[5B-23]

SAD 기반 비트 예측과 적응적 비트 할당 기법을 이용한 비디오 코딩에서의 비트율 제어 기법

김대원 , 선금종
삼성전자
drdw.kim@samsung.com

Rate control for video coding using adaptive bit-allocation & SAD based bits prediction

Daewon Kim , Kumjong Sun
Samsung Electronics Co. Ltd.

요 약

This paper introduces a novel rate control method for a real time video encoder which uses a discriminated bit allocation method between each frames. The proposed technology is based on the prediction of generated bits and the fact that the generated bits are proportional to the residual signals, sum of absolute difference (SAD). The performance is evaluated using the H.263 TMN5 encoder by applying the proposed rate control method.

I. 서론

In order to compress the video frames effectively in the wireless communication environments which are variable bit rate channels, the number of bits for the compressed contents must fit into the channel bandwidth. If the number of bits for the compressed multimedia contents are larger than the channel's bandwidth, then the data transferring time would be delayed resulting in unsuccessful real time video reconstruction. In this case, the frame rates which mean the number of frames played in real time should be decreased. On the contrary, if the number of bits are smaller than the existing channel's bandwidth, then there would also be a waste of bandwidth resulting in unsatisfied quality of video reconstruction. Therefore, it is important that the number of bits for compressed video frames must fit into the network bandwidth.

Users generally want high quality of transmitted video scenes, however, the bit rates are limited. Therefore, the high quality video scenes should be accomplished within the allotted bit rates. The complicated video frame processing which result in decelerating an encoder running or causing delay must be avoided for a real time processing such as wireless video communications. Furthermore, the processing step should be controlled under the limited bit rates. For these purposes, the quantizing steps are adjusted generally. Usual rate control algorithms consist of three stages such as bit allocation, rate control, and determination of the quantizing steps. Here we evaluate and compare the results and performance between the proposed method and the rate control method which was used in the H.263 TMN5.

II. H.263 TMN5 Rate control

Real time applications such as video conferencing, backward prediction method cannot be used as this makes some frame delay. Therefore in these cases, only I-frames (Intra frames), and P-frames (Inter frames) are allowed to be used. It is impossible to assign bits to frames with respect to the complexity of scenes since the video encoding process is performed in real-time, in other words, the video encoding process is not done with the ready-made (saved) video frames. Therefore, the TMN5 coder distributes all the bits allocated for a frame uniformly to a frame which is to be coded.

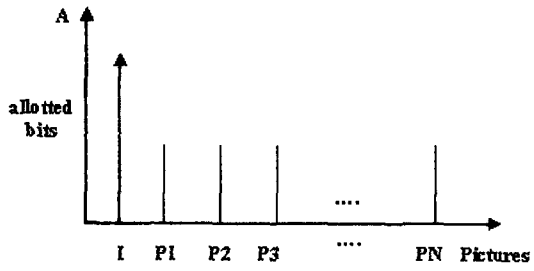

Fig. 1. Bit allocation between pictures

When the bit allocation for a frame is done, the assigned bits are redistributed uniformly for macro blocks in the frame.

I : A Bits (ex. Bit_rate*2/frame_rate
PN : (Bit_rate-spent_bits/remained frames)
Bit_rate : bits assigned per second (1)
Frame_rate:number of frames per second
Spent_bit:actual generated bits for previous frame

When the bit allocation procedure is done, a controlling method is performed in order to generate appropriate amount of encoding bits to each frames. The quantizing step of MBi in TMN5 is determined depend on the status of the assigned bits for the macroblock, MBi-1, of the previous step and the actual generated bits. In other words, if the amount of actual generated