

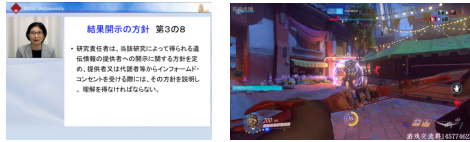
# Content Classification and Non-Square Partition for Fast Inter Prediction of Screen Content Coding

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## Background

### Screen Content Coding

Encode videos generated by computer



Online teaching

Gaming replay

Under inter configuration

Complexity reduction is necessary

## Problem

Inter prediction: takes 78% complexity

4 components of inter

- ① 4 Reference frames (RF)
- ② 4 Coding Unit (CU) Depth
- ③ 8 Prediction Unit (PU)
- ④ Motion Estimation (ME)

## Solution

Reduce complexity by reducing RF and skipping CU & PU

Proposal 1: RF reduction

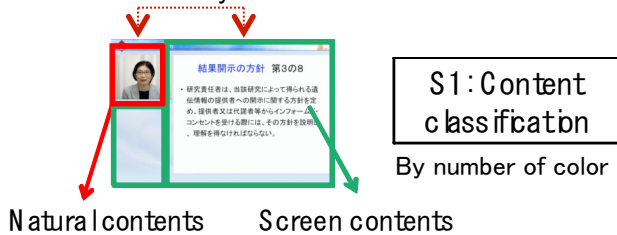
Proposal 2: CU & PU skipping

Conventional (ME simplification)

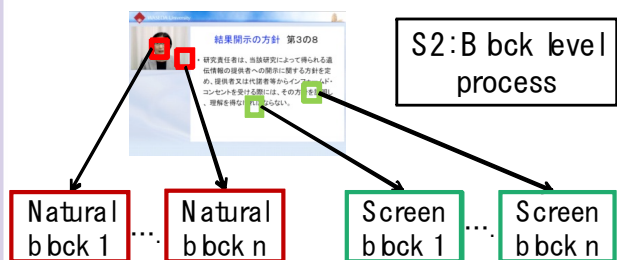
## Proposals

### 1. Content classification based PU level RF reduction

- Different motion leads to different RF selection
- Need to classify contents

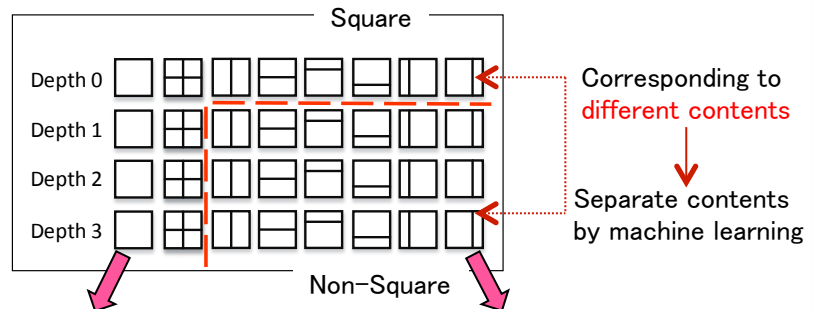


- Different block selects different RF
- Need different RF reduction process



RF reduction for Natural    RF reduction for Screen

### 2: Machine learning based non-square PU skipping

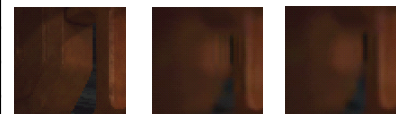


- Use SVM to classify and find simple region with small motion
- Skip non-square PUs in CU depth 1, 2, 3

Merit: few miss RF & PU skipping, reasonable complexity reduction with not obvious efficiency loss

## Experiment result

Categories	Sequences	Xiao's		Proposal 1 & 2	
		BD-rate [%]	TS [%]	BD-rate [%]	TS [%]
Text & Graphics with motion	Flying Gra.	-0.03	4.40	0.11	36.80
	Desktop	0.00	25.40	0.64	41.44
	Console	0.09	10.03	0.79	43.62
	Web Brow.	0.00	34.83	0.03	53.21
	Word Edi.	-	-	0.87	32.72
	Video Conf	-	-	-0.43	32.81
	Map	0.00	18.86	0.56	44.62
	Programming	-0.06	8.39	0.89	37.06
	Slide Show	0.00	12.35	1.43	42.51
Mixed content	Mission Con.	0.00	18.53	0.62	37.01
Animation	Robot	0.01	4.69	2.27	47.31
Average		0.00	15.27	0.71	40.83



Original    SCC    Proposal

Subjective result of worst case  
Observe information loss by enlarging

## Conclusion

Proposed methods can achieve 29.41% more time saving compared with conventional work with 0.71% BD-rate degradation



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