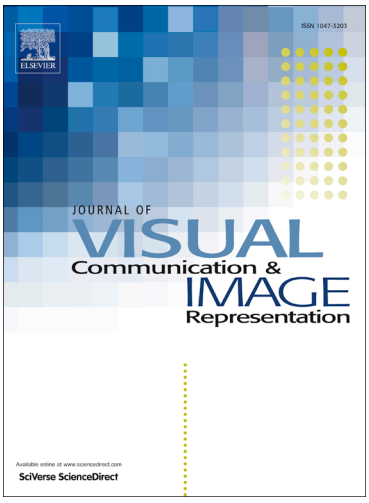
Accepted Manuscript



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Djamel Eddine Boudechiche, Said Benierbah, Mohammed Khamadja

PII: S1047-3203(17)30152-9
DOI: http://dx.doi.org/10.1016/j.jvcir.2017.07.007
Reference: YJVCI 2038

To appear in: *J. Vis. Commun. Image R.*

Received Date: 11 October 2016
Revised Date: 24 May 2017
Accepted Date: 30 July 2017

Please cite this article as: D. Eddine Boudechiche, S. Benierbah, M. Khamadja, Distributed Video Coding Based on Vector Quantization: Application to Capsule Endoscopy, *J. Vis. Commun. Image R.* (2017), doi: http://dx.doi.org/10.1016/j.jvcir.2017.07.007

Distributed Video Coding Based on Vector Quantization: Application to Capsule Endoscopy

Djamel Eddine Boudechiche[1], Said Benierbah[1]and
Mohammed Khamadja[2]

1- D. E. Boudechiche (boudechiche.djamel@gmail.com) and S. Benierbah, are with SP_Lab, Electronics dept., Mentouri University of Constantine, Algeria.
2- M. Khamadja is with SP_Lab and Electrical Eng. Dept., Larbi Ben Mhidi University of Oum el Bouaghi, Algeria.

Abstract

We present in this paper a new distributed video coding (DVC) architecture for wireless capsule endoscopy. It is based on the state of the art DVC systems, but without using key frames. Instead, it uses an adapted vector quantization (VQ) with a searching complexity that is shifted to the decoder. VQ allows creating a good side information (SI) by exploiting the similarities in human anatomy. Thus, SI is created from a codebook (CB) rather than by motion compensated prediction. This approach decreases largely the complexity of the encoder, which codes only Wyner-Ziv frames, and allows a progressive decoding. The encoder of the proposed DVC generates only a simple hash that is used by the decoder to select the corresponding VQ codeword. The obtained experimental results show that rate-distortion results are better than those of JPEG, and show the possibility of using scalable coding to control the used rate and energy.

***Keywords*:**
Distributed Video Coding, Wireless Capsule Endoscopy, Vector Quantization, Side Information, Image Compression.

1. INTRODUCTION

The wireless capsule endoscope (WCE) is a small medical imaging device used to visually examine the entire gastrointestinal (GI) tract; which is not possible by the conventional endoscopy [1], [2]. Particularly, the WCE allows investigating the sources of intestinal bleeding, tumors and other diseases. There are many WCEs on the market now and the majority of them are composed of five main components [3]: an image sensor, a radio frequency transceiver, light-emitting diodes, a data processing system and a source of energy (batteries). During its travel through the GI, the capsule captures the images, continuously, and transmits them wirelessly to an external receiver.

The major disadvantage of the WCE is its limited energy resources. Although, the capsule takes about 24 hours to pass through the entire GI tract, it can take pictures for about 8 to10 hours only [4]. Moreover, these images are of low resolution (256x256) and low frame rate (2 to 5 frames per second). Increasing the lifetime of the WCE and the quality of its images is an actual challenge. This can be possible by improving the supply of energy to the capsule,