# Complexity Controlled Side Information Creation for Distributed Scalable Video Coding

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***Abstract*—Distributed scalable video coding (DSVC) has recently been gaining many attentions due to its benefits in terms of computational complexity, error resilience and scalability, which are important for emerging video applications like wireless sensor networks and visual surveillance system (VSS). In DSVC, the side information (SI) creation plays a key role as it directly affects to the DSVC compression performance and the encoder/decoder computational complexity. However, for many VSS applications, the energy of each VSS node is usually attenuating along the time, making the difficulty in transmitting surveillance video in real time. To address this problem, we propose a complexity controlled SI creation solution for the newly DSVC framework. To achieve the flexible SI creation, the complexity associated to SI creation process is modeled using a linear model in which the model parameters are estimated from a fitting process. To adjust the SI complexity, a user parameter is defined based on the availability of the VSS energy resource. Experiments conducted for a rich set of video surveillance data have revealed the benefits of the proposed complexity control solution, notably in both complexity control and compression performance.**

***Keywords—Distributed scalable video coding, side information, visual sensor networks***

## I. INTRODUCTION

Nowadays, video surveillance systems (VSS) have been widely used in many important applications such as public safety and private protection [1]. Such a system can provide real-time monitoring and analysis of the observed environment. Real-world video surveillance applications, which typically require storing videos without neglecting any part of scenarios for weeks or months. In addition, the heterogeneity of devices, networks and environments is also gaining a request of adaptation solutions. In this scenario, there is a critical need of a powerful video coding scheme that is featured by high coding efficiency, scalability and low encoding complexity capabilities.

A VSS typically includes three main parts, the camera nodes, the center and the users as shown in Fig.1. The video is firstly captured and processed at the camera node and sent to the server. Such video bitstream can be transcoded or distributed to users with different quality, resolutions. At the user side, video data can be used for object detection, activity tracking, and/or event analysis.

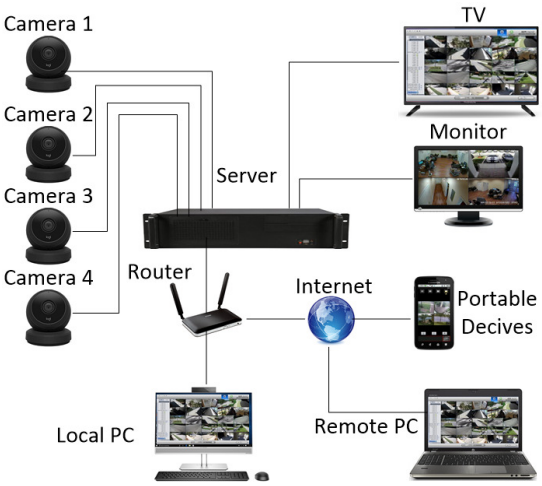


Fig. 1. A video surveillance system

The recent researches have shown that the distributed scalable video coding [2-4], a newly High Efficiency Video Coding (HEVC) [5] scalable extension [6] can satisfy the mentioned requirements of a VSS [1]. However, for many VSS applications, the energy allowed at each VSS node is usually attenuating along the time. In this case, the complexity of DSVC should be adjusted depending on the energy situation in each VSS node. In DSVC, the SI creation [7] usually consumes a largest percentage of computational complexity [2]. In this context, we propose in this paper a novel complexity controlled SI creation solution to adaptively adjust the overall DSVC complexity, notably by a SI complexity-modeling framework.

In the proposed SI creation solution, the complexity associated to the motion estimation stage is controlled using a user setting parameter. Depending on the energy situation of each VSS node, the user parameter is imported to control the complexity of the SI creation process and thus the overall DSVC solution. Experiments conducted for a rich set of test surveillance video has shown that the proposed SI creation solution is easily to manage the complexity at both the encoder and decoder.