

The Application of Direct – write 3D Hardcopy Holography in Art & Design

By Michael Page

Ontario College of Art & Design

Synopsis

- Once described as the perfect solution to which there are no problems, holography with the advent of digital imaging techniques, is finding its way into nearly all aspects of 3D visualization as hard copy print out.

The Direct write process

Removes some of the barriers to the application of digital holography to commercial printing:


- Full colour (true colour) holograms look the same as the computer graphic image that created the hologram.
- Large format: images can be “tiled” to form mural sized holograms.
- Automated, direct-from-digital process radically reduces cost of printing. 25% of cost in 2000.

Play direct write animation and Dubai

The computational barrier

RENDERING ISSUES RE: FULL PARALLAX

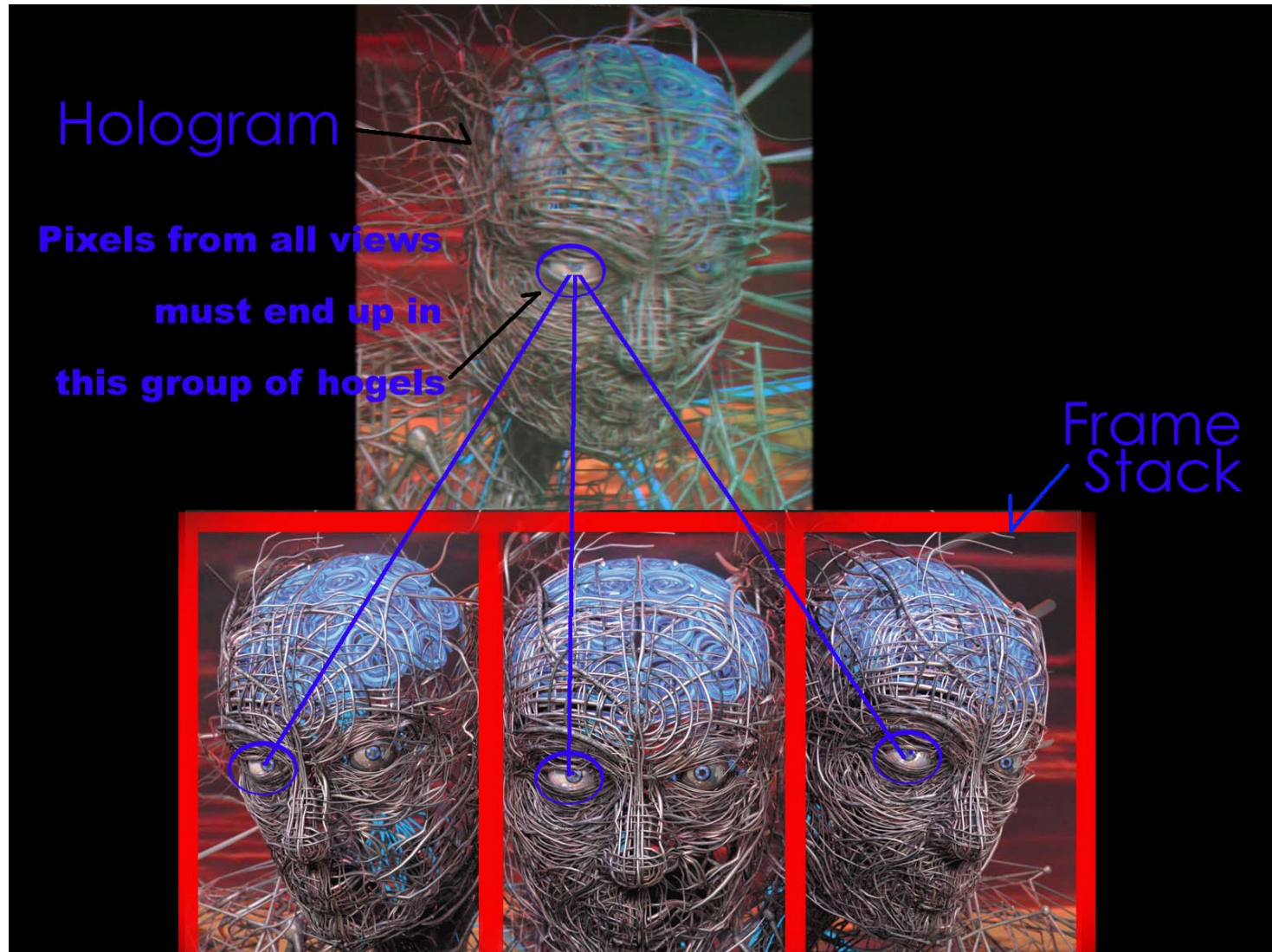
700MM X
1000MM
=700,000 sq.MM
AT 1.6MM HOGEL
SIZE, THIS
CORRESPONDS TO
NEARLY 440,000
HOGELS OR MORE
THAN 5 HOURS
OF 3D ANIMATION
IN THIS ONE
HOLOGRAM



70cm

100cm

Pixel Swapping Algorithm



Remaining barriers include:

- Lack of mass production techniques (currently each hologram is a one-off)
- Computational issues (relating to full parallax)
- Illumination issues (Holograms require an outboard light source to illuminate the image relative to the size of the hologram.)
- Who can make holograms?
- What type of imagery can be used in holograms?

Image After the Algorithm

- The image being recorded on the film, bares no resemblance to the images on the frame stack.

Play pixel swapping .mov

Some solutions

- Scientists are currently working north of Toronto to develop a contact copy method of printing copies of direct-write master holograms
- Scientists at MIT are working on edge-lit holograms, which would allow smaller holograms to be attached to a clipboard-like display.
- Microlens arrays or holographic layers could reduce the illumination distances required for illuminating larger format images.
- Computational issues. The development of inexpensive, massively parallel GPUs? (this issue appears to be taking care of itself)

Holographic Portrait of Queen

Commissioned at £150,000, an argument for holographic
portraiture



Rabbit Holes Media

RabbitHoles Media Inc.



- » Digital holography has now grown to be a commercially available full-colour process. Currently, the printing process begins as a series of digital files, typically derived from 3D computer graphics applications such as 3D Studio Max or Maya. Computer graphics production can be a labour-intensive, costly process.
- » What if we simply want to print a hologram of some pre-existing object or a human subject, a museum artifact or products in natural or studio lighting. **This limitation greatly impedes the adoption of this technology as a viable medium for imaging of all kinds.**

An early solution to getting the many perspective views required to make a hologram of real-world objects.
Yes, those are all Nikon film cameras



Photo Courtesy of Steven Smith

The RAIL Project

Real-World Acquisition Image Liaison

A holographic scanner

Play RAIL portrait.mov

Play RAIL_red one .mov

Play married couple.mov

Who can use holography and for what purpose?

- The R.A.I.L.* system will be configurable for production using high-end digital photographic gear or standard & high-definition TV cameras.
- The software will record living subjects and real objects with absolute precision, adjusting instantaneously for printer specifications.
- The optically encoded motors will be programmable and will “remember” preset compositions, providing exact camera-matched geometry for compositing real-world scenes with computer-generated data.
- This turn-key system can be used by professional photographers, holographers and others, around the world.
- Images can be FTPed from anywhere to the service bureau for printing the next day.

Who are the likely adopters of this technology?

- Hard-copy medical and scientific visualization
- Photographers /Portraits
- Architects /Architectural Models
- Advertisers /Print media advertising
- Entertainment /Movie posters
- Museums /Artifact replication

Thanks!

- Special thanks to the OCE who believed that artists sometimes have great ideas too and supporting our research.
- To OCAD for believing in our team and our collective vision

Some links to learn more about holography

<http://www.rabbitholes.com/>

www.holographer.org

www.photonleague.org

www.ocadhologallery.com

www.hotoniximaging.com

Email: mpage@faculty.ocad.ca