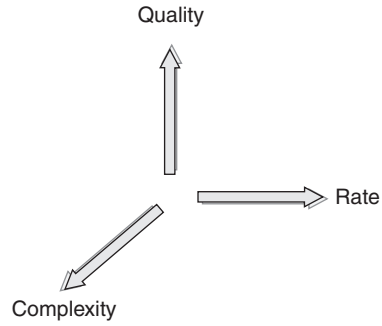

Figure 9.28 Rate, quality and complexity

motion compensation. Exhaustively searching this space to find the best combination of mode and prediction type is a highly computationally intensive task.

9.6 Low complexity coding

Many practical H.264/AVC codecs simply do not have the computational resources to carry out the full rate-distortion optimized mode selection process described above. This practical constraint, together with the desire to maximize compression performance, has led the development and proposal of hundreds of low complexity coding algorithms and approaches. The general goal is to maximize performance in the rate-distortion-complexity space (Figure 9.28). A low-complexity encoder will tend to have poor or average rate-distortion performance; applying more computation to the problem of choosing the best coding mode, hence moving along the complexity axis, will tend to increase rate-distortion performance. Hence compressed bitrate, decoded quality and codec complexity can be traded off. The goal of a good low-complexity coding method is to achieve good rate-distortion performance at a reduced computational cost. A suitable comparison point is a 'full complexity' H.264 encoder, which evaluates every possible coding mode, every prediction type and every motion vector when coding each macroblock.

In general, every low-complexity coding algorithm has a similar effect on performance, i.e. rate-distortion performance tends to be lower than the benchmark 'full complexity' codec and computational complexity is also lower. Some of the more sophisticated low-complexity algorithms, however, are capable of delivering coding performance very close to the benchmark with a significant reduction in computational complexity.

9.6.1 Approximating the cost function

The basic cost function (9.3) requires calculation of D and R. In a 'full' implementation this means it is necessary to:

(i) Code the block B to obtain R
(ii) Decode the block to obtain B', the reconstructed block
(iii) Calculate the distortion (e.g. SSD) between B and B'

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