

JVET-AB0098

EE1-2.3 related: GOP Level Adaptive Resampling  
with CNN-based Super Resolution

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# Introdouction

This contribution presents a GOP level adaptive resampling method with CNN-based super resolution.

- At the GOP level, the proposed method can adaptively select a scale factor from  $\times 1.0$  (original size) and  $\times 2.0$  (half size) to determine the encoding resolution, and the designed CNN-based super-resolution will be used for the half size.
- Experimental results show  $\{-4.42\%, -4.83\%, -4.11\% \}$  and  $\{-7.53\%, -8.14\%, -7.24\% \}$  BD-rate savings for  $\{Y, Cb, Cr\}$  under RA and AI configurations, respectively.

# Proposed method

## GOP level encoding resolution decision

- Scale factors at GOP level:  $\times 2.0$  (half size) and  $\times 1.0$  (original size)

$$D_1 = DnUpPSNR_{uv} - BasePSNR_{uv}$$

$$D_2 = DnUpPSNR_y - BasePSNR_y$$

$$D_3 = DnUpPSNR_y - (PredefinedPSNR_y - (QP_i - BaseQP) * 0.5)$$

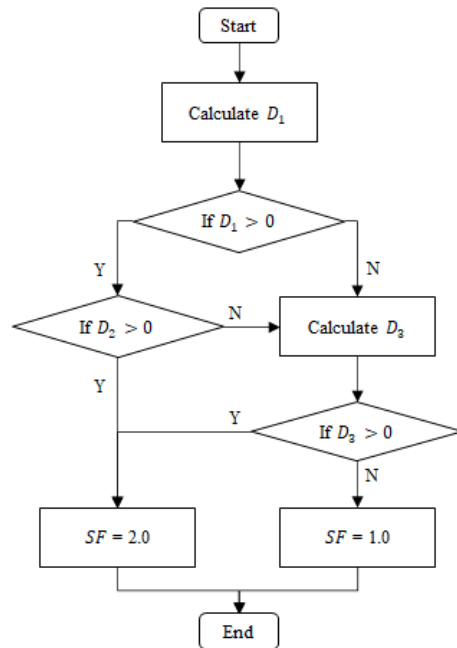


Fig. 1 Scale factor decision for AI

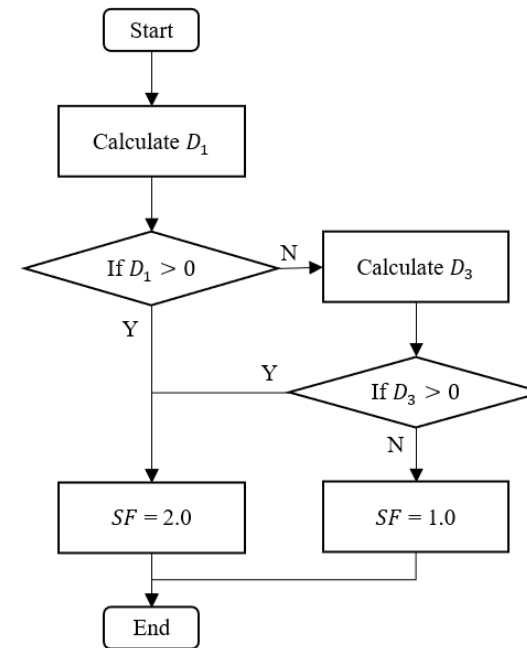


Fig. 2 Scale factor decision for RA

# Proposed method

## CNN-based super-resolution

The super resolution network architectures for luma and chroma are shown in Fig. 3 and Fig. 4 respectively.

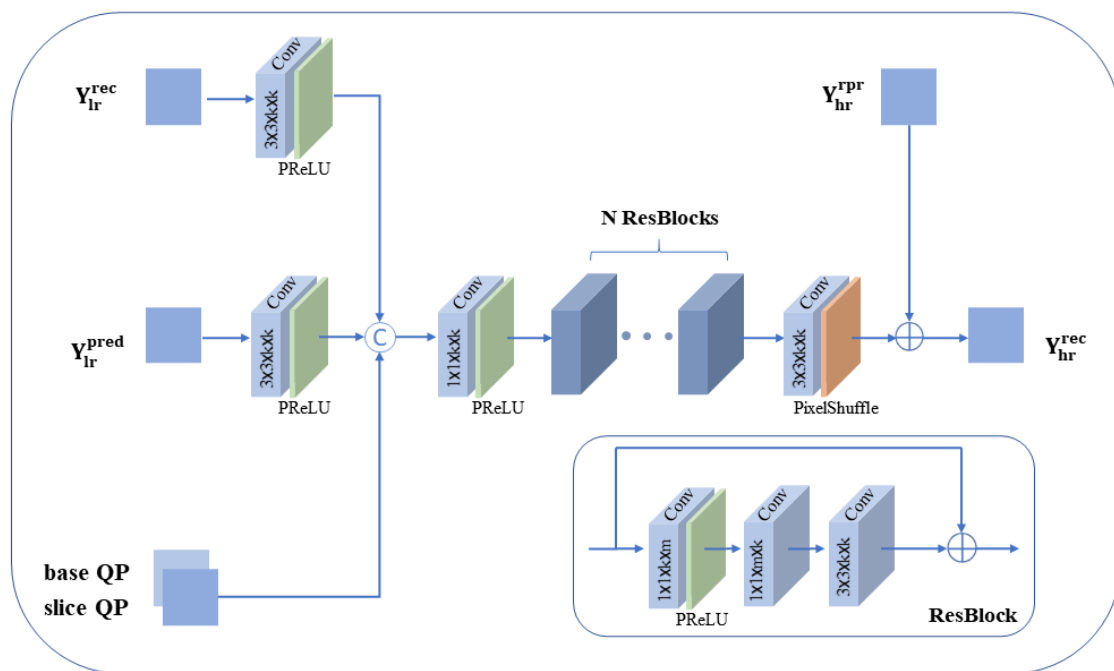


Fig. 3: The super resolution network architecture for luma

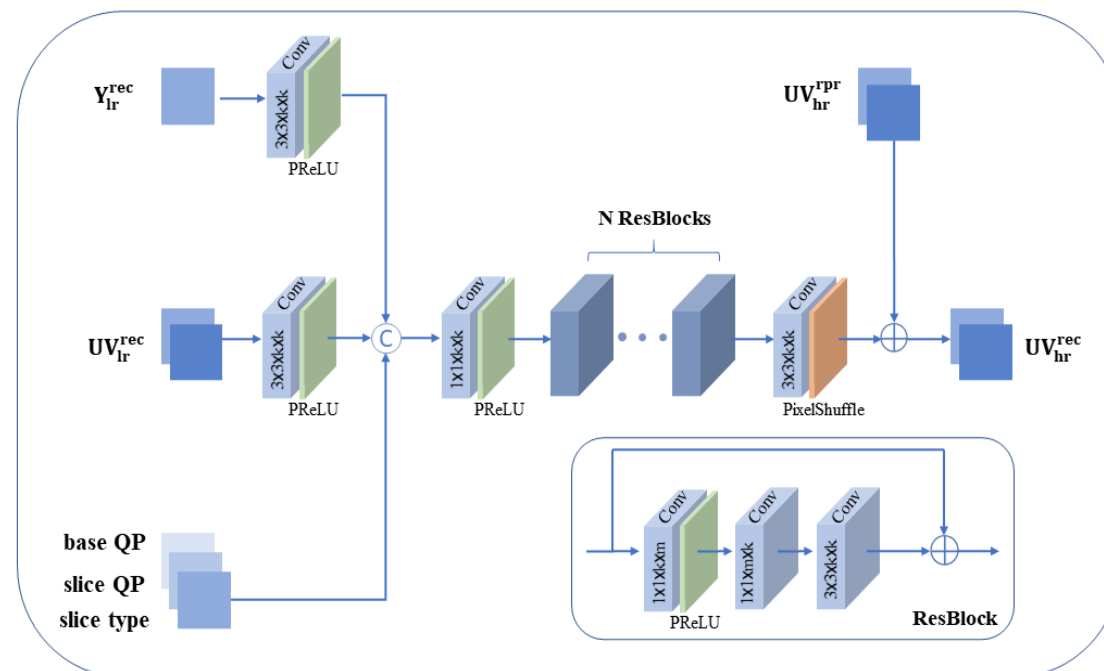


Fig. 4: The super resolution network architecture for chroma

# Results on NNVC-2.0

Table 1. Performance of the proposed method (RA)

		Random Access Main10				
		Over VTM-11.0_nnvc-2.0 (QP 22, 27, 32, 37, 42)				
		Y	U	V	EncT	DecT
Cass A1	Tango2	-12.28%	-24.26%	-16.65%	101%	11895%
	FoodMarket4	-10.28%	-11.50%	-12.86%		
	Campfire	0.45%	0.46%	0.69%		
Class A2	CatRobot1	-0.38%	-0.98%	2.08%	119%	1777%
	DaylightRoad2	-1.49%	0.00%	0.64%		
	ParkRunning3	-2.51%	7.29%	1.45%		
Average on A1		-7.37%	-11.77%	-9.61%	101%	11895%
Average on A2		-1.46%	2.10%	1.39%	119%	1777%
overall		-4.42%	-4.83%	-4.11%	110%	6836%

Table 2. Performance of the proposed method (AI)

		All Intra Main10				
		Over VTM-11.0_nnvc-2.0 (QP 22, 27, 32, 37, 42)				
		Y	U	V	EncT	DecT
Cass A1	Tango2	-13.70%	-18.16%	-14.68%	157%	5577%
	FoodMarket4	-8.77%	-5.62%	-6.75%		
	Campfire	0.01%	0.12%	0.07%		
Class A2	CatRobot1	-11.85%	-6.70%	-3.75%	101%	10595%
	DaylightRoad2	-7.20%	-23.47%	-18.89%		
	ParkRunning3	-3.69%	5.02%	0.59%		
Average on A1		-7.49%	-7.89%	-7.12%	157%	5577%
Average on A2		-7.58%	-8.38%	-7.35%	101%	10595%
overall		-7.53%	-8.14%	-7.24%	129%	8086%



# Conclusions

- In this contribution, a GOP level adaptive resampling method with CNN-based super resolution is tested.
- By considering the difference between luma and chroma component, the proposed resampling factor decision strategy better adaptively select the encoding resolution between an original size and a half size.
- The experimental results verify that the proposed method can bring considerable coding performance.
- It is recommended that this technique be adopted into NCS.

# Thanks

