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# A multiscale-contour-based interpolation framework for generating a time-varying quasi-dense point cloud sequence

**Key words:** Multi-view video, Free-viewpoint video, Point-pair, Multiscale-contour-based interpolation, Spatio-temporal-contour, Consistency, Time-varying point cloud sequence

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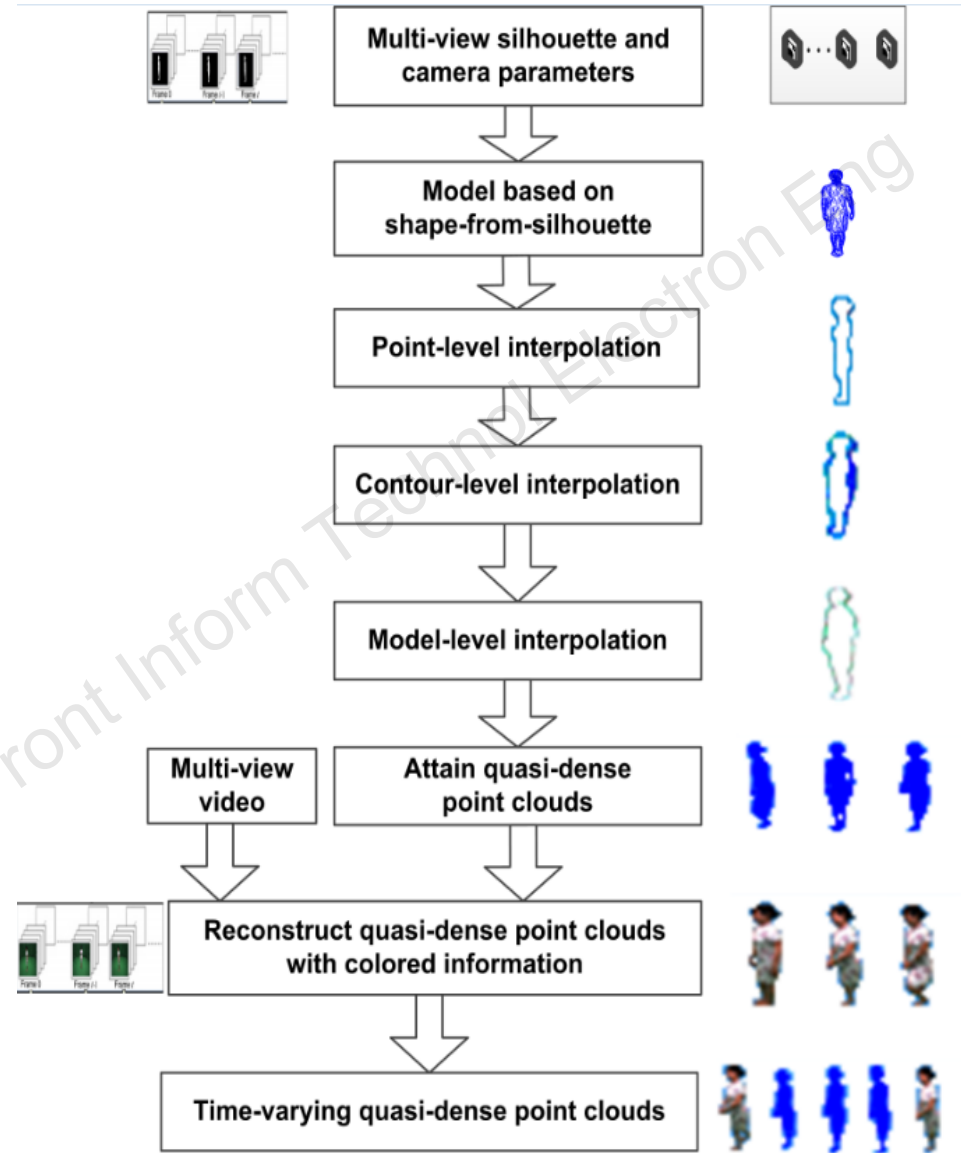
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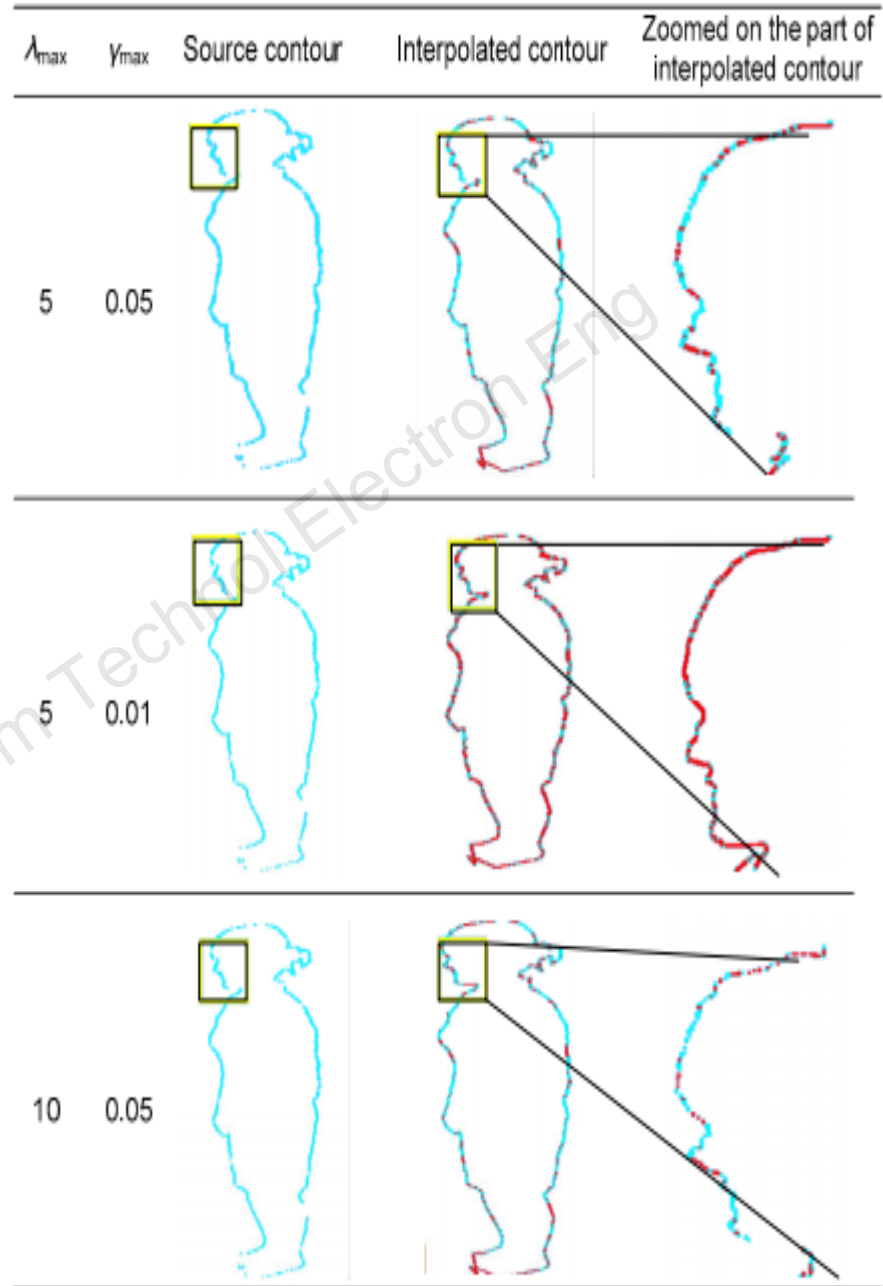
# Introduction

- The reconstruction of 3D dynamic scenes is a key technology to obtain FVV. we propose an efficient framework to reconstruct 3D dynamic objects using a multiscale-contour-based interpolation from MVVs.
- The framework focuses on obtaining a higher frame rate point cloud sequence to generate FVV.
- Improving efficiency by using a multiscale-contour-based framework: We have integrated multiscale spatio-temporal-contour consistency into a framework in three stages: interpolating single contours, interpolating two spatial contours which belong to the same model, and interpolating two spatial contours which belong to different neighboring models.

# Block diagram of the proposed shape tracking system



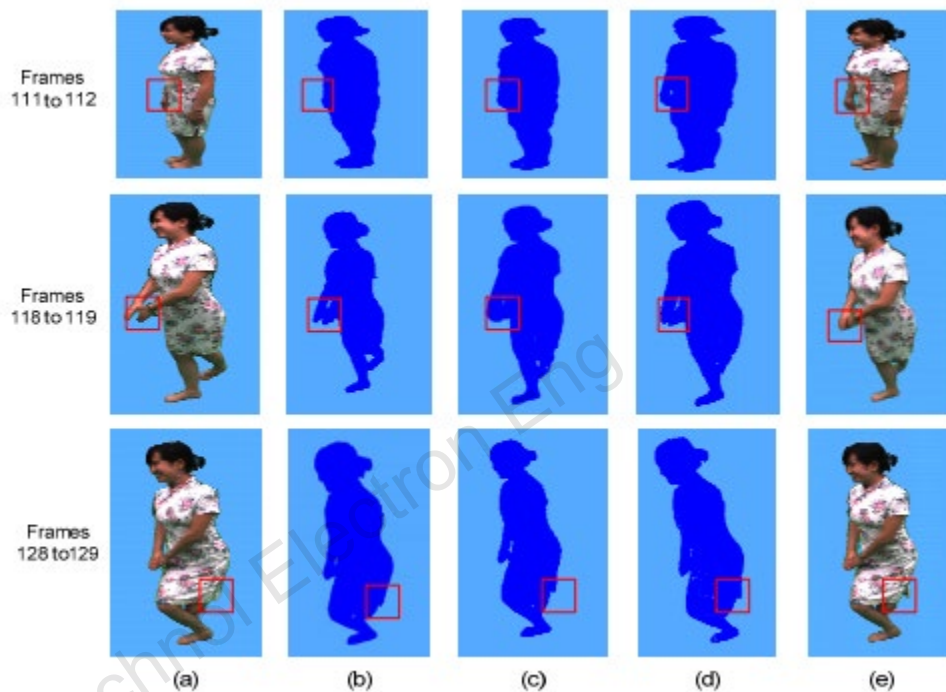
# Point-level interpolation



# Contour-level interpolation

Dataset	$\lambda_{max}$	$\gamma_{max}$	Sparse point cloud	Quasi-dense point cloud	Color quasi-dense point cloud
Lady Dance	5	0.05			
	5	0.01			
	10	0.05			
Redshirt	5	0.05			
	5	0.01			
	10	0.05			
Cheongsam	5	0.05			
	5	0.01			
	10	0.05			

# Model-level interpolation



# Performance comparison

**Table 3 Average reconstruction time per frame between neighboring frames using different methods**

Method	Reconstruction time (s)		
	Frames	Frames	Frames
	111 to 112	118 to 119	128 to 129
Liu <i>et al.</i> (2010)	140.32	138.61	141.94
Bilir and Yemez (2012)	67.45	66.43	71.45
Allain <i>et al.</i> (2015)	80.73	78.72	82.75
Our method	59.26	47.69	49.19

**Table 4 Average reconstruction time per frame through the sequence**

Dataset	Method	Time (s)
Cheongsam	Liu <i>et al.</i> (2010)	142.68
	Bilir and Yemez (2012)	67.45
	Allain <i>et al.</i> (2015)	80.85
	Our method	52.59
Redskirt	Liu <i>et al.</i> (2010)	145.45
	Bilir and Yemez (2012)	68.45
	Allain <i>et al.</i> (2015)	80.78
	Our method	56.54

# Conclusions

- We have proposed an interpolation framework to construct the shape of an object. The interpolation is performed within a frame, between neighboring frames temporally, and between neighboring frames.
- We have obtained a higher frame rate, spatio-temporal-coherence, and quasi-dense point cloud sequence with color information.
- Speeding up reconstruction by using the multiscale-contour-based framework. According to the different levels of the contour consistency, we integrated the multiscale spatio-temporal-contour consistency into a framework and made good use of these consistencies to reduce the reconstruction time.