

Research Methods in Computer Graphics

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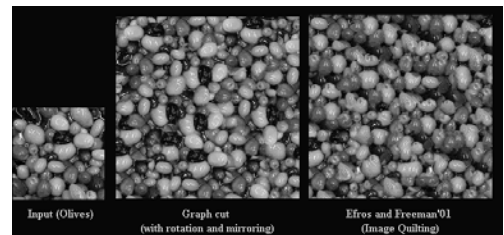
Common Frameworks

- real-time vs off-line
- realistic vs stylized
- easy-to-use vs polished results
- data / user / algorithm - driven

Common Tools

- precomputation or compression
 - PCA, SVD, RBF, MDP, ... (machine learning)
- pose as optimization problem

Graph-cut Textures



Graph-cut Textures



Graph-cut Textures paper

- textures:
 - parametric vs non-parametric models
- motivations ?
- proposed solution ?
- evaluation ?
- contributions ?
- future work ?

Animated Presentations paper

- well written ?
- motivations ?
- proposed solution ?
- evaluation ?
- contributions ?
- future work ?

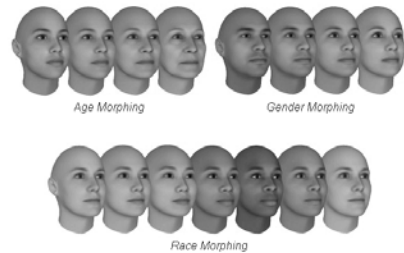
Recent Progress in CG

- texture synthesis
- graphics hardware, pixel shaders
- flexible GPU usage
 - numerical sims
- fluid + fire sims [demo]
- fracture [demo]
- cloth sims [demo]

Recent Progress (cont.)

- deformable model sims
- point-based rendering
- automated mocap processing
- parameterized models
 - eigen-faces, eigen-bodies [demo]
- levels of detail
- sound simulation

Recent Progress (cont.)



Recent Progress (cont.)

- non-photorealistic rendering
- data-based reflection models
- high-dynamic range images
- photo-real synthetic actors

Open Problems in CG

- 3d user modeling tools
 - wide-spread 3D authoring
- 3d automated acquisition
 - image-based model acquisition
- real-time fluid sim
- real-time cloth sim
- believable non-physical motions

Open Problems (cont.)

- graphics system compilers
- perceptually-based graphics
- high dynamic range displays
- character animation
 - composable motion behaviors
 - interfaces for directing characters

Stereotype of Research Method

- choose phenomena
- dig into literature
- build a first-order model
- refine model

Evaluation

- does it solve a new problem ?
 - new phenomena, acquisition technique, ...
 - new use of hardware
- does it solve an old problem ?
 - space, time, accuracy / quality
 - system integration
- compare with previous work
- compare with real phenomena

Evaluation (cont.)

- user tests (rare)
- reproducible results
 - easy for others to compare

Issues Particular to CG

- contribution of imported ideas
 - export of ideas
- unpublished results from film, games
- conferences vs journals
- emphasis on polish of results

Issues (cont.)

- barriers to entry
 - complex sw systems, \$\$ hw
- a few self-sustaining “ungrounded” research areas

next class: RM in SW Eng

- On the Criteria to be used in decomposing systems into modules

David Parnas. CACM, 15(12), 1053-1058

- Invariant Inference for Static Checking: An Empirical Evaluation

Nimmer and Ernst. Proc. of FSE 2002

next class... Gail Murphy

- In this class (lecture), we will discuss the kinds of problems and approaches taken to research in programming languages and software engineering. Since my background is in software engineering, we'll focus more on that area than programming languages (but we will discuss the differences).

Please read the two assigned papers "before" class and fill in the reading evaluation form for each paper "before" class. These two papers show two kinds of problems tackled in these research areas, demonstrate some of the differences in evaluation approaches taken (particularly how research methods are evolving in this area). Come prepared to discuss these papers! (i.e., I don't expect to be doing all, or even most, of the talking).