Fast Mode and Depth Decision in HEVC Intra Prediction Based on Edge Detection and Partitioning Reconfiguration

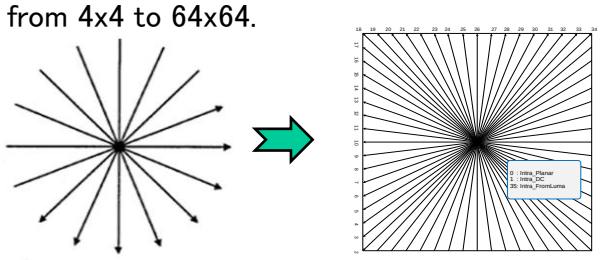
陳高星　池永研究室　修士2年

Research background

HEVC intra prediction

1. In H.264, there are only 9 prediction modes, but HEVC increased to 34 modes.

2. In H.264, intra unit partitioning only 16x16 and 4x4, but HEVC increased to multiples sizes from 4x4 to 64x64.



Directions in H.264　　Directions in HEVC

Target

Fast and efficient intra prediction algorithm is necessary

Proposed method

1,Pixel Gradient Statistics (PGS) and Mode Refinement (MR) based fast mode decision

2, Partitioning reconfiguration based fast depth decision

1, Pixel Gradient Statistics

- Pixel gradient calculation
- Gradient-mode matching
- Mode statistics

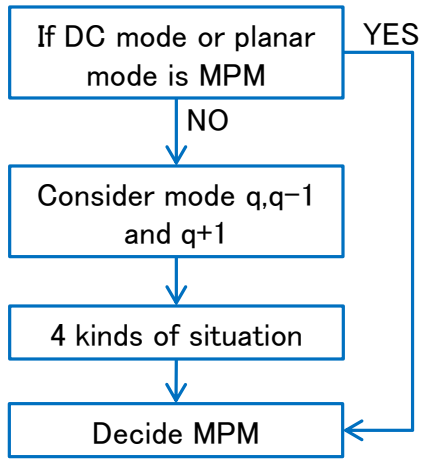
Previous work: theory in Jiang's paper

- Directional preference (muscle, armguard)
- Direction of original block
- Most Probable Mode (MPM)

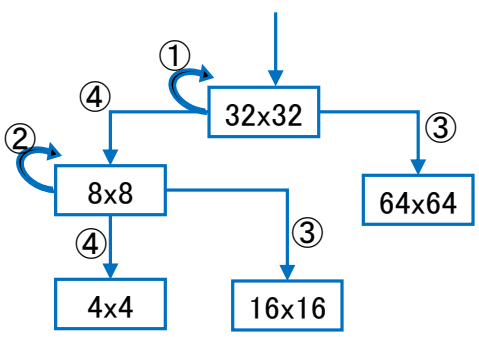
PU Size	H.264	HEVC
4x4	9	35
8x8	0	35
16x16	4	35
32x32	0	35
64x64	0	35

Number of modes and depth in H.264 and HEVC

2, Mode Refinement



3, Partitioning reconfiguration



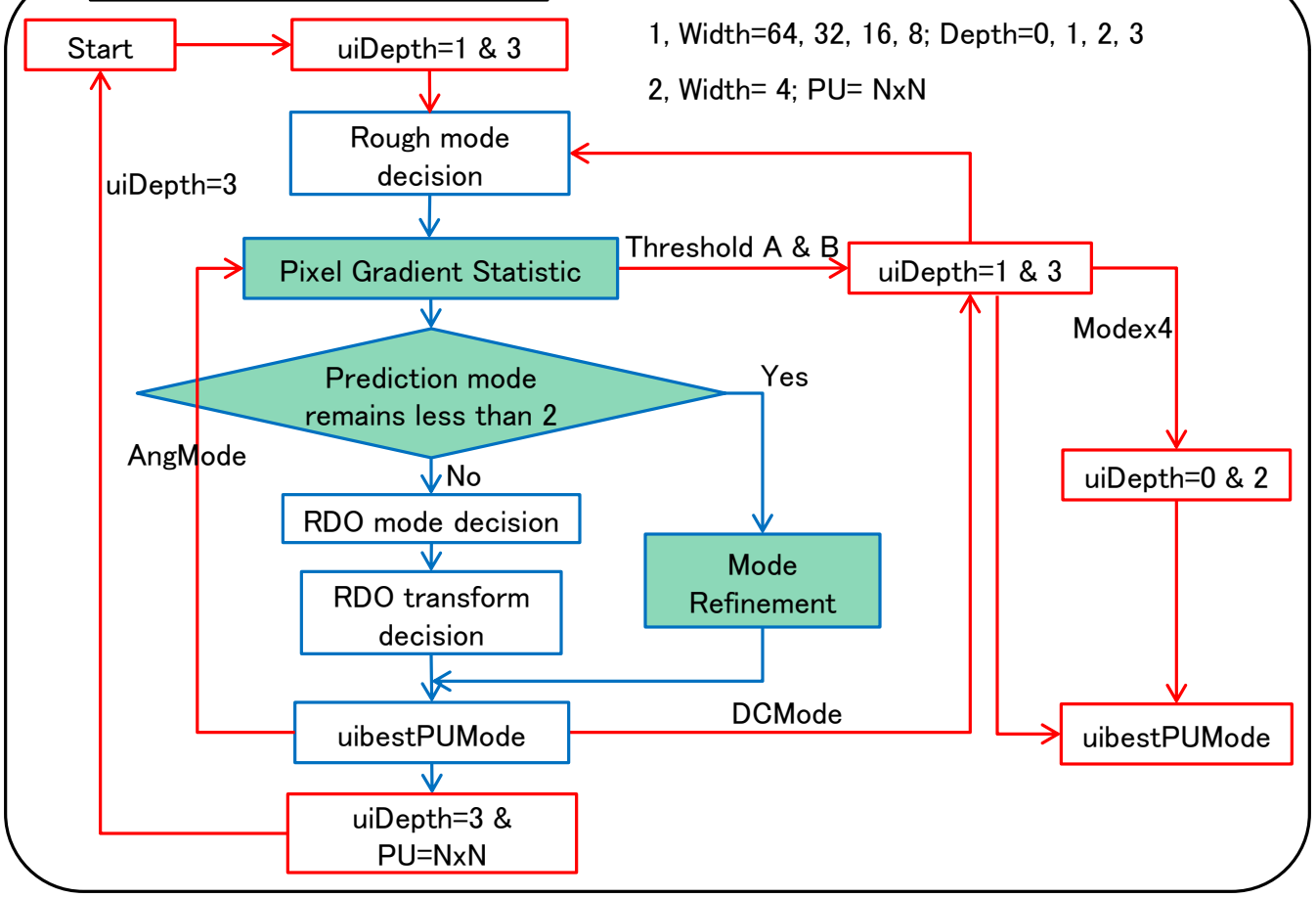
①smoothly:Mode=DC or PGS＞80%

②smoothly:Mode=DC or PGS＞85%

③Same prediction mode for 4 CU

④roughly

Overview flowchart



Simulation result:

	Jiang's Paper			Mode Decision Only			Mode & Depth Decision		
SEQUENCE	BDBR	BDP	TS	BDBR	BDP	TS	BDBR	BDP	TS
Average	0.82	−0.044	19.92	0.53	−0.038	28.45	0.61	−0.041	42.84

Conclusion : With the proposed algorithm, approximately 42.84% time saving can be achieved. BD-Rate increase is only 0.61% and BD-PSNR loss only 0.041db. This result is better than previous work both in time-saving and performance loss.

Graduate School of Information, Production and Systems
Waseda University