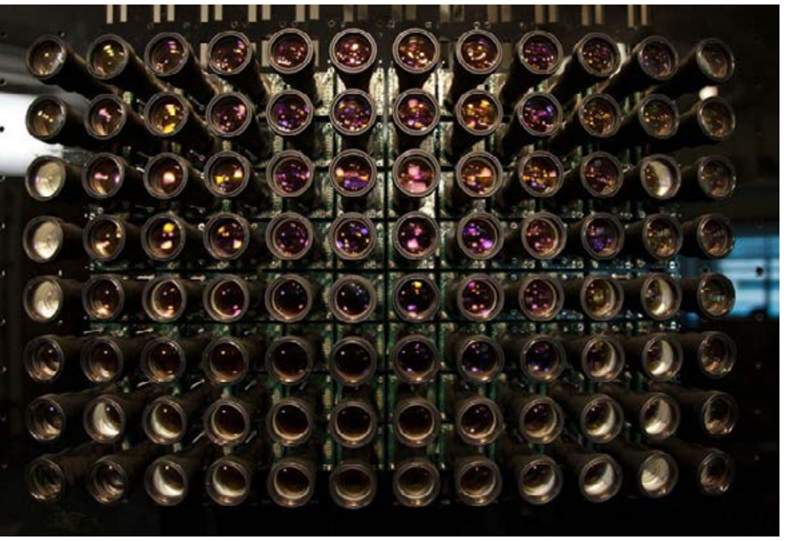
MUVIS

Multi-view Distributed Video Coding for Visual Sensor Networks

· The potential of the multi-view distributed video coding paradigm was exploited, by jointly exploiting temporal and Inter-view correlations.
· New techniques to improve the performance of popular depth map coding solutions were proposed.
· The combination of predictive and distributed coding techniques was proposed and new hybrid predictive-distributed video codecs were designed.



Main Project Team	
João Ascenso	**MSP-Lx**
Catarina Brites	MSP-Lx
Fernando Pereira	MSP-Lx
Funding Agencies	
FCT (Fundação para a Ciência e Tecnologia)	**70,000€**
Start Date	01/03/2012
Ending Date	01/06/2015
Indicators	
Journal Papers	3
Conference Papers	10 (9 inter/a1 nac.)
Technical Reports	3

Two Main Publications

C. Brites, F. Pereira, **Epipolar Geometry-based Side Information Creation for Multiview Wyner-Ziv Video Coding,** IEEE Transactions on Circuits and Systems for Video Technology, Vol. 24, No. 10, pp. 1771 - 1786, October, 2014

X. HoangVan, J. Ascenso, F. Pereira, **Optimal Reconstruction for a HEVC Backward Compatible Distributed Scalable Video Codec**, Visual Communications and Image Processing - VCIP, Valletta, Malta, December, 2014

PROJECT WEBPAGE URL
https://www.it.pt/Projects/Index/1570

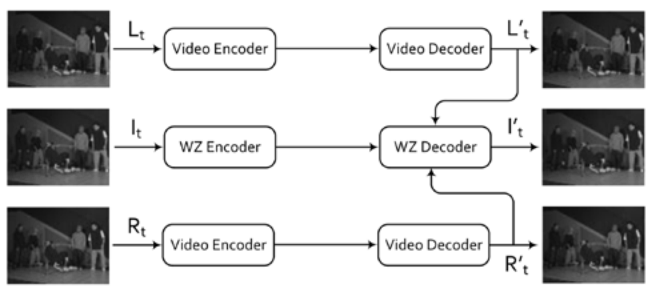


Fig. 1 Three-camera multi-view setup.

Fig. 2 Multi-view plus depth representation format for 3D video.

GENERAL MOTIVATION

Nowadays, audiovisual coding solutions are among the information technologies with wider deployment and use, e.g., watching and uploading video on popular video sharing sites, receiving an e-mail with photos attached or making a voice call over the Internet. Despite their ubiquitous use, end users do not know much about these technologies; however, they know quite well some of the most popular devices and services that make extensive use of audiovisual coding technologies, e.g., digital cameras, digital television, DVDs, MP3 players and smartphones.

With the recent wide deployment of wireless networks and the proliferation of mobile terminals with constrained computing power, a growing number of applications do not fit well the typical downlink model but rather follow an up-link model in which many senders deliver data to a central receiver. Examples of these applications are wireless low power video surveillance, visual sensor networks, mobile video communications and deep-space applications. Typically, these emerging applications require light encoding or at least a flexible distribution of the video codec complexity, robustness to packet losses, high compression efficiency, and, often, low latency/delay as well.

OBJECTIVES

Distributed video coding (DVC) is a different coding paradigm that allows to exploit the video statistics, partial or totally, at the decoder, enables a reversed complexity coding mode, where the encoder complexity is shifted to the decoder making it more simple. The DVC coding approach provides am architectural benefit to multi-view video systems as the DVC encoders do not need to jointly encode the several views and, thus, Inter-camera communication is not needed; this is a key feature for applications with critical bandwidth and power consumption constraints. In this context, this project aims to develop and evaluate novel state-of-the-art distributed multi-view video systems as well as the improvement of predictive video codecs using distributed coding principles. In addition, methods to code auxiliary data such as depth data for multi-view + depth video sequences were developed, considering the intrinsic characteristics of such type of data.

KEY ACHIEVEMENTS

The following technical achievements have been accomplished by the MUVIS project:

· Exploiting the potential of the multi-view distributed video coding paradigm: Methods to create high quality side information (an estimation of the source created at the decoder) were proposed by (jointly) exploiting temporal and Inter-view correlations. In this context, several solutions that combine temporal and Inter-view SI estimation were developed, as well as correlation noise models capturing the statistical correlation between the side information and the source.

· Studying and improving the rate-distortion (RD) performance of depth-map compression schemes: The recent developments in 3D and free viewpoint video systems rely on the capability to synthesize more views at the decoder than those explicitly coded, typically by transmitting information about the scene geometry, a sequence of depth maps. In this context, both the texture and depth maps should be efficiently coded to prevent severe geometric distortions in the virtual synthesized views. This project has made contributions in the field of depth map coding.

· Propose a novel solution where predictive and distributed coding join forces instead of competing with each other: The combination of predictive coding techniques, to exploit the temporal correlation, with distributed coding techniques is a successful "cocktail mix" to obtain higher RD performance. The work completed in this project targets the RD performance enhancement of the widely popular H.264/AVC video codec and of the state-of-the-art HEVC/H.265 video codec using distributed coding principles.

The evaluation made concerns rate-distortion performance and other criteria such as complexity, delay, and other functionalities such as error resilience and scalability.