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H.264 Video Coding - Performance/Complexity Trade-Offs in H.264 Motion Search

In video coding systems, motion estimation and motion compensation reduces temporal redundancies by exploiting interpicture correlation. The assumption is that pixels within the current picture can be modeled as translations of pixels within previous pictures. Block-based motion estimation methods are the most popular methods in video coding systems.

In [1], the authors are comparing the performance metrics tradeoffs of two different flavors of the H-263 standard, and in [3] the H.264 Baseline Profile is evaluated on a general purpose/DSP processor and brings insights into the storage requirements and the memory access cycles.

In the course of this project, I am planning to improve (ie, speed up) the memory search part of the H.264 encoder by (1) improving the locality of the algorithm – by doing this we could lower the cache misses – and (2) by limiting the amount of required computations. I am planning to achieve (1) by doing manual optimizations of the H.264 motion search implementation and also by trying a threaded implementation, if the time will permit it. (2) is going to be achieved by introducing the computation cost in the motion search function and at the same time by minimizing the distortion, much like [2] is doing it, but I hope to get improved results by limiting the search area even more, by subsampling the image with an algorithm like in [6] or by remembering the previous predicted vectors and estimating new predicted vectors from them.

If the time will permit, I will go into the next level of optimization that could be done, and that would be assembly language (I am planning to optimize for Opteron, Sun SPARC and Intel Pentium 4).

1.

References

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