Low-Complexity SVC/AVC Transcoder based on Data Exploitation and Approximation for Videoconferencing

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Background & Target

- Video compression is an important component in videoconferencing, which is a convenient communication tool in nowadays.
- Most legacy videoconferencing systems use Advanced Video Coding (AVC) for video compression and Scalable Video Coding (SVC) is the next generation technology.
- To enable the communication between SVC-based and AVC-based systems, SVC/AVC bitstream transcoding is needed.
- This poster presents low-complexity SVC/AVC transcoding techniques based on **Data Exploitation** and **Data Approximation** methodologies, targeting at *spatial* and *quality* scalabilities (temporal is not used in videoconferencing due to the severe structural delay).

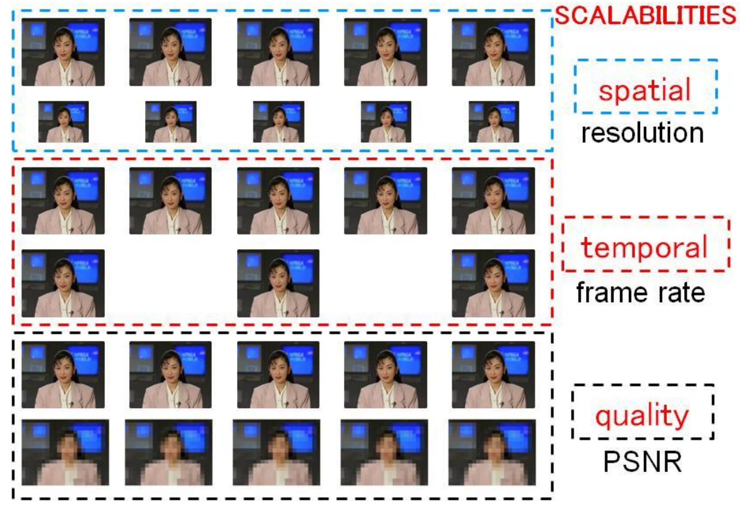


Fig. 1 Scalabilities provided by SVC.

Proposed Methods

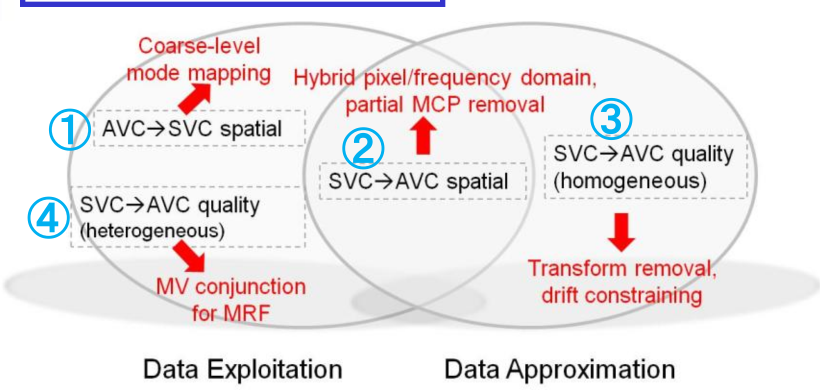
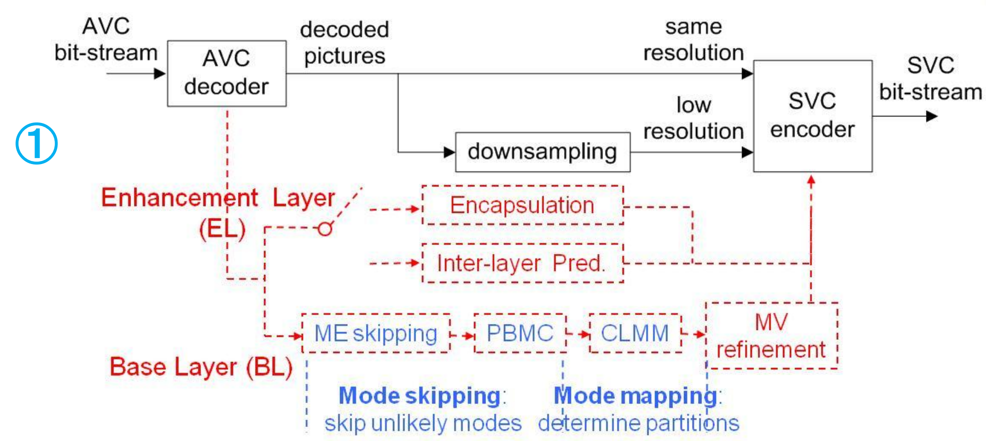
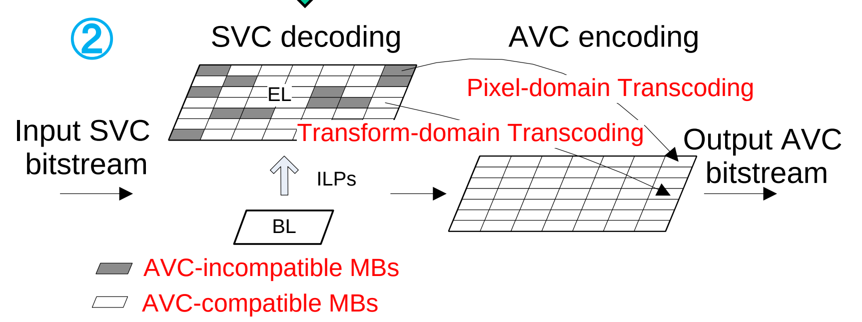


Fig. 2 Summary of my proposals.



PBMC: profile-based mode control, CLMM: coarse-level mode-mapping



Pixel/transform-domain hybrid spatial transcoding

③

Conventional $t_n = Q_2(s_n + T(MC(T^{-1}(s_{n-1} - Q_2^{-1}(t_{n-1})))))$

↓ Q_2: distributive

$t_n = Q_2(s_n) + Q_2(T(MC(T^{-1}(s_{n-1} - Q_2^{-1}(t_{n-1})))))$

↓ T & MC: commutative

$t_n = Q_2(s_n) + Q_2(MC(s_{n-1} - Q_2^{-1}(t_{n-1})))$

↓ Q_2 & MC: commutative

$t_n = Q_2(s_n) + MC(Q_2(s_{n-1} - Q_2^{-1}(t_{n-1})))$

↓ Q_2: distributive

Proposal $t_n = Q_2(s_n) + MC(Q_2(s_{n-1}) - t_{n-1})$

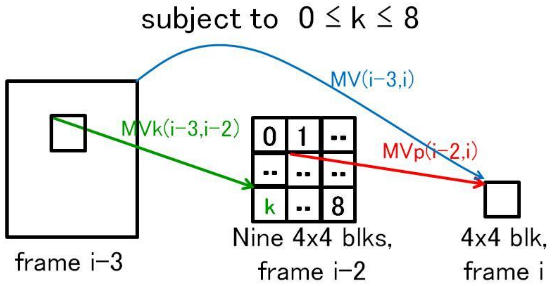
approximated to

Motion compensation in quantization-domain

④

- Estimation: MVp(i−2,i) = ½*MV(i−3,i−1) + MV(i−1,i)
- Refinement: minimize |MVk(i−3, i−2)+MVp(i−2, i)−MV(i−3, i)|

  subject to 0 ≤ k ≤ 8



Simulation Results

- 82.7% average time saving comparing with conventional work with 0.18 dB BL quality loss & 0.11 dB EL quality loss for proposal ①.
- Averagely 3.3 times faster than the representative work with negligible coding efficiency loss for proposal ②.
- Averagely 6.5 times faster than the representative work with 8.2% bit-rate increase and 0.3 dB quality loss for proposal ③.
- 4.9% bit-rate saving and 0.28 dB quality improvement regarding conventional work with merely 1.7% less time saving for proposal ④.