

Edge Analysis to H.264/AVC Fast Intra Mode Decision Algorithm and Parallel Hardware Accelerator

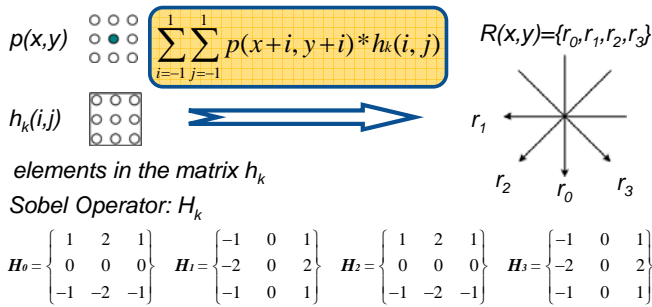
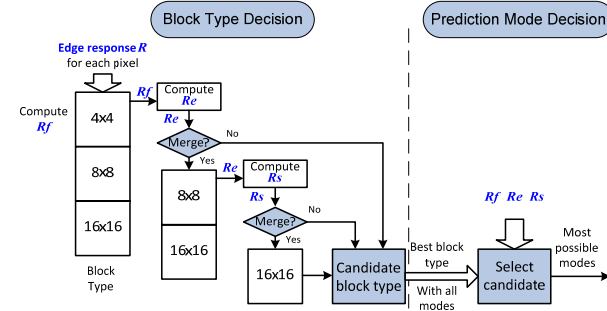
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Research Contents

Edge based Intra Mode Decision Algorithm

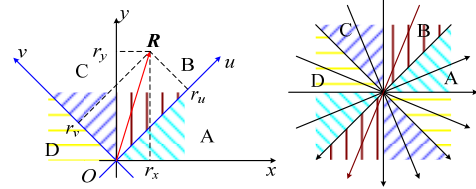
Pre-decide the block type and prediction mode in intra prediction instead of exhaustive search in H.264 encoder.

- Problem: High computation complexity in intra prediction of H.264 encoder.
- Proposal: Pre-decide the block type and prediction mode instead of exhaustive search.
- Target: Low-computation and negligible-quality-loss algorithm



Prediction mode decision

- Select candidates with the **edge response R**



Evaluation result

- Evaluation for number of candidate modes (in 4x4 blocks):

| Sequence | QP=24 | QP=28 | QP=32 | Aver. |
|-----------------|-------|-------|-------|-------|
| mobile(cif) | 2.32 | 2.32 | 2.30 | 2.31 |
| container(qcif) | 2.33 | 2.30 | 2.28 | 2.30 |
| news (qcif) | 2.38 | 2.38 | 2.36 | 2.37 |

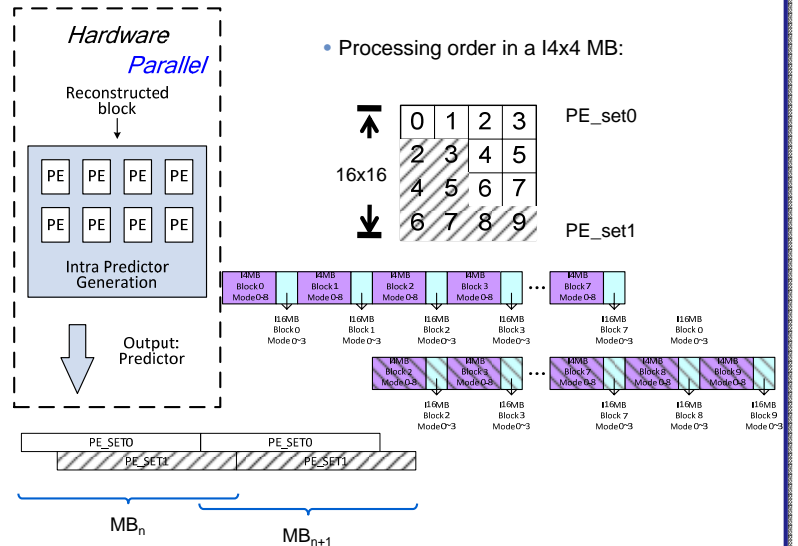
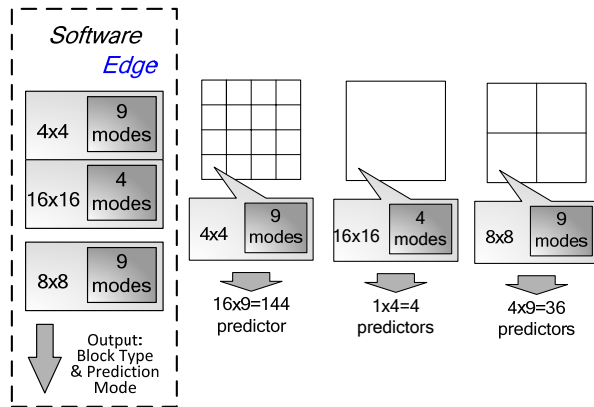
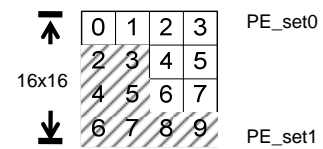
- Evaluation for coding time saving:

| Method | Sequence | Δ Bits(%) | Δ PSNR(dB) | Δ Time (%) |
|----------------------|-----------------|------------------|-------------------|-------------------|
| Pan [1] 8 x 8 Off | mobile(cif) | 3.17 | -0.26 | -59.09 |
| | container(qcif) | 3.70 | -0.23 | -56.36 |
| | news (qcif) | 3.90 | -0.29 | -55.34 |
| Proposed 8 x 8 On | mobile(cif) | 3.75 | -0.19 | -76.63 |
| | container(qcif) | 0.42 | -0.14 | -77.31 |
| | news (qcif) | 5.02 | -0.12 | -75.76 |

Parallel Hardware Accelerator for Intra prediction

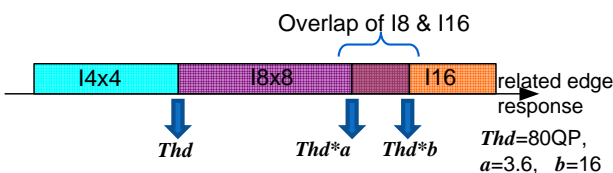
Parallel Hardware Accelerator (Predictor Generator)

- Processing order in a 14x4 MB:



Block type decision

- Different thresholds



- Evaluation result:

| | Y. Huang's | Proposal |
|-----------------------|------------|------------|
| Technology | TSMC 250nm | ROHM 180nm |
| Gate Count | 12945 | 5673 |
| Cycles/MB | 832 | 416 |
| Max. Clock Rate (MHz) | 55.0 | 82.0 |

