APES & BLOCKS OF FOAM
OLLI RAJALA / ANIMA VITAE
Feature Films
~250 High End Commercials
TV-Series
TV-Series

- Itse Valtiaat (The Autocrats)
  - 233 x 15min (14 seasons)
  - 7 x 45min specials

- Pasila (Police Station)
  - 54 x 25min (6 seasons)

- Dialog driven shows
Anima Lipsync

- First pieces of proprietary software at Anima (2000)
- Recognizes vowels by looking at formants
  - Formants = Peaks in frequency spectrum
  - Each vowel has a distinct peak
  - Create animation curves based on detected formants
- Problems detecting consonants
  - Mouth has tendency to stay open
    → Lacks rhythm
Goal #1 - “Create a lipsync device”

- “Acting with hand” natural for (some) animators
- Simply record open/close movement
- Combine with vowels from animaLipsync
- Add styled rhythm to the lipsync solution
- Works in Muppets so why not for us!
PROTOTYPE #1
(aka "Hanska")
What’s Out There?

- **Video/CV based solution**
  - Webcam
  - Performance in varying light conditions?
  - Stability?

- (kinect wasn’t out yet)

- **Data gloves**
  - Remember virtual reality from the 90s :P
  - All really crap or really expensive
  - Only fingers vs all movements of hand
The Power Glove. You play it like any joystick. But the similarity stops there. Because now you don't just guide the action. You are in the action.

As soon as you put on the Power Glove, its 21 sensors track the position of your hand in space. You enter the program code. Calibrate the glove. Center it. And feel the mechanical moves of a joystick give way to free-flowing, instant response. You actually break out Mike Tyson. Get the steering wheel of Real Racers II. Ball up fire from F-16 in 3-D. The Battle of Midway. All simply by moving your hand.

The Power Glove has a unique programming keypad that gives the best NES players moves they've never had before—and never will have with a joystick. Test your skill for an immovable head bust in Double Dragon. Beat a dinger for "Triple Mode"—your character turns and shoots in all possible directions. Beat another for "One-Shot Turnaround!" You automatically change direction and fire faster than you ever could with a joystick.

With new moves at your disposal, it makes your joystick games especially vertical and exciting. New. Different. More exciting. And this is only the beginning.
Something Else!

- **Hack** something together
- Simpler and more flexible to try out ideas
- **Bend sensor + rotational sensor**
I-CubeX to the Rescue!

- perfect prototyping platform
- MIDI = simple interface
- huge number of different kinds of sensors
- ~$100 + sensors

www.infusionsystems.com
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Sensors
Prototype #1

BEND SENSOR

2D ROTATION SENSOR
Prototype #1.1

DISTANCE SENSORS
Connecting with Maya

- > ./icubex | externserver -c hanska.cfg
- Space/tab separated values
- Maya mocap api
- Minimal recording capabilities
Issue #1 - "Rotated distance"
Issue #1 - "Rotated distance"
Issue #1 - "Rotated distance"
Issue #2 – Noisy Data

- Rotation sensor terribly noisy
- Need good realtime filtering
  - Post filtering not enough
  - Noisy feedback is bad when recording
- Implement **Kalman** filter
  - Works great realtime
  - Simple Kalman – simplified 1D version
Kalman Example
Human Testing

- Test on animators
  - Rhythmic test (drum beat)
  - Lipsync test (vo dialog)
  - Acting test (movie dialog)
- 15-30mins / person
- Feedback positive!
- Not just for lipsync!

"Tumppumies"
Control knobs:
- Eye target
- Mood
Human Testing – Medley Video
Human Testing – Acting Video

INTERNAL TEST ANIMATION MATERIAL

Contains dialog from Monty Python's Life of Brian.

Not cleared – so MUTE or EDIT OUT IF NOT OK!
Human Testing – Acting Video
Goal #2 – Puppeteering System

- Aim higher!
- Complete digital puppeteering solution
- 6 degrees of freedom
- Low latency
- Minimal noise
Hey! Didn’t Jim Henson do all this already in the 80’s or something?
The Jim Henson Hour "Waldo"

http://www.youtube.com/watch?v=dP6TUB7KQc4
PROTOTYPE #2
(aka "Production Hanska")
Search For the Right Tech

New goals geared us away from sensors and clumsy hardware (remember that Jim Henson stuff?)

- **Magnetic mocap?**
  - Sceptical about noise and distortions

- **Optical mocap?**
  - Expensive, clumsy setup and realtime not obvious
Polhemus Patriot
**Polhemus Patriot**

- **Update Rate:** 60 Hz. per sensor, simultaneous samples
- **Latency:** Less than 18.5 milliseconds
- **Static Accuracy:** 0.1 in. RMS for X, Y or Z position; 0.75° RMS for sensor orientation
- **Resolution:** 0.0015 in. (0.0038 mm) at 12 in. (30 cm) range; 0.1° orientation
- **Range:** 36 in. (90 cm) at above specifications; useful operation up to 60 in. (152 cm)
- **Not too expensive** ~2500e with 2 sensors
Polhemus Patriot
Video: Patriot Data Quality
DAILY APES GO SHANGHAI
Daily Apes Concept

Tropical Comedy 5 times a week

Daily Ape

www.anima.fi - www.fb.com/animavitae
World Expo in Shanghai

- May-Oct 2010
- Anima involved in pavilion project
  - Large scale projections in pavilion
- Producers managed to sell DA concept to gov
  - Apes are great for promoting Finland??
  - Ideal test project
  - Combine the tech and DA concept
  - 8x2min webisodes
  - www.dailyape.com
Daily Apes Go Shanghai

GO FOR IT!

- Confident enough to try production with the prototype system
- Schedule allowed to fall back on traditional animation if all failed
- Simplify character design to suite style
DA Shanghai Production Notes

- Most of the hands and faces were still hand animated
- Lipsync combination of puppeteering, automation and fixing by hand
- Used different kinds of Maya dynamics for secondaries (hair, particles, etc.)
- Nevertheless the puppeteered head/body provided huge time savings
  - Super fast to lay down basic timing and action of a scene
Lessons Learned - Feedback

• WORKING THIS WAY IS REALLY FUN!!!
  – Immediate feedback, WYSIWYG
  – Redoing stuff feels almost effortless
• AkiM: ”It's like... playing with a toy vs. working with (finnish) patient record system”
• Jere: “took one week to get into”
• Natural arcs and idling come for free
• You can do real production with it!
Lessons Learned - Improvements

• Get rid of Maya mocap API
  – Good days / laggy days
  – Spent a lot of time trying to get to the root of the problem

• Minimize need to “take the glove off”
  – Interrupts the flow if need to access mouse or keyboard

• Easier / simpler / more stable dynamics

• Blend takes

• Facial animation?
APINATASAVALTA
"Ape Republic"
Evolve DA → AT

- **Apinatasavalta** - ”Ape Republic”
- Adapted DA to fit YLE’s **political satire** slot
  - 17x15min series

- **Simplify characters even more**
  - Better suite the ”hanska motion look”
  - More suitable for stylized movement
  - More efficient!
Character Evolution
APINATASAVALTA
FINALISING TOOLKIT
Jog Wheel

- ShuttlePROv2 - a cheap generic USB edit jog wheel
- Control playback, record, time
- Minimize the need to “take the glove off”
Jog Wheel
New Maya Connection

- Get rid of mocap API
- Custom DG-node plugin - animaHanskaClient
  - Patriot comm over unix named pipe
  - Shuttle comm over Maya command port
AnimaHanskaClient - Plugin

- DG-node (but not a typical one)
  - Support multiple in scene
  - Multiple can be active simultaneously
  - Scale and Offsets for sensor data
AnimaHanskaClient - Plugin

• Maya DG-nodes should be **black box**
  – Communicate only through inputs/outputs
  – First version implemented this way
  – Output attributes -> transform node
  – *What about recording and animCurves??*
AnimaHanskaClient - Plugin

- Don’t want to disconnect/reconnect attributes
  → Must break the black box rule!
  - Message connections to xform nodes
  - Find destination attributes through API
  - Override values at destination
AnimaHanskaClient - Plugin

- Empty Compute()
  - Nothing to do here
- All functionality in Callbacks
  - `playingBackCB` (called when play state changes)
  - `timeChangedCB` (called when time changes :)

ANIMA VITAE LTD - WWW.ANIMA.FI - WWW.FB.COM/ANIMAVITAE
playingBackCB():
  for each ahcNode:
    if playStart & ahcNode.recordOn:
      clearCaches()
    if playStop & ahcNode.recordOn:
      createKeyFramesFromCache()
AnimaHanskaClient - Callbacks

timeChangedCB():

values = readValuesFromServer()

for each ahcNode:

    if ahcNode.active:
        ahcNode.getXFormNode().set(values)

    if ahcNode.recordOn:
        storeToCache(values)
"Hanska Rig"

- Layer between Hanska and character rig
- Easy to connect to many things
- Ribbon based “articulation”
- Add on top of regular animation rig
  - Does not prevent animating by hand
"Hanska Rig" - Ribbon
"Hanska Rig" - Head/Chest
"Hanska Rig" - Different Characters
Animation Layers

- Take blending
- Editing with Jog Wheel
- Basic layers
  - Eyes
  - Jaw
  - Ribbon (body)
Facial Animation

- "Face machine" GUI
- Tailor made to fit AT
- Expressions go through eye blink
- Pose-to-pose
- Editing without "drifting values"
- First brows, then lids
Facial Animation - Demo
Jiggles and Other Dynamics

- Fast custom "mass spring" / "pendulum" dynamics
- Easy to add to many things
- Important for secondary movement
- Custom Maya node
- Simple unified baking
  - Bakes to keyframes
  - First bakes outputs
  - Then moves animCurve-connections to "bake inputs"
Dynamics – Basics
Dynamics – Hierarchy
Dynamics – Character Hands
Dynamics – Hangin'
APINATA SAVALTA
HOW DOES IT LOOK LIKE THEN?
APINATASAVALTA
CG PRODUCTION
AT - CG-Production

- ~10wk?? pre-production time (small team)
- ~22wk production time (Nov 2011 -> Apr 2012)
- 17x15mins
- first lower pace, quite soon 1wk/episode
  - Interleaved 2 week production cycle
  - 1wk animation, 1wk new chars/render/post/edit/sound
AT - CG Team

- Director/Editor
  - animatic
- Production Designer / AD
- 4 ape-a-nators
  - One puppeteer – never done animation before
- 1 production TD
  - props modelling, render, some comp
- 2 production artists
  - character textures / BG art
AT – Animating Speed Comparison

- Highend (i.e. Pixar) quality ~2-3 sec/wk
- Euro-anim (i.e. Niko) quality ~10-12 sec/wk
- Apinatasavaltta ~60 sec/day!
- Lead “ape-a-nator”: “1,5-2 mins/day at best!!!”
AT - Ape-a-nating a typical scene

- Lipsync (~30mins/scene)
- Setup cameras / cuts (based on the animatic)
- First pass (1 pass/char) to block out timing
- Iterate on all chars – reach target quality
- Faces
- Eyes
AT – Visual Storytelling

- **Limited camera angles**
  - Flat world - 2D backgrounds
  - No dynamic dollys / cranes

- **Use medium shots and close-up shots**
  - We don't want to show feet
  - Entering / exiting frame

- **Wide shots only if characters stay put**
  - (with a few exceptions of course)
AT – Walks / Framing Video
AT – Character Variations

- Many new characters per episode
- Building blocks:
  - 5 x body types (ape, gorilla, chimp, child, baby)
  - 5 x upper face piece
  - 5 x mouth piece
  - Few hair styles
- Costume variations with texturing
  - Simple "sleeveles shirt" geo
- All pieces share same UV-layout
APINATASAVALTA
WRAP UP
AT – Lessons Learned

- IT STILL IS REALLY FUN!!!
- Works in a bigger fast paced production
- We can take in non-CG people
- Up to speed in a couple of weeks
Ideas for Further Development

- Control the "hanska rig mode"
  - i.e. go from a "walk mode" to "normal"
- Try other controllers
- "Sensor attached to stick"
  - For hands? Props?
- State Machine, Blend Trees
  - Facial animation, body actions, gestures
- "Face crunch"
Ideas for Further Development

- **Voice acting** puppeteer (like in Muppets)
  - Immediate expressive connection
  - Real dialog between 2 characters? Improv?
- Experiment with character designs
- Experiment with concepts
  - ...which suite the technique even better
  - i.e. ”Dirty Socks”!
THANKS!

Lasse Lunden
Aki Martikainen
Mikko Pitkänen

Entire AT-team!
And all test subjects!
Thanks For Listening!