SFX - Tricks of the Trade 2009

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Fido Stockholm
... and 20 or so commercials
CTO what?

- Chief Technical Officer
- Building a high-end digital studio in Stockholm
- Front edge research in Sweden (LIU/KTH)
- [www.fido.se/rnd](http://www.fido.se/rnd)
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SFX/VFX

- **SFX** - Special Effects
  In-Camera effects, done on location

- **VFX** - Visual Effects
  Digital Effects, done in post
Workflow

Client

Research & Development

On-Set
Integration
Models
Miniatures
Make-Up

Backplates
Conversion
Wire removal
Rotoscoping
Dustbusting

Pre-Viz

Modeling

Animation
Lookdev

Hair/Feather
Cloth
FX

Lighting/
Rendering

Matte Paintings

Compositing
• **Involves Producers and Supervisors**
  - Producer - The money guy and negotiator
  - CG/VFX Supervisor

• **Feature: Script breakdown**
• **Commercial: Treatment + Pitch**
• **Story Board - Sometimes**
Bid
Conceptual
Pre-viz
R&D
On-set
Backplates
Modeling
Lookdev
Animation
FX
Cloth
Hair/Feathers
Matte Paintings
Lighting
Rendering
Compositing
Pre-viz

Bid
Conceptual
Pre-viz
R&D
On-set
Backplates
Modeling
Lookdev
Animation
FX
Cloth
Hair/Feathers
Matte Paintings
Lighting
Rendering
Compositing
A very important part of production

- Takes time and cost money
- No guarantee of success

- Fluid systems
- Hair & Feather Systems
- Volume rendering
- Shaders
- Crowd systems
On-set (Integration team)

Bid
Conceptual
Pre-viz
R&D
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On-set (Integration team)

Camera/Lens information
Lens distortion
Light Information
HDRI
Promote
On-set (Integration team)

- Blue or green screen? Why not red screen?
- Creating mattes is called keying
- Chroma key
- Luma Key
- Difference matting
On-set (Models & Miniatures)

Have traditional models played there part?
Difficulties shooting models
Depth of field
Correct camera speed
Motion Control
Motion Control
Repeat pre programmed movements precisely
On-set (Animatronic)

Bid
Conceptual
Pre-viz
R&D
**On-set**
Backplates
Modeling
Lookdev
Animation
FX
Cloth
Hair/Feathers
Matte Paintings
Lighting
Rendering
Compositing
Backplates - Rotoscoping, Wire Removal & Dust busting

Conversion
Colorspaces
DPX - Linear
Modeling

Tools
• ZBrush
• Mudbox
• Maya
• UV-Layout
• Wacom/Scanner

• Digital modeling
• Digitizing clay models
• 3D/Lidar Scanning
• Imagebased Modeling
• Procedual Modeling
Lookdev

Tools
• ZBrush
• Photoshop
• Maya + Slim

• Defining colors
• Textures & shaders
• Base light setup/look
Animation and Rigging

Tools
• Maya
• Houdini (rarely)
• Motion Builder

• Rigging and Skinning
• Technical & Complex
• Necessary funcionality
Animation and Rigging

Animating digital characters
• Keyframes, keyframes, keyframes
• Blend Shapes
• Motion Capture
  Optical Motion Capture
  Magnetic Motion Capture
Facial Animation
- Key frame muscle groups
- Performance Capture
- Blend Shapes
- Image Metrics /Debevec
CG Skin and muscles

- Technology for deforming character skins, extension of cloth
- Volume conservation muscles, collision detection between muscles
- Sticky and sliding effects, skin jiggle, and relax/wrinkle type effects
- CgCharacter, cMuscleSystem
**FX Animation**

**Tools**
- Houdini
- Maya
- Custom Software/plug-ins

**Crowds**
- *Waterloo (1970)* – 20,000 Soldiers
- *Gandhi (1982)* – The Funeral scene
- *Seabiscuit (2003)* used inflatable dolls.

**Massive**
Multiple Agent Simulation System In Virtual Environment

**React**
Reasonable Embodied Agents for Crowd Simulation
Procedural Animation
Complex form of animation
Define properties and behaviour of the object to animate

We used procedural animation for all foliage animation on Surf’s Up
FX Animation

Particle Systems, extension to procedural animation
Used to create and control a large number of objects.

Most cool effects are done with particles
Water, fire, smoke, snow, sand, dust, crowds etc
Which movie is considered the first to have used particles in production?
Rigid Body Dynamics (RBD)

- Simulate motion of three dimensional solid objects
- Bullet & ODE
- Often used to create shots that show the destruction of buildings
Water
• Difficult to create digital water.
• Ocean Surface
  Fast Fourier Transforms and
  Phillips Spectrum
• Three dimensional fluid Simulation
  (CFD, Computational Fluid Dynamics)
• SPH - Smoothed-Particle Hydrodynamics
Fire
Ghost Rider used a computational fluid simulation from Maya

Fire on the GPU
(Siggraph 2009)
Cloth, Hair & Feathers

Tools
• Maya
• Houdini
• Syflex
• Shave and a Haircut
• Custom Software/Plug-ins

Cloth
• Usually a polygonal mesh connected with tiny springs
• In-house solutions
• Simple verlet integration model was implemented in React.
Traditionally hard to do
A single creature can have millions of hair driven by guide hairs
Mostly in-house solutions

Feather are even harder to control
No commercial systems available
Matte Paintings

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Compositing
Lighting & Rendering

Tools
- Maya
- Houdini
- Renderman
- Mental Ray
- Mantra

- The basic: key, fill and rim
- Global illumination
- Ambient Occlusion
- High Dynamic Range (HDR)
- Lightstage
Lighting & Rendering

Renderman
Mental Ray
Mantra
3Delight
Arnold

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Compositing

Tools
• Nuke
• Shake
• SynthEyes
• Matchmover
• Mocha

• Compositing is the most important department
• All mistakes on-set and in 3D are “fixed in comp”
• Everything is faster in 2D than in 3D
• Everybody loves comp
Compositing

- Merge all elements for a shot
- Can be hundreds of elements
- Different lighting passes
- Fill lights, spec lights, diffuse, ambient lights, ambient occlusion, shadows, ID pass (z depth) etc.
Set Extension
Compositing

Bullet time or Time slice
Array of individual still cameras are positioned around the subject
Programmed to take a single shot simultaneously

The resulting still photographs are edited together to form a succession of images.
Crowd Replication
Same shot filmed a number of times and the small crowd move between every take.

Moving camera requires motion control camera