Abstract (EN)

Uncompressed high-definition video transmission over wireless personal area networks (WPANs) has been drawing interest due to development of the 57-66GHz millimeter-wave (mmWave) WPANs that can provide multi-Gbps transmission data rate. However, mmWave signals have stronger attenuation than the conventional low-frequency signals (2.4 or 5GHz), and therefore maintaining the received video quality under harsh wireless link becomes challenging problems. In this thesis, we propose an unequal error protection (UEP) scheme which manages the transmission power allocation for each bit-plane level in encoder. Efficiently transmission energy management can offer better received video quality over conventional equal error protection (EEP) scheme under the same average transmission power. Besides, this encoder is designed for an iterative joint source-channel decoder (ISCD) based on a 3D-MRF soft-in soft-out (SISO) source decoder. The 3D-MRF based source decoder utilizes a bit-plane level MRF model which successfully reveals the spatial and temporal redundancy of uncompressed video sequences. To estimate the received video quality before transmission, our proposed UEP scheme also exploits such MRF model to exploit the spatial and temporal redundancy of uncompressed video and to optimize the resource usage for better error protection through fragile wireless channel. To accomplish this system, we formulate and solve the optimization problems that correspond to maximizing the expected video quality in terms of average peak signal-to-noise ratio (PSNR) under the given average transmission power constraint. Besides, since the received video quality can be perfectly predicted in encoder, we also formulate and solve the optimization problems for the minimum energy required for the certain video quality. Computer simulations show that the proposed UEP scheme can further enhance the video quality and mitigate the unstable quality varying in comparison to the conventional EEP scheme.