Exploiting the potential of image based crowd rendering

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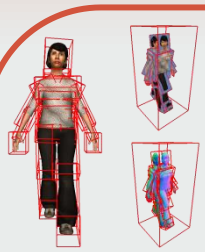
Per-joint impostors achieve high performance when rendering thousands of agents, while still allowing us to blend animation. This provides interactively animated crowds and reduces the memory footprint compared to classic impostors. In this poster we exploit the potential of per joint impostors to further increase both visual quality and performance. The CAVAST framework for crowd simulation and rendering has been used to quantitatively evaluate our improvements with the profiling tools that it provides. Since different applications will have different needs in terms of performance vs. visual quality, we have extended CAVAST with a new user interface to ease this process.



Relief Impostors

- Animate boxes with rigid transf.
- Fragment shader recover the original geometry using a dual dual-depth version of relief mapping.

Improvements:

- Adaptive Texture Resolution
- Adaptive number of linear and binary steps
- Secant method for relief mapping

Flat Impostors

- Animate cube maps (Voronoi map for each limb)
- Retrieve the fragment color with a single texture lookup.

Improvements:

- Adaptive Texture Resolution
- Adaptive number of views
- Real joint rotations for masks

CAVAST

Modular architecture for simulation animation and rendering of crowds in real time.

https://sites.google.com/site/cavastproject

- Incorporated color modulation and pre-computed lighting (less memory and faster computation).
- New interface for parameter fitting (LODs, adaptive texture resolutions, number of steps, views, etc.)

Beacco A., Pelechano N., : *CAVAST: The crowd animation, visualization, and simulation testbed.* CEIG Spanish Conference on Computer Graphic . Eurographics Spanish chapter (2014)

Results:

Perceptual studies to evaluate at what distance artifacts appear for each type of impostor: classic (billboards), relief or flat

Street view

Aerial view

Time and distance for which each impostor type was detected, and the percentage of errors made by participants:

Impostor type	Classic	Flat	Relief
Mean time (s)	10,5	21,1	23,9
Mean distance	15,5	10,7	8,9
Miss %	6%	9%	15%

Experiments: 22 participants (16 males and 6 females). Resolution of 1920*1080 pixels. Distance user – screen: 60 cm. Each user watched 36 videos in random order (2views*3impostor_type*2videos_impostor*3repetitions)

Performance RI		# steps	Speed up
Adaptive steps	Linear	[16,128]	3.7x
	Binary	[4,10]	
Secant method	Linear	8	1.5x
	max (bin/sec)	100	

Memory usage		# Views	Texture Res.	MB
Classic (25 frames)		128	64^2	100.0
Flat	head	128	128^2	58.7
	others	72	64^2	
Relief	head	6	128^2	4.3
	others		64^2	

1. Beacco A., Andújar C., Pelechano N., Spanlang B.: *Efficient rendering of animated characters through optimized per-joint impostors*. Computer Animation and Virtual Worlds 23 (2): 33–47 (2012).
2. Beacco A., Spanlang B., Andújar C., Pelechano N.: *A flexible approach for output-sensitive rendering of animated characters*. Computer Graphics Forum 30 (8): 2328-2340 (2011).