Author(s): Ascenso, J (Ascenso, Joao); Pereira, F (Pereira, Fernando)

Title: Advanced side information creation techniques and framework for Wyner-Ziv video coding

Source: Journal of Visual Communication and Image Representation, 19 (8): 600-613 DEC 2008

Language: English

Document Type: Article

Author Keywords: Wyner-Ziv Video Coding; Distributed Video Coding; Side Information Creation; Frame Interpolation

KeyWords Plus: Motion Estimation

Abstract: Recently, several distributed video coding (DVC) solutions based on the distributed source coding (DSC) paradigm have appeared in the literature. Wyner-Ziv (WZ) video coding, a particular case of DVC where side information is made available at the decoder, enable to achieve a flexible distribution of the computational complexity between the encoder and decoder, promising to fulfill novel requirements from applications such as video surveillance, sensor networks and mobile camera phones. The quality of the side information at the decoder has a critical role in determining the WZ video coding rate-distortion (RD) performance, notably to raise it to a level as close as possible to the RD performance of standard predictive video coding schemes. Towards this target, efficient motion search algorithms for powerful frame interpolation are much needed at the decoder. In this paper, the RD performance of a Wyner-Ziv video codec is improved by using novel, advanced motion compensated frame interpolation techniques to generate the side information. The development of these type of side information estimators is a difficult problem in WZ video coding, especially because the decoder only has available some reference, decoded frames. Based on the regularization of the motion field, novel side information creation techniques are proposed in this paper along with a new frame interpolation framework able to generate higher quality side information at the decoder. To illustrate the RD performance improvements, this novel side information creation framework has been integrated in a transform domain turbo coding based Wyner-Ziv video codec. Experimental results show that the novel side information creation solution leads to better RD performance than available state-of-the-art side information estimators, with improvements up to 2 dB: moreover, it allows outperforming H.264/AVC Intra by up to 3 dB with a lower encoding complexity. (C) 2008 Elsevier Inc. All rights reserved.

Addresses: [Ascenso, Joao] Inst Super Engn Lisboa, Inst Telecomunicacoes, P-1959007 Lisbon, Portugal; [Pereira, Fernando] UTL, Inst Telecomunicacoes, Inst Super Tecn, P-1049001 Lisbon, Portugal

Reprint Address: Ascenso, J, Inst Super Engn Lisboa, Inst Telecomunicacoes, R Conselheiro Emidio Navarro 1, P-1959007 Lisbon, Portugal.

E-mail Address: joao.ascenso@lx.it.pt; fp@lx.it.pt

Publisher: Academic Press INC Elsevier Science

Publisher Address: 525 B ST, STE 1900, SAN DIEGO, CA 92101-4495 USA

ISSN: 1047-3203

DOI: 10.1016/j.jvcir.2008.06.001

ISO Source Abbrev.: J. Vis. Commun. Image Represent.

ISI Document Delivery No.: 383ZY