体卫星网络的调度策略[J]. 西安电子科技大学学报, 2004,31(5): 765-769
11. 李维;杨付正.考虑包内容特性的网络语音质量评价模型[J]. 西安电子科技大学学报, 2011,38(2): 23-28+98

12. 闫江舟;刘增基.IPLS网络中基于业务划分的资源管理机制[J]. 西安电子科技大学学报, 2003,30(2): 205-209
 13. 李波¹;李建东²;方勇¹.非饱和状态下IEEE 802. 11 DCF的性能分析[J]. 西安电子科技大学学报, 2007,34(1): 76-81
 14. 孔繁镛;肖嵩;周有喜.基于场景模型的联合信源信道编码的视频网络传输[J]. 西安电子科技大学学报, 2007,34(3): 354-359
 15. 张国鹏;张海林.无线局域网中业务流接入控制的博弈论算法[J]. 西安电子科技大学学报, 2008,35(5): 805-810
-