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Development of a MPEG-4 AVC/H.264 Software Encoder Engine for Video Distribution Services That Preserves the Same Picture Quality at Twice the Speed: Work Costs are Reduced by Auto Retry Technology

Nippon Telegraph and Telephone Corporation (NTT, headquartered in Chiyoda-ku, Tokyo, President: Satoshi Miura) developed a software encoding engine that is fully compliant with MPEG-4 AVC (Advanced Video Coding)/H.264, the latest international video coding standard. The encoding engine is a software library ^{*1} ([Figure 1](#)) that runs on a PC, and is intended to be used for application software such as encoders and transcoders.

The encoder engine implements parallel processing of compression tailored for multicore PCs and is thus twice as fast as previous engines while preserving the same picture quality, and enhances the compression ratio by 20% while maintaining the same processing time. The encoder thus delivers the highest level compression performance that is currently available.

In addition, the engine also automatically detects video playback defects and fixes them with an auto retry capability that significantly reduces viewing verification work, recoding work when errors are found, and thus reduces the cost of the encoding work. These new techniques contribute to lower costs related to video distribution.

The encoder engine will be exhibited at NTT's booth (South Hall Upper Level, SU7217) at NAB SHOW 2010, the world's biggest exhibition of new broadcasting development, that will be held this year in the U.S. at the Las Vegas Convention Center from April 12-15, 2010.

1. Development Background

Recently IPTV, VoD, and other video distribution services have achieved widespread penetration ([Figure 2](#)). Now in addition to MPEG-2 that supports digital terrestrial broadcasting, we are seeing increased use of MPEG-4 AVC/H.264 that provides greater compression. The higher compression ratio of MPEG-4 AVC/H.264 can increase the processing time, but high-speed high-compression encoders are needed to reduce service costs.

NTT labs have developed codec LSIs and other equipment for professional broadcasters, and now this expertise has proven useful in the development of a MPEG-4 AVC/H.264 software encoder engine that serves the needs of the video distribution service market.

2. Technology Overview

(1) Parallel Processing Technology

In implementing the new encoder engine, we reassessed parallel processing as a way of exploiting the full potential of the recent trend toward multicore PCs (i.e., PCs that boost performance by implementing more than one core within the housing). In the conventional parallel processing approach based on screen separation, data reference between separated images was impossible, and increasing the number of divisions

drove down the compression ratio. This meant that the number of divisions had to be limited, and it was impossible to exploit the full potential of newer PCs with many cores. This led us to a different approach of implementing parallelization in macroblock units as the smallest encoding unit that we developed in earlier work on video codec LSIs. This way we could achieve data reference between macroblocks, so we could implement parallelization in compliance with the number of cores in multicore PC while preventing a decline in the compression ratio ([Figure 3](#)). Adopting this approach, we succeeded in cutting the compression time in half for the latest multicore PC with eight cores. And considering allowable compression work time (about five times actual time) for video distribution services from the standpoint of compression work cost, we were able to lower the bit rate by 20% by incorporating an encoding tool. This was the optimum level compression performance under these conditions.

By tailoring the encoder engine's parallel processing to the number of cores in a current or future PC, the encoder engine will always fully reflect the optimum performance of the latest model PC.

(2) Auto Retry Technology

Generally, if hard-to-compress video (for example, a splash or spray of water) continues and the actual bit rate is beyond the target bit rate for a while, then the compressed data is too late for the transmission and the compression work has been redone. If compression conditions are set to accommodate reworking hard-to-compress portions in order to fit the target bit rate, this diminishes the picture quality of the entire video. Time and effort are also required to verify the compressed video and redo problem places.

The new encoder engine uses coding control to just alter the compression conditions of the hard-to-compress places, and automatically detects and recompresses problem sites during the compression processing. This saves the trouble of recompression and saves compression work effort, while preserving the picture quality of the video as a whole.

3. Future Plans

In the latter half of 2010 we plan to release a commercial version of the encoder engine, while we develop applications that incorporate the encoder engine and investigate implementation of a SDK ^{*2}. We also plan to show the encoder engine at the NTT booth (South Hall Upper Level, SU7217) at NAB SHOW 2010, the foremost broadcasting exhibition in the world, that will be held this year at the Las Vegas Convention Center from April 12-15, 2010.

Glossary

***1: Software Library**

The encoder engine is a software library, and cannot be used alone. In order to be used, the encoder engine has to be called from an application. For example, implementation of an encoder application requires a video and audio input unit, a audio compression unit, and a unit for combining compressed video and audio data.

***2: Software Development Kit (SDK)**

This is a tool kit needed to develop applications using the encoder engine library.

- [Figure 1: H.264 software encoder configuration](#)
- [Figure 2: From image capture to distribution](#)
- [Figure 3: Parallel technology](#)

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