

AHG7: Bi-pred restriction for small PUs

JCTVC-I0297

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1. Overview

Overview

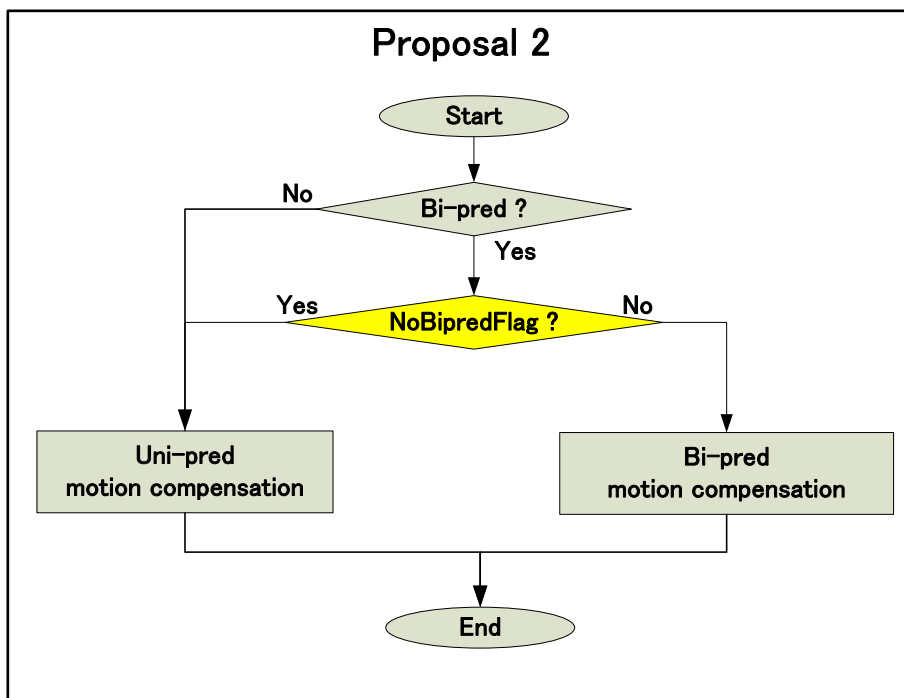
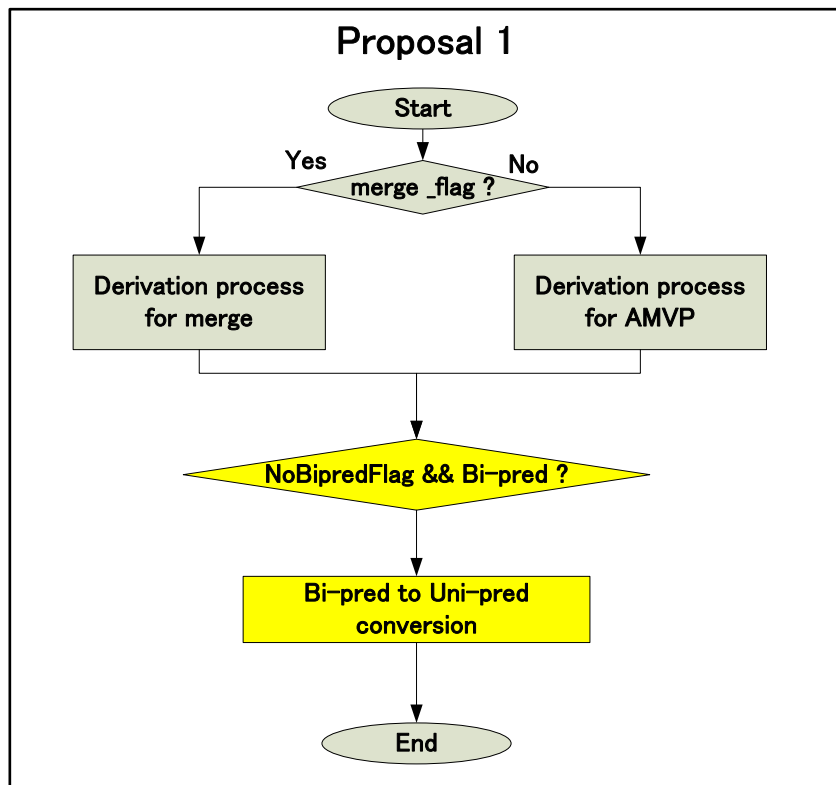
- Proposed technique
 - Bi-pred restriction by PU size for both encoder and decoder
- Algorithm
 - Convert bi-pred to uni-pred for both merge and AMVP
 - Proposal 1: after derivation process of merge/AMVP
 - Proposal 2: on motion compensation process
- Crosscheck
 - JCTVC-I0449 by Sony
- Simulation results
 - Average 0.3% coding loss in case that 4x8/8x4 PU is restricted



2. Algorithm

Proposal

- Bi-pred restriction by PU size both on encoder and decoder
- Convert bi-pred to uni-pred for both merge and AMVP
- Proposal 1 : bi-pred to uni-pred **after derivation process of merge/AMVP**
- Proposal 2 : bi-pred to uni-pred **on motion compensation process**



Benefits

- Guarantee the maximum memory bandwidth on decoder explicitly
 - by the high level indicator
 - by profile / level constraint explicitly
- No PU level syntax change
 - No additional condition check on parsing process
- Simple conversion of bi-pred to uni-pred both merge and AMVP
 - Unify the restriction method for merge and AMVP
 - Use the converted merge candidates to improve coding efficiency

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3. Experiments

Experiments

Encoder constraint

| | Random Access Main | | | Random Access HE10 | | | | Low delay B Main | | | Low delay B HE10 | | |
|----------------|--------------------|-------------|-------------|--------------------|-------------|-------------|----------------|------------------|-------------|-------------|------------------|-------------|-------------|
| | Y | U | V | Y | U | V | | Y | U | V | Y | U | V |
| Class A | 0.3% | 0.4% | 0.3% | 0.2% | 0.3% | 0.2% | Class A | | | | | | |
| Class B | 0.3% | 0.3% | 0.3% | 0.2% | 0.2% | 0.2% | Class B | 0.4% | 0.0% | 0.6% | 0.3% | 0.1% | 0.3% |
| Class C | 0.5% | 0.6% | 0.6% | 0.4% | 0.4% | 0.4% | Class C | 0.9% | 1.0% | 0.8% | 0.7% | 0.7% | 0.7% |
| Class D | 0.8% | 0.7% | 0.7% | 0.7% | 0.6% | 0.6% | Class D | 1.0% | 0.8% | 0.9% | 1.0% | 0.5% | 0.5% |
| Class E | | | | | | | Class E | 0.5% | 0.5% | 0.7% | 0.3% | 0.0% | 0.2% |
| Overall | 0.5% | 0.5% | 0.5% | 0.4% | 0.4% | 0.3% | Overall | 0.7% | 0.6% | 0.7% | 0.6% | 0.3% | 0.4% |
| | 0.5% | 0.5% | 0.4% | 0.4% | 0.4% | 0.3% | | 0.7% | 0.6% | 0.8% | 0.6% | 0.4% | 0.4% |
| Class F | 0.2% | 0.3% | 0.3% | 0.2% | 0.3% | 0.3% | Class F | 0.5% | 0.0% | 1.2% | 0.4% | 0.5% | 0.8% |
| Enc Time[%] | 93% | | | 94% | | | Enc Time[%] | 91% | | | 93% | | |
| Dec Time[%] | 100% | | | 101% | | | Dec Time[%] | 99% | | | 99% | | |

Proposal 1

| | Random Access Main | | | Random Access HE10 | | | | Low delay B Main | | | Low delay B HE10 | | |
|----------------|--------------------|-------------|-------------|--------------------|-------------|-------------|----------------|------------------|-------------|-------------|------------------|-------------|-------------|
| | Y | U | V | Y | U | V | | Y | U | V | Y | U | V |
| Class A | 0.1% | 0.0% | 0.4% | 0.0% | 0.2% | 0.1% | Class A | | | | | | |
| Class B | 0.2% | 0.2% | 0.2% | 0.1% | 0.1% | 0.1% | Class B | 0.2% | -0.2% | -0.1% | 0.2% | -0.1% | 0.0% |
| Class C | 0.4% | 0.4% | 0.4% | 0.3% | 0.3% | 0.2% | Class C | 0.5% | 0.6% | 0.4% | 0.4% | 0.6% | 0.5% |
| Class D | 0.6% | 0.5% | 0.7% | 0.5% | 0.5% | 0.4% | Class D | 0.6% | 0.3% | 0.8% | 0.6% | 0.2% | -0.2% |
| Class E | | | | | | | Class E | 0.2% | 0.3% | 0.0% | 0.1% | 0.0% | 0.1% |
| Overall | 0.3% | 0.3% | 0.4% | 0.2% | 0.3% | 0.2% | Overall | 0.4% | 0.2% | 0.2% | 0.3% | 0.1% | 0.1% |
| | 0.3% | 0.3% | 0.4% | 0.2% | 0.3% | 0.2% | | 0.4% | 0.3% | 0.3% | 0.3% | 0.2% | 0.1% |
| Class F | 0.1% | 0.3% | 0.2% | 0.1% | 0.2% | 0.2% | Class F | 0.2% | 0.4% | 1.2% | 0.2% | 0.0% | 0.5% |
| Enc Time[%] | 94% | | | 95% | | | Enc Time[%] | 92% | | | 93% | | |
| Dec Time[%] | 98% | | | 101% | | | Dec Time[%] | 99% | | | 99% | | |

Proposal 2

| | Random Access Main | | | Random Access HE10 | | | | Low delay B Main | | | Low delay B HE10 | | |
|----------------|--------------------|-------------|-------------|--------------------|-------------|-------------|----------------|------------------|-------------|-------------|------------------|-------------|-------------|
| | Y | U | V | Y | U | V | | Y | U | V | Y | U | V |
| Class A | 0.2% | 0.0% | 0.2% | 0.1% | 0.2% | 0.0% | Class A | | | | | | |
| Class B | 0.2% | 0.2% | 0.2% | 0.1% | 0.1% | 0.1% | Class B | 0.2% | -0.2% | -0.1% | 0.1% | 0.2% | 0.3% |
| Class C | 0.4% | 0.5% | 0.4% | 0.3% | 0.3% | 0.2% | Class C | 0.4% | 0.6% | 0.3% | 0.4% | 0.6% | 0.7% |
| Class D | 0.6% | 0.4% | 0.6% | 0.5% | 0.5% | 0.5% | Class D | 0.6% | 0.6% | 1.0% | 0.6% | 0.1% | 0.5% |
| Class E | | | | | | | Class E | 0.2% | 0.0% | 0.4% | 0.1% | 0.0% | 0.0% |
| Overall | 0.3% | 0.3% | 0.4% | 0.3% | 0.3% | 0.2% | Overall | 0.4% | 0.2% | 0.4% | 0.3% | 0.3% | 0.4% |
| | 0.3% | 0.3% | 0.4% | 0.3% | 0.3% | 0.2% | | 0.4% | 0.3% | 0.4% | 0.3% | 0.3% | 0.4% |
| Class F | 0.2% | 0.3% | 0.3% | 0.1% | 0.2% | 0.3% | Class F | 0.3% | 0.6% | 0.6% | 0.2% | 0.6% | 0.5% |
| Enc Time[%] | 93% | | | 94% | | | Enc Time[%] | 91% | | | 92% | | |
| Dec Time[%] | 98% | | | 100% | | | Dec Time[%] | 97% | | | 99% | | |



4. Conclusion

Conclusion

- Benefits
 - Guarantee the maximum memory bandwidth explicitly
 - No PU level syntax change
 - Unify restriction method for merge and AMVP
 - Reduce coding efficiency loss
- Recommendation
 - Introduced uni-pred conversion process
 - Consider proposal 1 and proposal 2 for adoption to DIS and HM

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