As the state of the art video coding standard, H.264/AVC achieves significant coding performance gain comparing to its predecessors. Nevertheless, the advance comes at huge complexity increase of the encoder, which may hinder its applications to real world. In addition, network applications impose some unique requirements on existing video coding algorithms. For instance, the encoder output bit stream has to be compatible with transmission channel conditions.

In this dissertation, two issues related to H.264/AVC video coding are to be addressed: coding complexity and bandwidth adaption, and corresponding solutions are provided. To reduce the coding complexity, the original mode decision process in H.264/AVC reference software is optimized for fast implementation. Moreover, two bandwidth adaption algorithms were also presented to address different requirements of bandwidth compatibility.

Experiments are performed to test and validate the proposed algorithms. The results show that the proposed algorithms provide efficient solutions to the above problems and facilitate H.264/AVC coding standard for practical deployment.