题目：学习算法在环路滤波器中的应用研究及实践

摘　要

随着数字视频在生活中的不断普及与应用，数字压缩技术也开始变得举足轻重，而随之产生的视频编码标准也有了一定的发展。类似于以往的视频编码标准，HEVC 一如既往的采用了基于块的变换编码，因此也同样的产生了块效应和振铃效应等失真效应。相比较 H.264 等以往的视频编码标准，HEVC 中采用的去块效应滤波器和样点自适应补偿滤波器能有效的解决这些失真效应。前者主要用于减轻由变换系数的粗量化产生的方块效应，而后者是环路滤波技术中新增的用于减少振铃效应的模块，在提高了视频编码性能的同时也增加了编码复杂度。

随着学习算法在图像处理中的应用，让学者们看到了学习算法在提高环路滤波算法编码性能上的可能。现有的学习算法主要包括一些基于多尺度卷积神经网络的帧内预测，基于深度神经网络帧间预测和基于卷积神经网络的环路滤波技术。学者们提出的这些算法对编码性能和复杂度都有效，通过学习这些算法的研究及应用来拓展自己在该领域的知识。通过实验仿真，在一定程度上提高了环路滤波的编码性能和图像质量。

关键词：HEVC；环路滤波；去方块滤波；帧内预测

Abstract

With the popularization and application of digital video in daily life, digital compression technology has become very important, and the video coding standard has developed to some extent. Similar to previous video coding standards, HEVC, as always, adopts block-based transformation coding, so it also produces distortion effects such as block effect and ringing effect. Compared with previous video coding standards such as h. 264, the loop filtering technology used in HEVC can effectively solve these distortion effects. The loop filter module in HEVC standard includes a block-removing filter and a split-point adaptive compensation filter. The block-removing filter is mainly used to reduce the block effect caused by the coarse quantization of the transformation coefficient, while the new adaptive compensating filter of sample points in the loop filtering technology is mainly used to reduce the ringing effect, which improves the coding performance of the video to some extent, but also increases the coding complexity.

With the application of learning algorithm in image processing, scholars see the possibility of learning algorithm in improving the coding performance of loop filtering algorithm. The existing learning algorithms mainly include intra - frame prediction based on multi - scale convolutional neural network, inter - frame prediction based on depth neural network and loop filtering based on convolutional neural network. These algorithms proposed by scholars are effective in both coding performance and complexity. By learning the research and application of these algorithms, I can expand my knowledge in this field. Through the experimental simulation, the coding performance and image quality of loop filter are improved to some extent.

Key Words: HEVC ； In-loop filter ； De-blocking filtering ； Frame prediction