Image Texture Direction and Relative Strength based HEVC Encoding Algorithm for VLSI Implementation

• Research background

High resolution/quality video real-time compression

HEVC (Large complexity)

VLSI implementation for HEVC encoder

VLSI friendly algorithm (HEVC: Software oriented)

• Proposed algorithm

Image Texture Direction

Edge detection

Motion vector

Quantization strength

Direction strength

Boundary strength

1 Intra

2 Inter

3 SAO

Relative Strength

1 Dual feature and direction strength based intra prediction

Original mode decision

Conventional

Proposal: mode decision

Rough Mode Decision

Rate-Distortion Optimization

End

Edge detection

RDO

RDO+ Mode refinement

End

End

32 × 32

64 × 64

8 × 8

4 × 4

16 × 16

C: Direction strength

2 Multi-feature based depth decision

Conventional works

Proposal

Target block

Content similarity

Quantization feature

Motion vector feature

C

Skip

8 × 8

Skip

64 × 64

3 Boundary strength prediction for SAO

Original

Conventional

Proposal

Boundary pixels

C1: Boundary strength

C2: SAO predictability

Boundary pixels

C1

off

on

C2

predictable

unpredictable

SAO

DF

SAO

Prediction

• Result and conclusion

Intra prediction

28.6% time reduction

Shorten PU depth decision (5→3)

0.61% BDBR increasing

Inter prediction

15.8% time reduction

Shorten CU depth decision (4→3)

0.76% BDBR increasing

SAO

0.1% computation increase

0.13% BDBR saving

Impact on VLSI implementation

Hardware size and average power

Processing performance

Other impact

Video quality

Positive impact

Negative but negligible impact