

# Polygon Texture Unit Visual Encoding

JCTVC-I0546

Sung-Hoon Hong, Byung-Kwan Yi and  
Panos Nasiopoulos

**Centri**

*Center for Technology Research on Intelligence*

# Introduction

Presents a new video compression approach

- Triangle (or arbitrary) shape polygon texture unit for reducing spatial and temporal redundancies
- Partitions raw video frame data to polygon texture blocks first, and then predicts, transforms, quantizes and compresses the partitioned polygon textures
- Achieves approximately 20% bit-savings compared to HEVC

# Polygon Unit Encoding BD-Rate Performance

[BlowingBubbles 416x240.yuv](#)

**H.264/AVC**



**100kbps  
(416x240 50frames  
20kB)**

**HEVC  
(Lowdelay Main)**



**100kbps  
(416x240 50frames  
20kB)**

**Proposed Method**



**100kbps  
(416x240 50frames  
20kB)**

H.264	HEVC	Multi-Texture
-	-48%	-68.2%

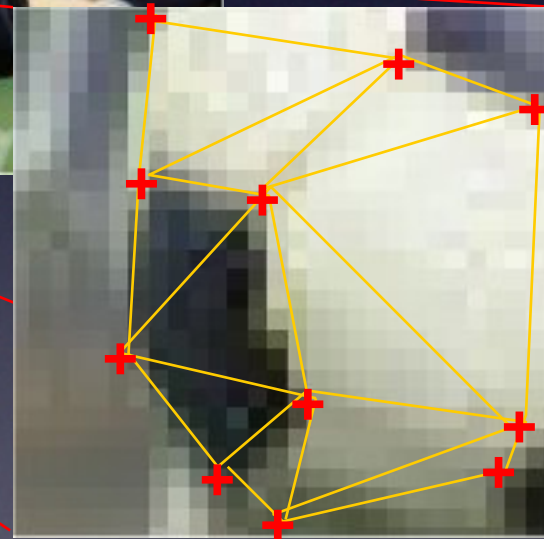


# Polygon Texture Unit Partitioning

Frame



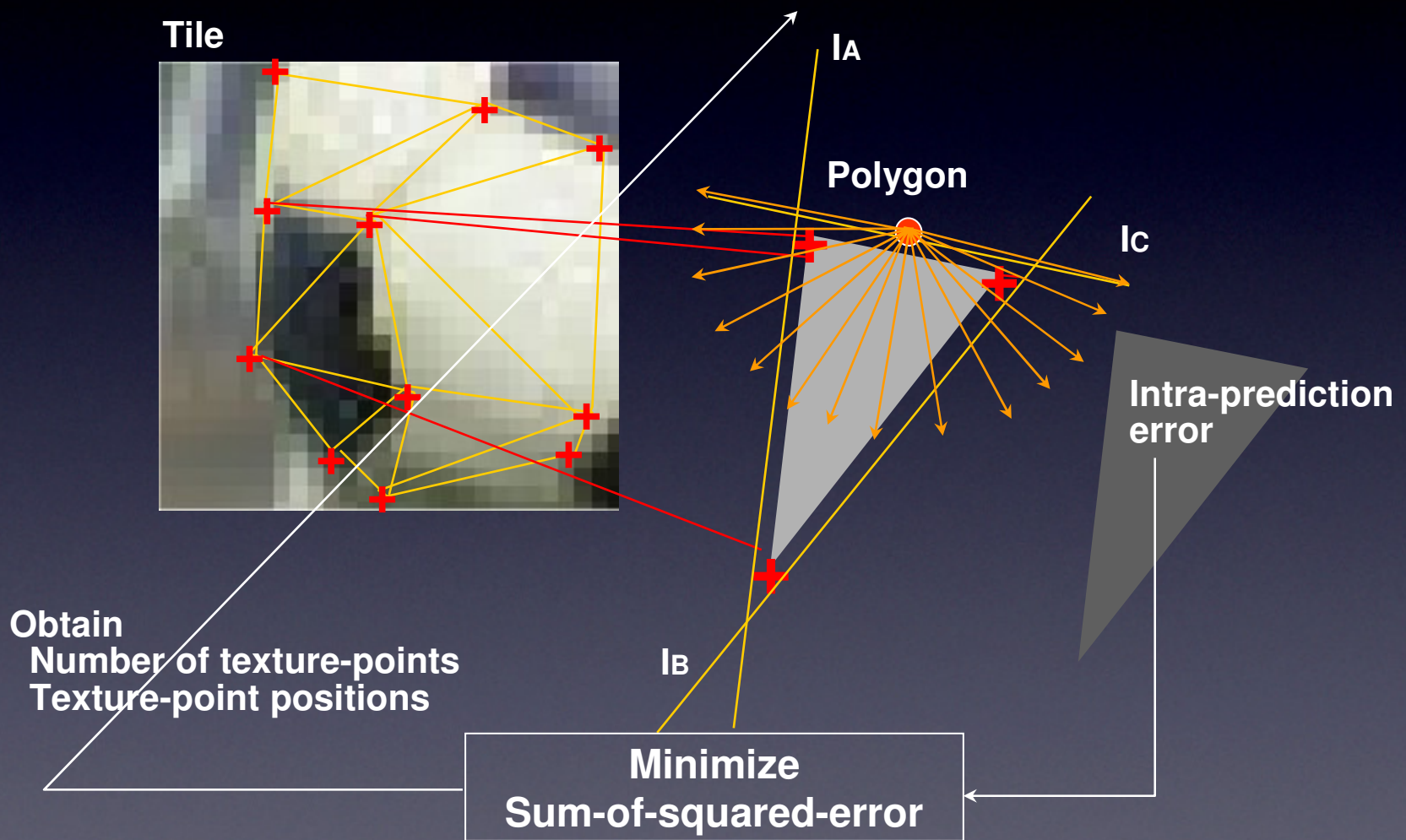
Tile



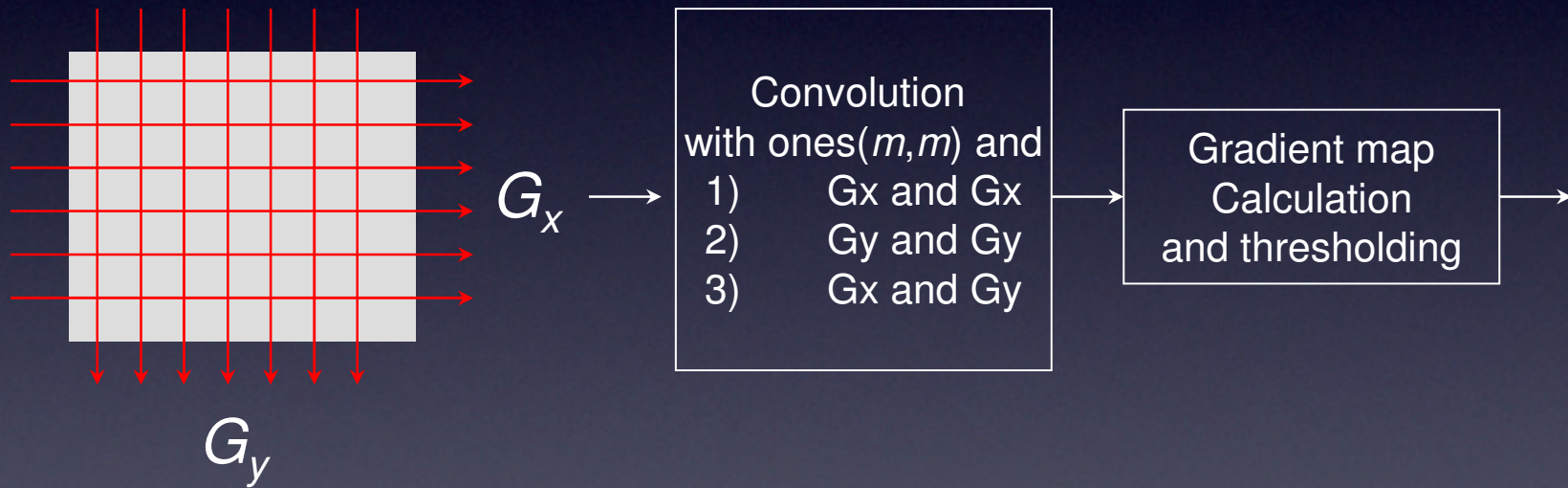
Texture  
point

# Polygon Texture Unit

## Intra Prediction

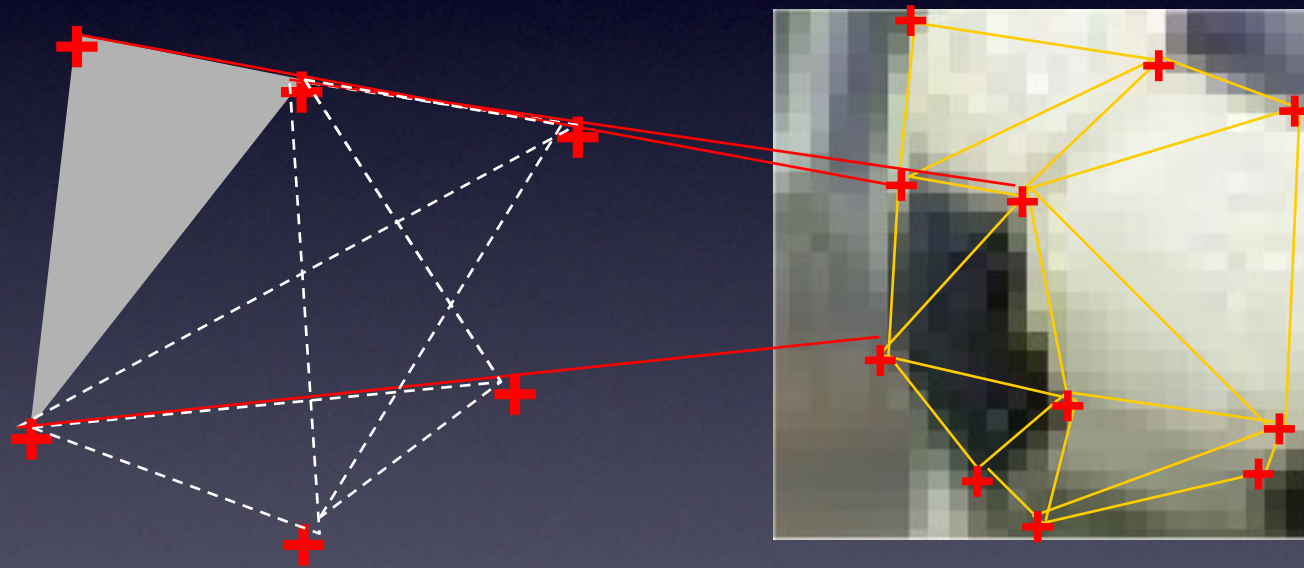


# Initial Texture-Point Detection



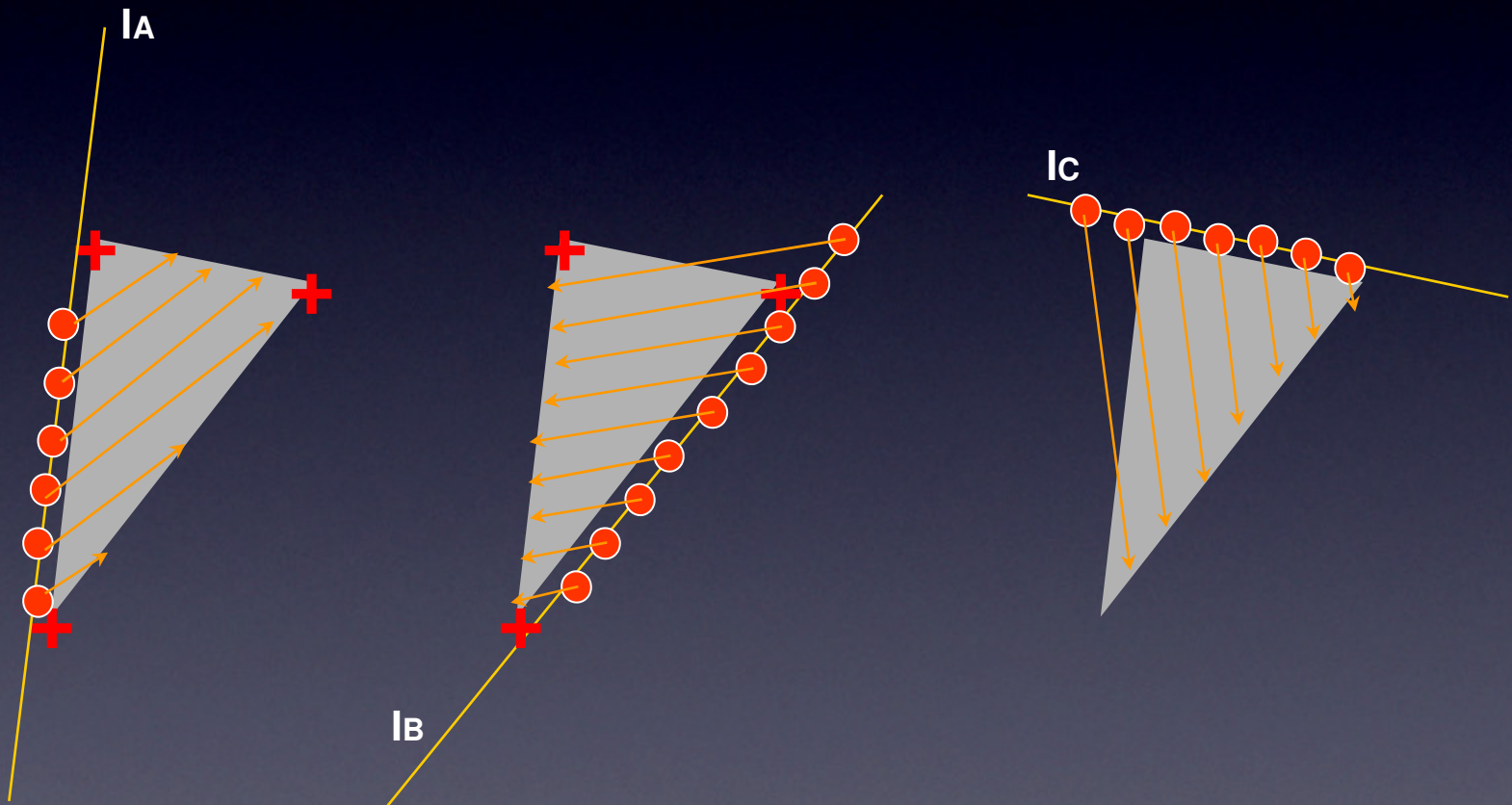


# Polygon Texture Unit Partitioning



# Polygon Texture Unit

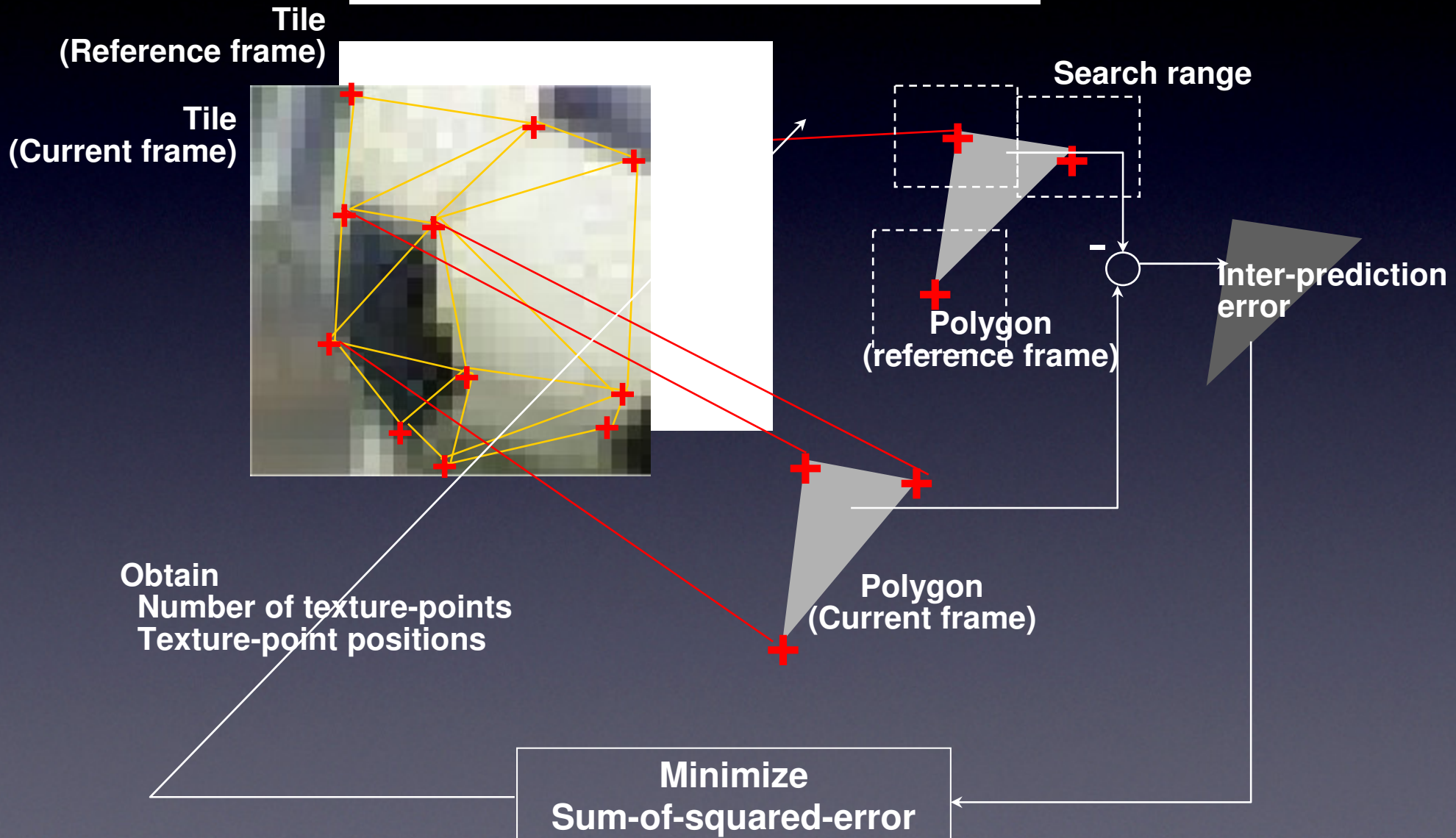
## Intra Prediction





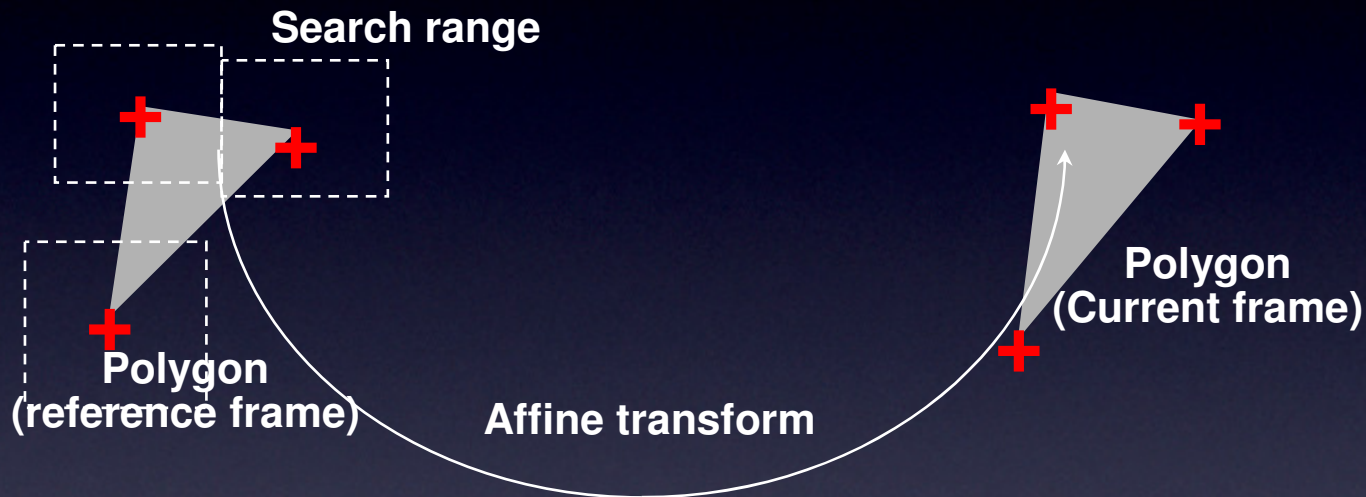
# Polygon Texture Unit

## Inter Prediction



# Polygon Texture Unit

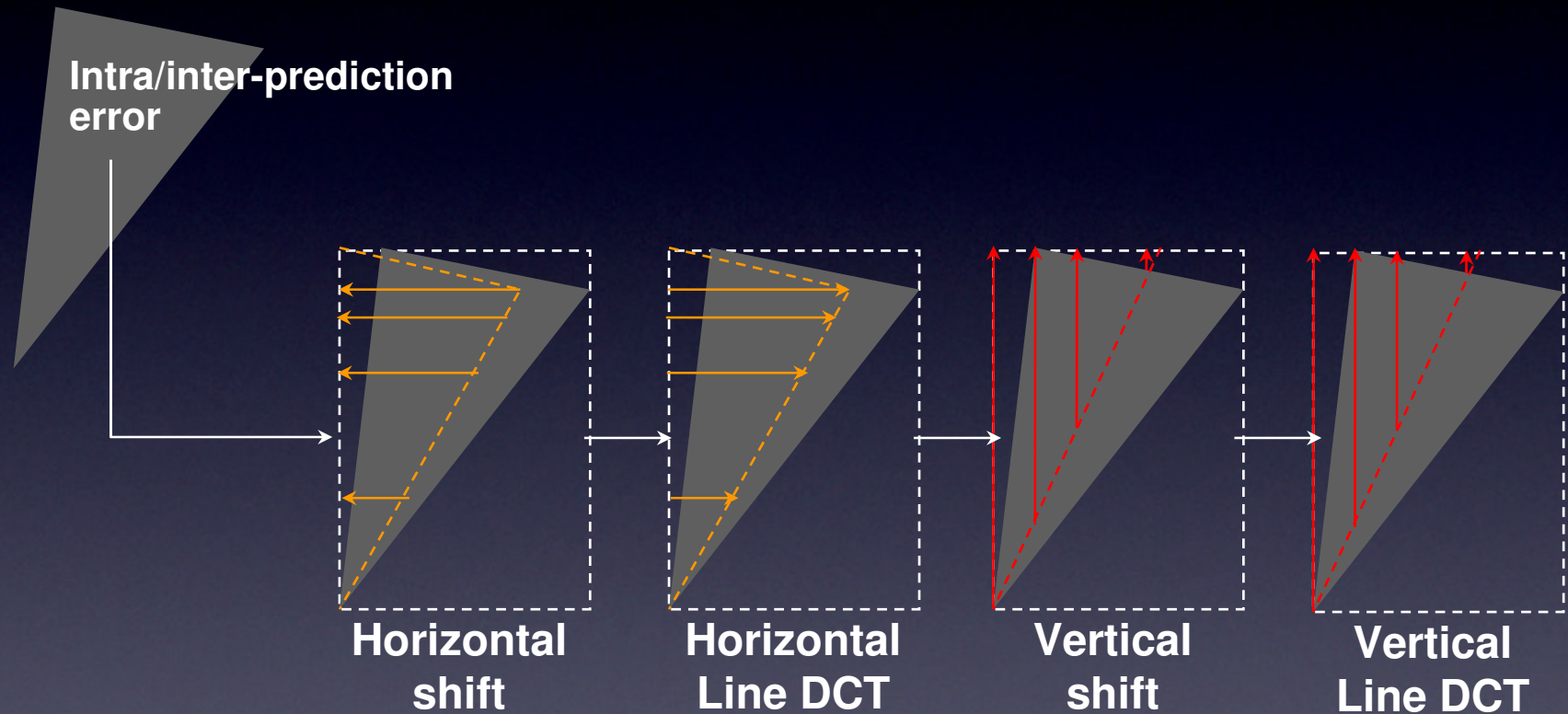
## Inter Prediction



$$\begin{bmatrix} x_t(1) \\ y_t(1) \\ x_t(2) \\ y_t(2) \\ x_t(3) \\ y_t(3) \\ 1 \end{bmatrix} = \begin{bmatrix} & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \end{bmatrix} M \begin{bmatrix} x(1) \\ y(1) \\ x(2) \\ y(2) \\ x(3) \\ y(3) \\ 1 \end{bmatrix}$$

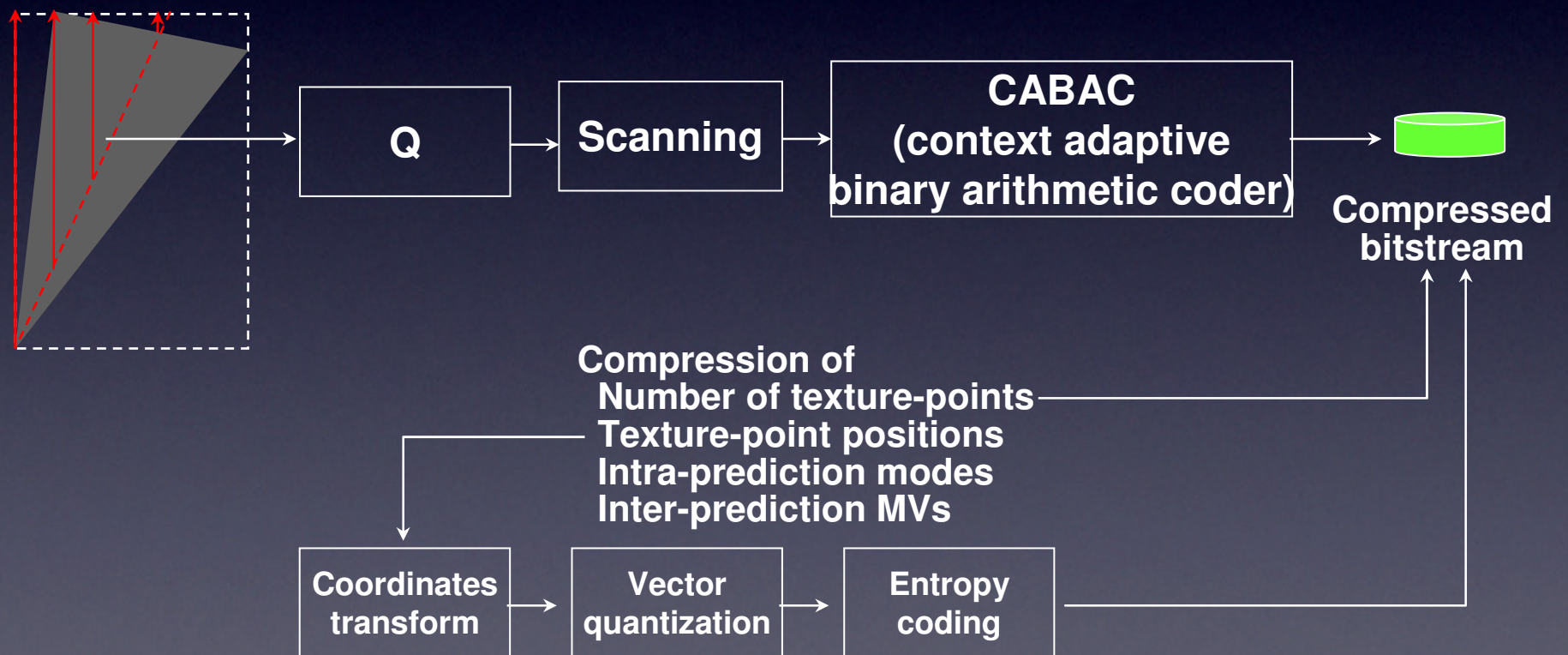
# Polygon Texture Unit

## DCT





# Polygon Texture Unit Compression



# Polygon Unit Encoding Performance Comparison

## Encoding parameter set of the proposed method

- ✓ Average number of polygons per frame (150~300)
- ✓ Affine transform motion vector search range (4~8 pixels)
- ✓ Motion vector precision (1/4 pixel)
- ✓ Maximum polygon partitioning depth (3)
- ✓ Group size of quantized DCT coefficients for CABAC (16)

## Encoding parameter set of HEVC

- ✓ Low delay main

# Polygon Unit Encoding

## BD-Rate Performance

[BasketballPass\\_416x240\\_50.yuv](#)

**H.264/AVC**



**100kbps  
(416x240 50frames  
20kB)**

**HEVC  
(Lowdelay Main)**



**100kbps  
(416x240 50frames  
20kB)**

**Proposed Method**



**100kbps  
(416x240 50frames  
20kB)**

H.264	HEVC	Multi-Texture
-	-32%	-58.9%



# Polygon Unit Encoding BD-Rate Performance

[BlowingBubbles\\_416x240.yuv](#)

**H.264/AVC**



**100kbps  
(416x240 50frames  
20kB)**

**HEVC  
(Lowdelay Main)**



**100kbps  
(416x240 50frames  
20kB)**

**Proposed Method**



**100kbps  
(416x240 50frames  
20kB)**

H.264	HEVC	Multi-Texture
-	-48%	-68.2%

# Conclusion

- Got an unexpected good result with the polygon texture unit and want to let JCT-VC knows.
- Want to suggest JCT-VC to make an ad-hoc approach with the proposed polygon texture unit visual encoding.