Fine-Granular SNR scalable (FGS) technologies of H.264/AVC-based scalable video coding (SVC) provide a flexible and effective foundation to accommodate different and variable network capacities. To support efficient quality extraction, it’s important to obtain the rate–distortion (R–D) or distortion–rate (D–R) function of each FGS packet. In this paper, firstly, we analyze the sub-bitplane technology of SVC FGS coding, and conclude the MSE-based D–R function should be linear within a FGS layer, which also explains the slow–start phenomena of PSNR-based D–R function. Consequently, a piece–wise linear model is proposed to describe the no–drift R–D function of FGS EL.

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Secondly, considering both the picture prediction structure and the reference picture correlation, we investigate the SVC drift of hierarchical B pictures and propose a simple and effective distortion model to estimate the reconstructed frame distortion with drift. At last, based on above analysis and models, a new model-based quality layer assignment algorithm is proposed to achieve equivalent coding efficiency as the SVC test model with significantly reduced complexity.