

SAN ANTONIO
SIGGRAPH
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Recreating the Past

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Quantifying Realism

Alan Chalmers

The need for realism

- Archaeological sites can be easily reconstructed on a computer
- Such “pretty pictures” can be misleading
- Quantifiable realism is *essential* if such reconstructions are to be useful tools for the archaeologist



Different fuel types



Modern lighting



Tallow candle



Olive oil



With salt



With water

Ancient light sources



Realistic flame



oil



oil+water



oil+salt



Spectral readings of different fuel types

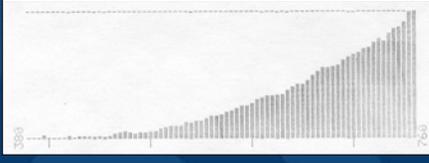
Spectral properties



oil+salt



oil



Process

Original Image → Crop → Threshold → Sphere Data → Radiance Data Files



video

Results



Turbulent flame



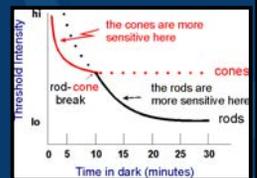
Validation

Ioannis Roussos



Visual Adaptation

Ferwerda et al, 1996



a) daylight: 1000 cd/m²



c) moonlight: 0.04 cd/m²

High Dynamic Range Scenes



Greg Ward et al. 1997



Image Quality

- **Why do we need high fidelity images?**
 - How do I know this image is real?



No absolute truths

- **For sites which no longer exist or have yet been built**
 - User must have confidence in the image



Photo-Realism vs High Fidelity

- **What is reality?**
 - Image synthesis techniques allow us to simulate accurately light distribution within a scene \Rightarrow does NOT imply high fidelity visual appearance



Problems

- **Lack of high fidelity due to:**
 - problems with modelling the scene
 - residual shortcomings of the rendering process
 - limited dynamic range of displays
 - extent to which human vision encodes such departures from perfect physical realism

Image Quality Metrics

- **Trying to provide quantitative data**
 - real vs photograph
 - real vs synthetic
 - photograph vs synthetic



MSE: 3297.343

Realistic images

Patrick Ledda & Peter Longhurst



Scruffy textures



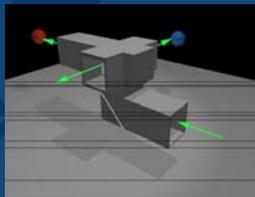
Level of scruffiness



Is a Photo more Real than Reality?

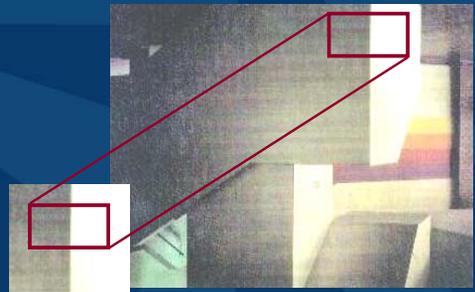


Calibrating *Believable* Reality

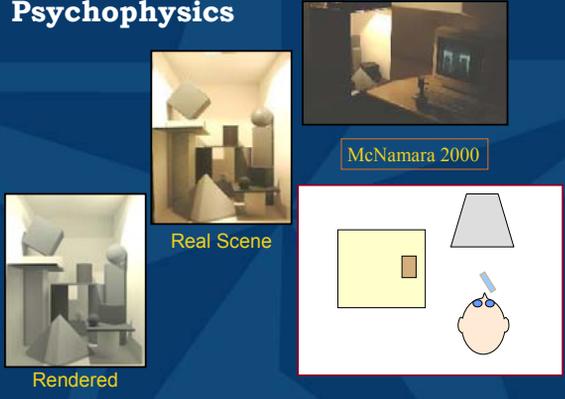


Lightness

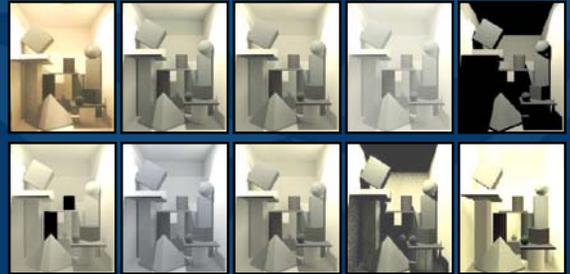
Gilchrist 1977



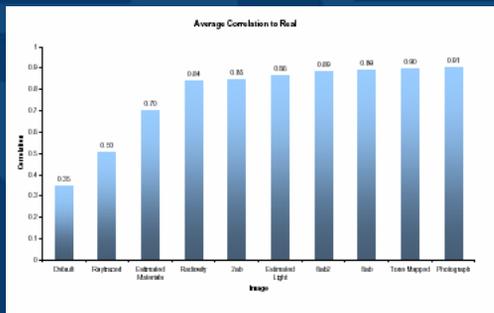
Psychophysics



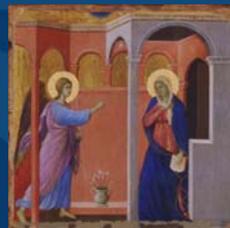
Graphic Reconstructions



Quantifiable Realism



Perception of Art



Modern lighting



Candle Light

The Human Visual System

Kirsten Cater

- *Good but not perfect!*



Flaws in the human visual system:

- Change Blindness
- Inattention Blindness

Avoid wasting computational time

Magic trick to demonstrate Inattention Blindness

- Please choose one of the six cards below.



Focus on that card you have chosen.

Magic trick (2)

- I've shuffled the cards and removed the one which I think was your card.



Can you still remember your card?

Magic trick (3)

- Here are the remaining five cards, is your card there?



Did I guess right? Or is it an illusion?

Magic trick - Explanation

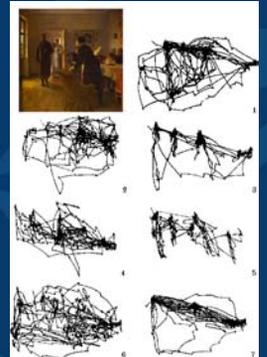
- You just experienced *Inattentional Blindness*
- None** of the original six cards was displayed!



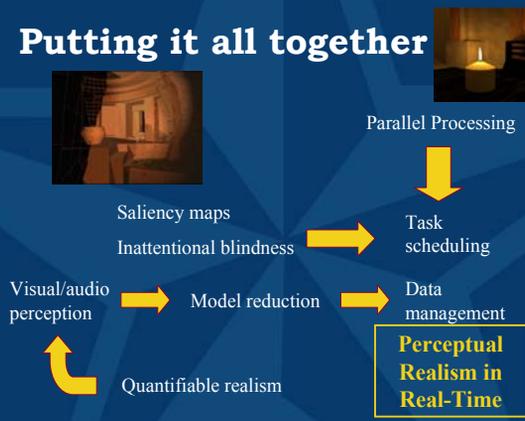
Tracking eye movements

- Bottom up**
 - Saliency maps
- Top down**
 - Inattentional blindness

Yarbus 1967



Putting it all together



Summary

It's all about Lighting!

- High fidelity reconstructions of *your* sites
- Unique wealth of display & research opportunities
- More details at:
 - www.archlight.co.uk
 - Email: Alan.Chalmers@bris.ac.uk

