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Adaptive Scalable Video Coding: a HEVC based Framework Combining the Predictive and Distributed Paradigms

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The emerging Scalable HEVC (SHVC) video coding standard provides an efficient solution for transmission of video over heterogeneous and time dynamic networks, terminals, and usage environments. The encoding complexity and the error sensitivity associated to the efficient HEVC coding tools adopted in SHVC make this scalable codec less attractive to some emerging applications such as video surveillance, visual sensor network, and remote space transmission

where these requirements are critical. To address the requirements of these application scenarios including scalability, this paper proposes a novel HEVC based framework offering quality scalability on top of a HEVC compliant base layer while appropriately combining the predictive and distributed coding paradigms. To achieve the best enhancement layer compression efficiency, two novel coding tools are proposed, notably a machine learning based side information creation mechanism and an adaptive correlation modeling process. The experimental results reveal that the rate-distortion performance of the proposed DSVC-HEVC solution outperforms the relevant alternative coding solutions, notably by up to 52.9% and 23.7% BD-rate gains regarding the HEVC-Simulcast and SHVC standard solutions, respectively, for an equivalent prediction configuration, while achieving a lower encoding complexity.
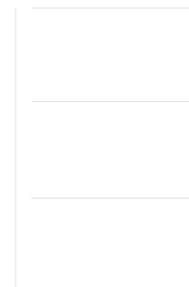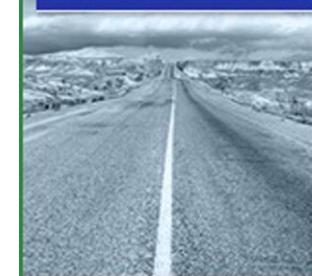
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