Advanced Optimizations for VQ Compression on Parallel Systems

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Recently, parallel processing technologies have been applied to a variety of applications to boost its performance. We implemented a parallel algorithm with “double strip-mining” method of optimal codeword search for VQ compression on a shared-memory parallel environment and evaluated the effectiveness of the parallel algorithm. Namely, by applying strip-mining method to a loop with regard to vectors as well as that to codewords (double strip-mining), the buffer area, which keeps the intermediate results, can be dramatically reduced and the results of our experiments find that this method can keep the same performance as the original strip-mining method in terms of the elapsed time. As shown in Figure 1-(b), the p-dist algorithm with the double strip-mining method outperforms the c-dist algorithm by over 10%, when the size of strip-mining is enough large.

Moreover, two optimization methods for sequential computers are presented: the shortcut calculation and the modified expression. The shortcut calculation is that the distance calculation should be terminated if the intermediate result exceeds the tentative minimum in order to reduce the computation cost, and the modified expression is that the distance formula should be altered to achieve less computation. As shown in Figure 1-(a), our experimental results show that the elapsed time is improved by 20% to 40% by using the both sequential optimization methods and the effectiveness depends on the size of a vector and the size of the codebook, so the effectiveness of the above methods on sequential computers is empirically confirmed and can be also applied to parallel systems easily.

Figure 1. Results of our experiments

(a) Double strip-mining (SMP with 4 CPUs, VSIZE = 8192) (b) Shortcut calculation and modified expression (1024 x 1024)

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