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5 min slideshow
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# Uncharted Animation:

## An In-depth Look at the Character Animation Workflow and Pipeline

5 min slideshow

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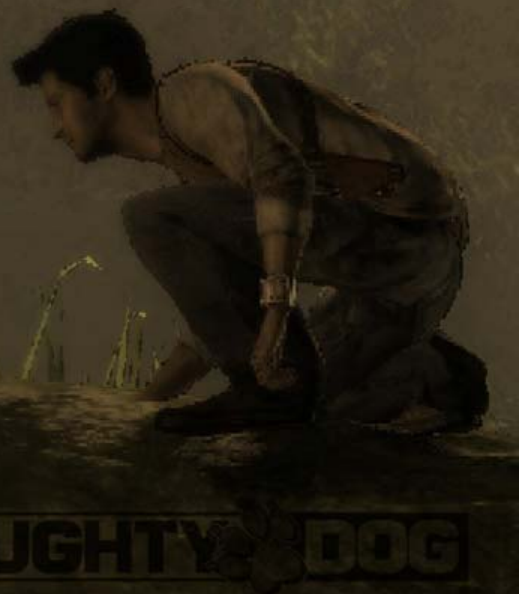
# Introduction: What we're going to cover

- **Early Considerations**
- **First Part: Tools and Pipeline:**
  - **Initial goals for Uncharted animation**
  - **First pipeline pass & what we didn't like about it…**
  - **What we finally ended up with!**
- **Second Part: Animation Workflow and Runtime:**
  - **Workflow Examples – Mocap pipeline demo & Keyframe pipeline demo**
  - **Run time Animation Post Mortem**
- **Lessons Learned**
- **Q/A?**



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1:00-1:03

# Disclaimer

## Terminology

- Animation rig or control rig
- Motion capture rig or motion capture skeleton
- Deformation Rig or Game Skeleton
- iToons is not the same as iTunes

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# Early Considerations

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# Early Considerations

## Stylized to Realism



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# Early Considerations

- Realism is less forgiving…
- Integration of motion capture

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1:03-1:05

# Initial Goals

# Initial Goals

## Create stable rig and pipeline
## ...Prevent Jak legacy problems

***Proportion changes***

***No symmetry in joints***

***Eyes textures***

***IK issues – joints not on a plane***

***Cinematic & Game skeleton separate – no animation compatibility***

***No shared skeletons***


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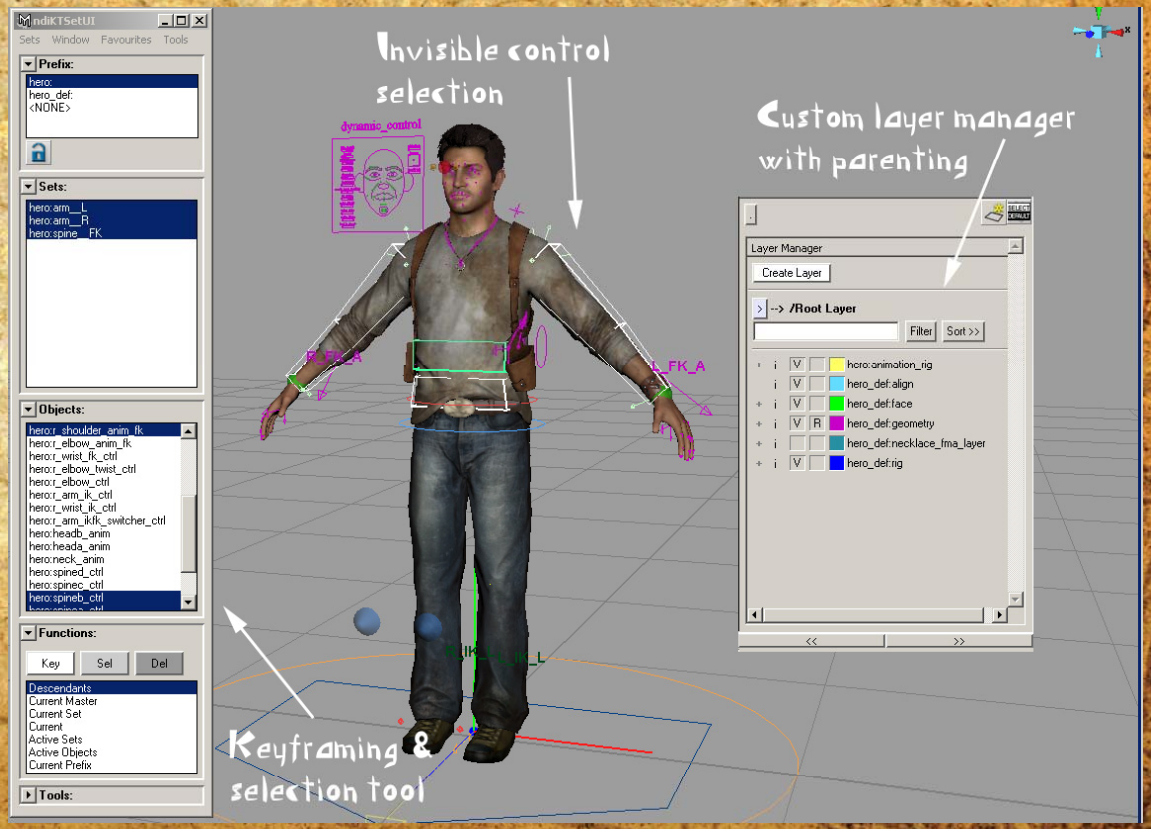
# Initial Goals

Make keyframing and selection
of characters really quick and intuitive

- ***Pick in the viewport***
- ***Invisible control boxes***
- ***Less clutter***
- ***Custom pick walk***
- ***Custom Layer manager***
- ***Key-framing & Selection Tool***

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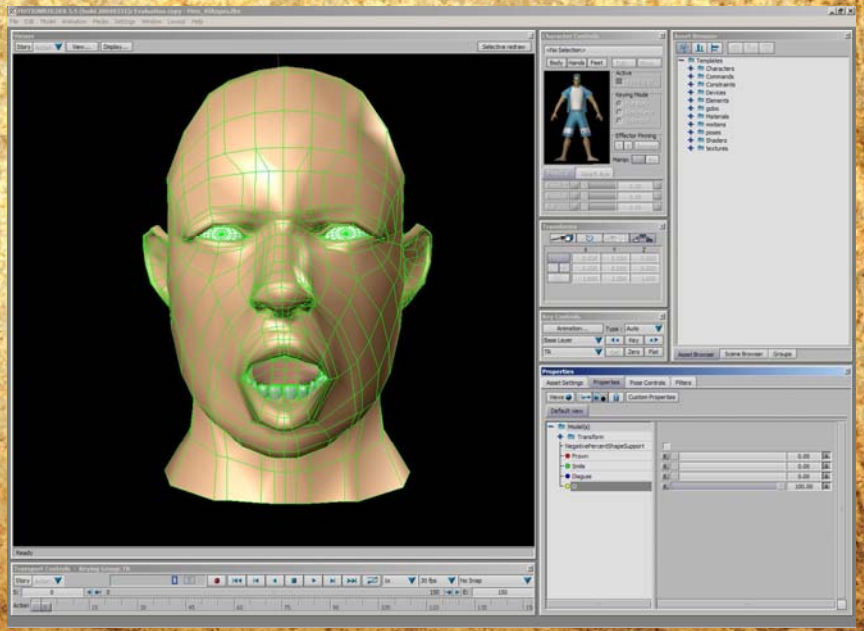
1:05-1:10

# Initial Goals

- Integrate Motion Capture & Motion Builder into our pipeline



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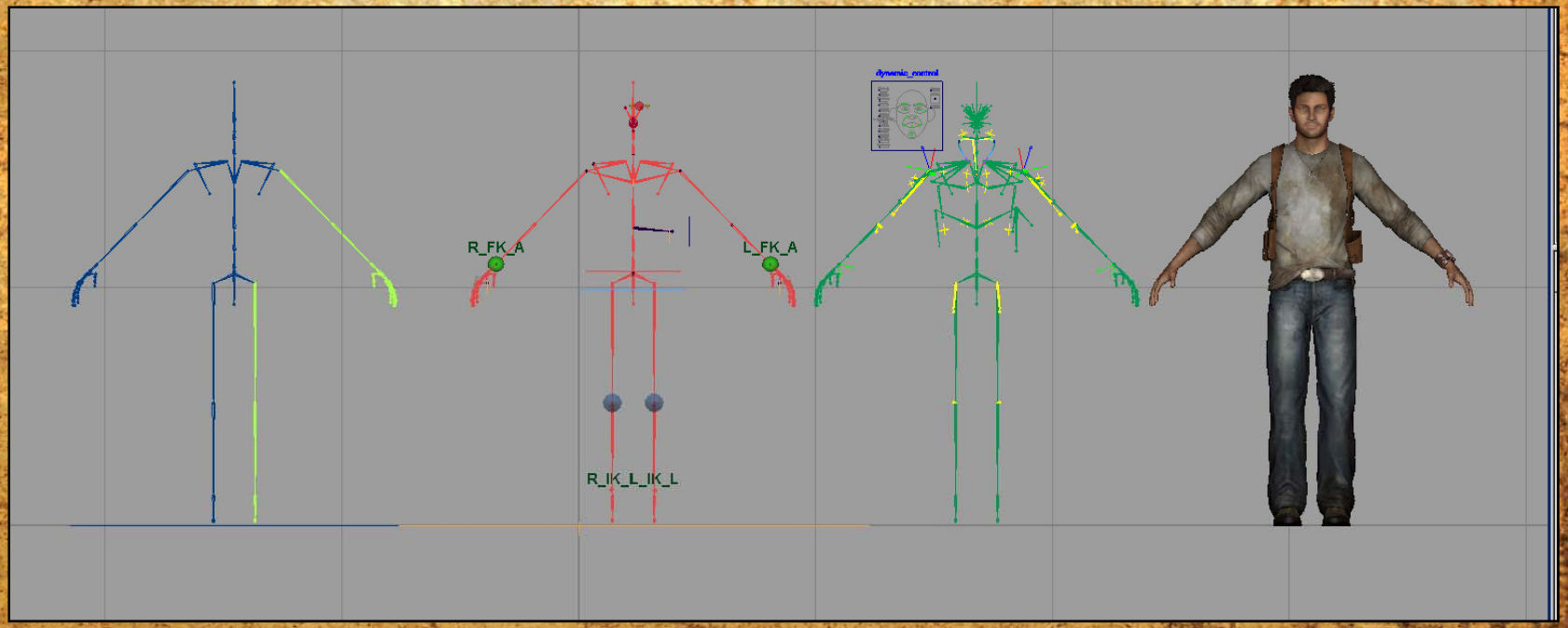
First pass at our pipeline & what we didn’t like about it...

# First pass at our pipeline & what we didn't like about it...

## 3 Skeleton Rig Setup

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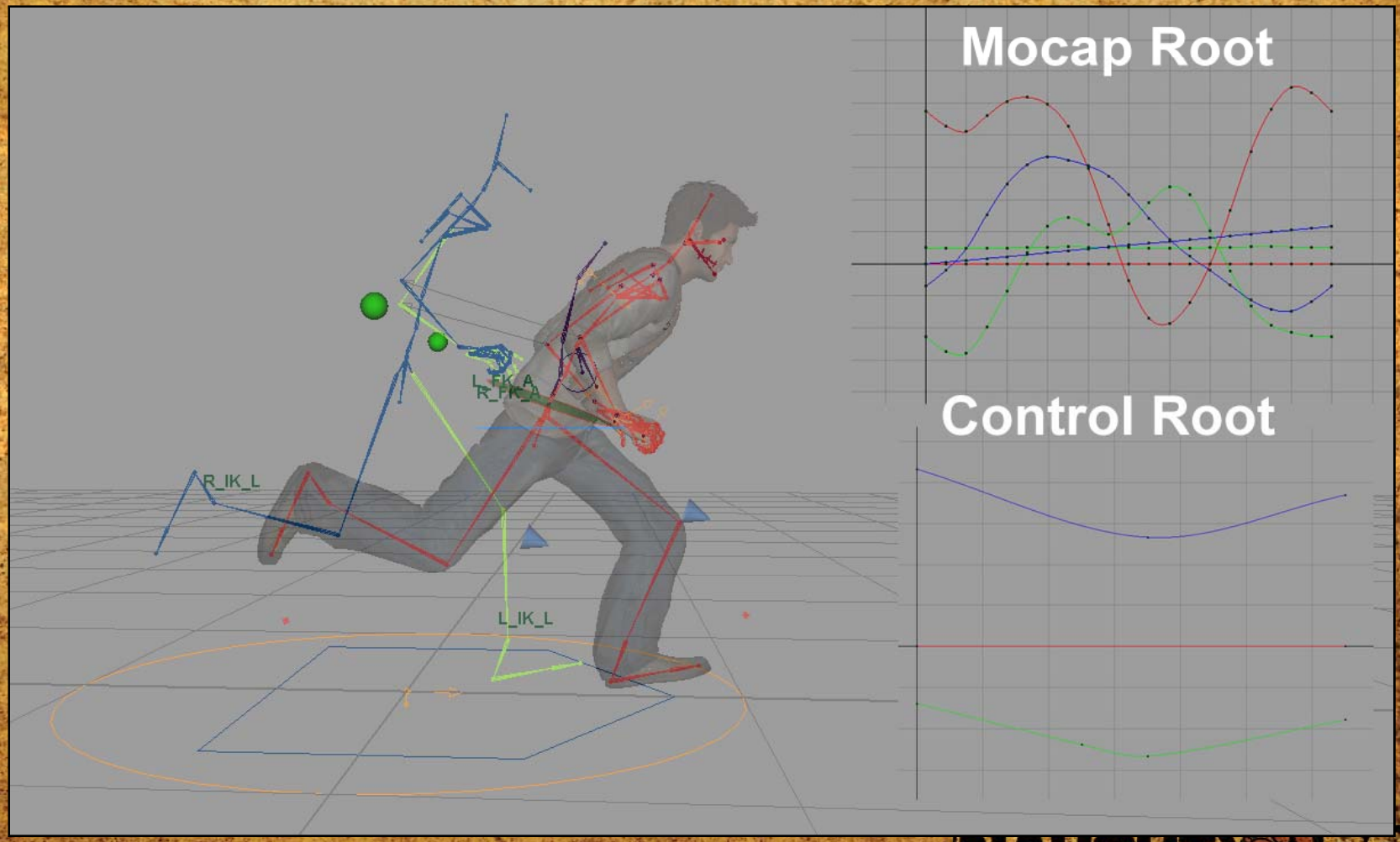
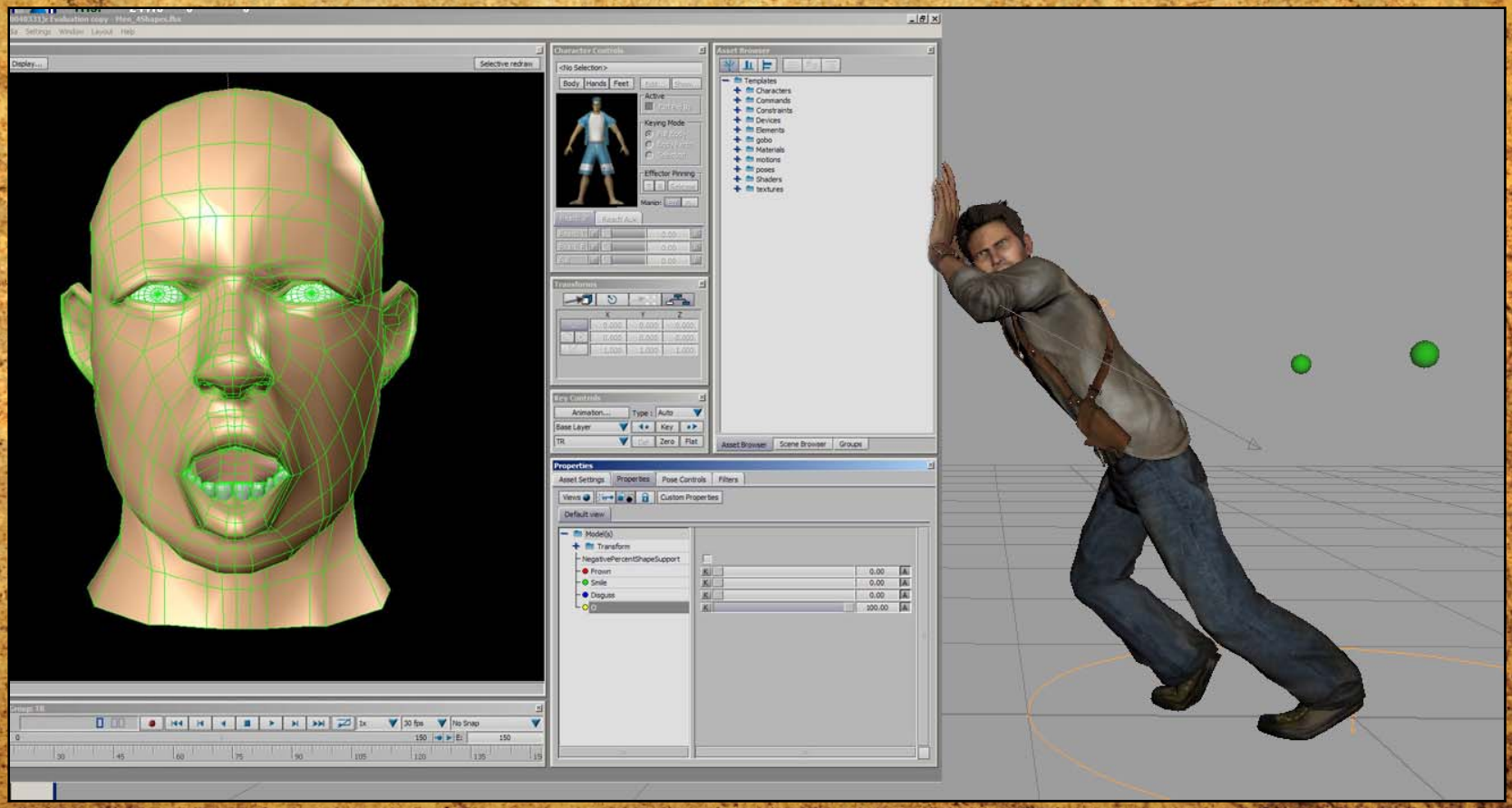
- Motion Capture driving offset rig is too abstract.



- We decided not to use MotionBuilder…



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# First pass at our pipeline & what we didn't like about it...

- Need a tool to reference and link character skeletons.
- No way to manage animation data.
- Still way too many bottlenecks when it comes to everyday tasks.
- Tools were a little slow (all done in MEL – needed to be converted over to plug-ins)

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# The Rig Pipeline

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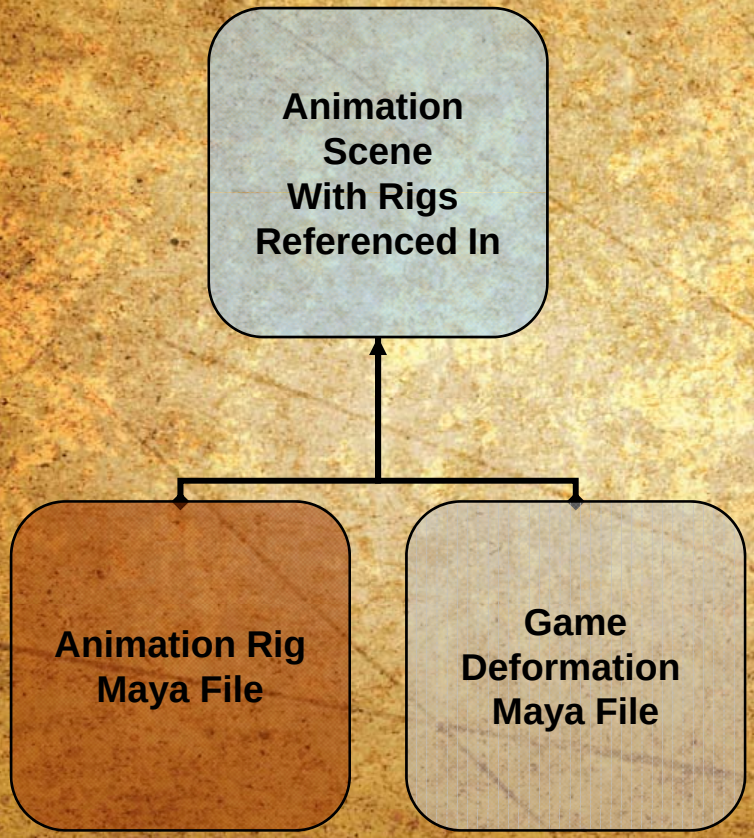
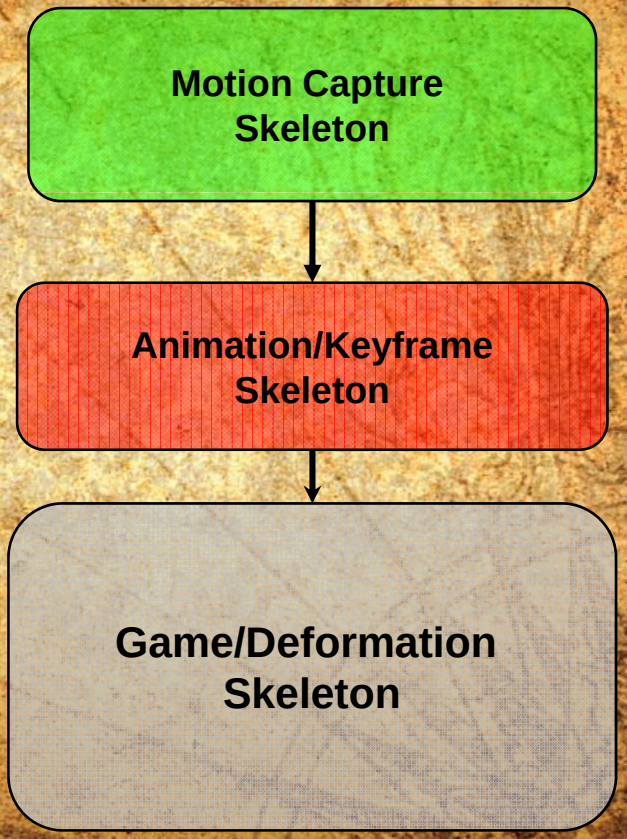
1:15-1:20

# Rig Scene Pipeline:

## Rig Referencing in Animation Scene




## Skeleton Linking

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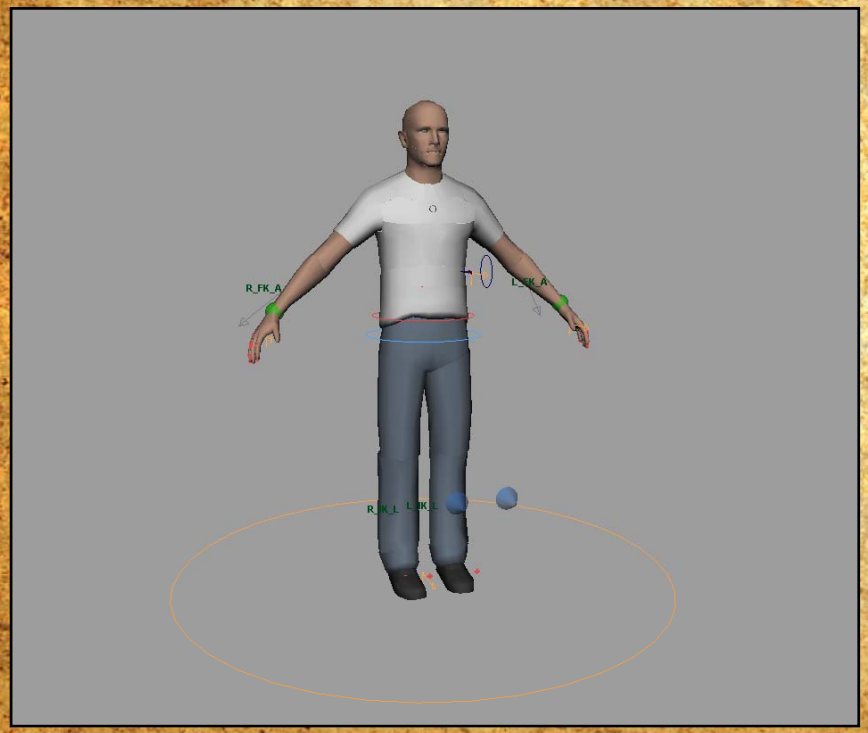
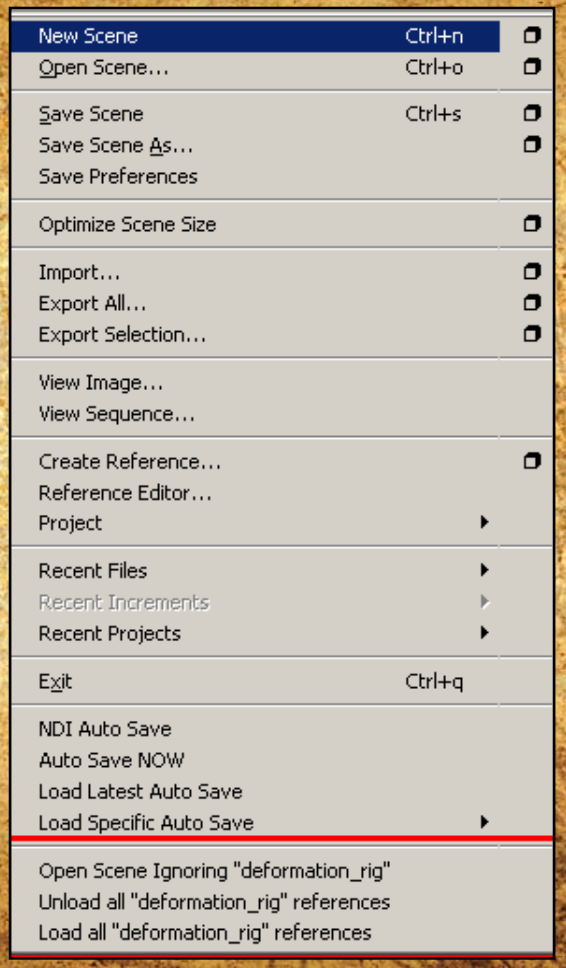
# Proxy Rig:

- **Lived in the animation rig scene**

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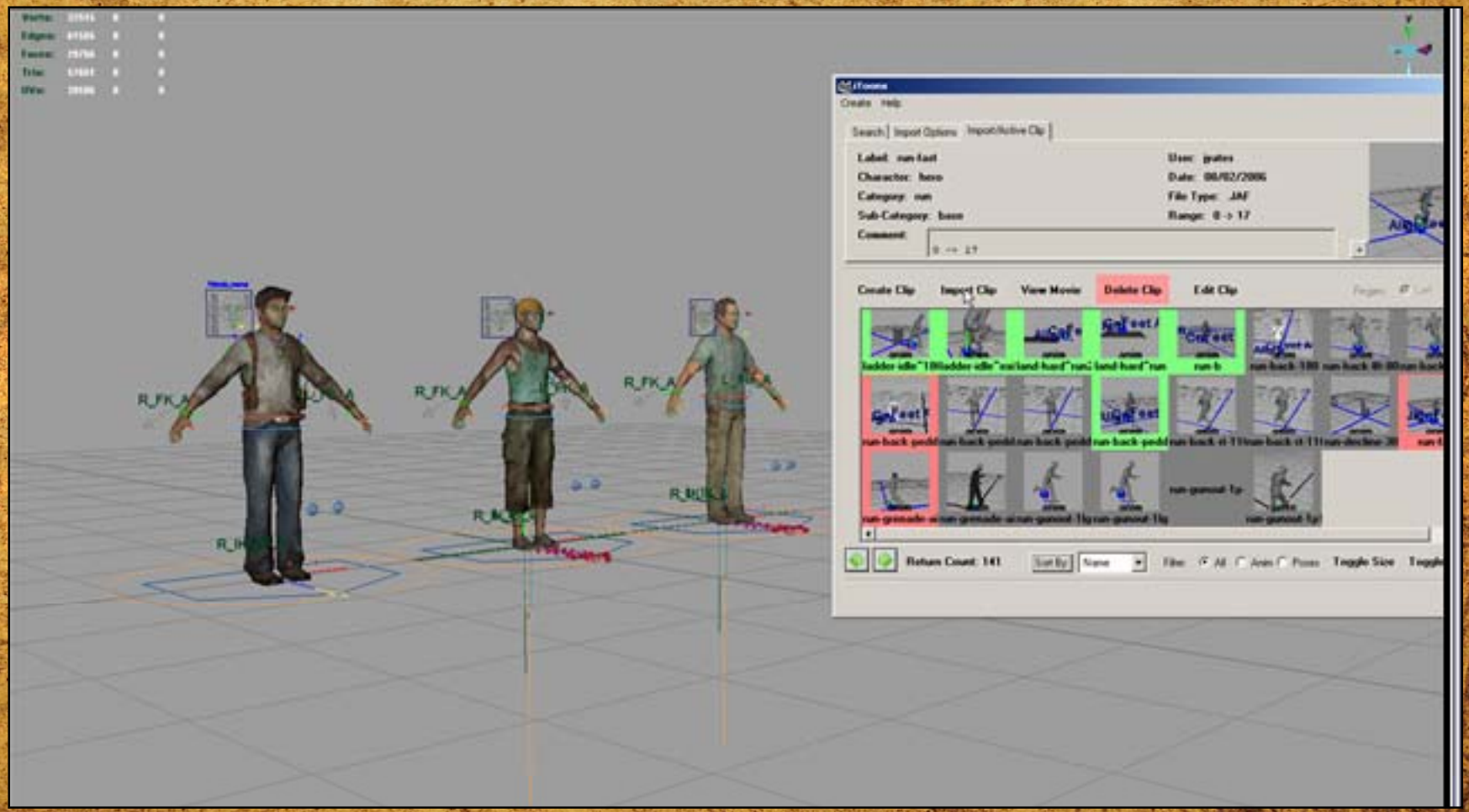
1:15-1:20

# Shared Skeletons:

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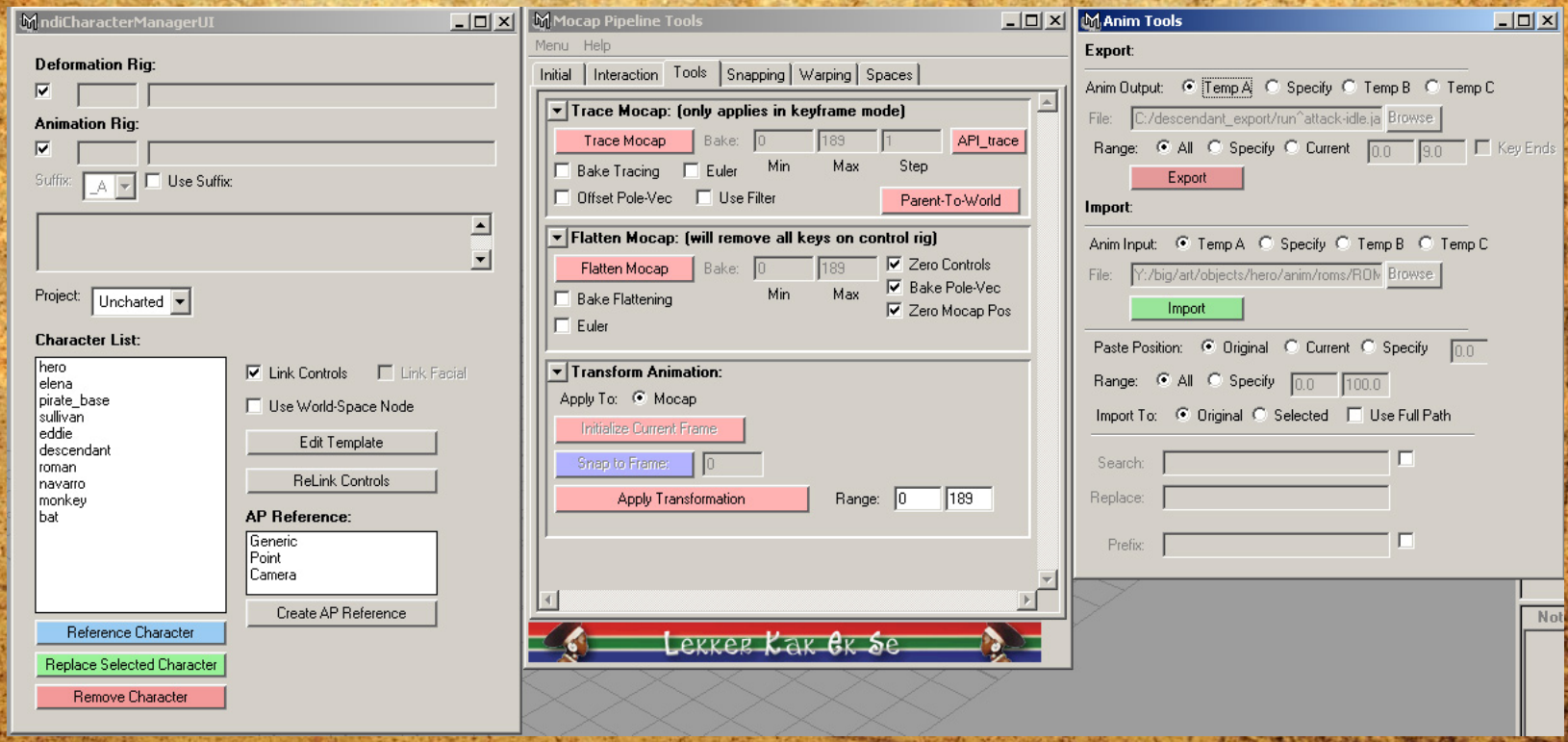
# The Tools Pipeline

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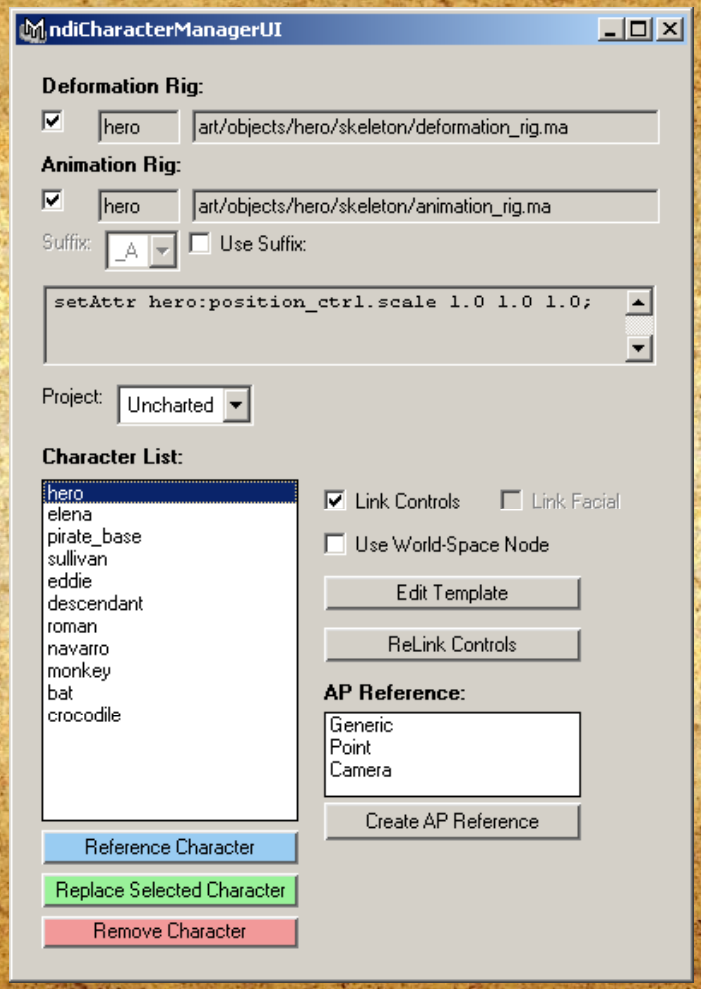
1:15-1:20

# Tools:
# Character Manager Tool

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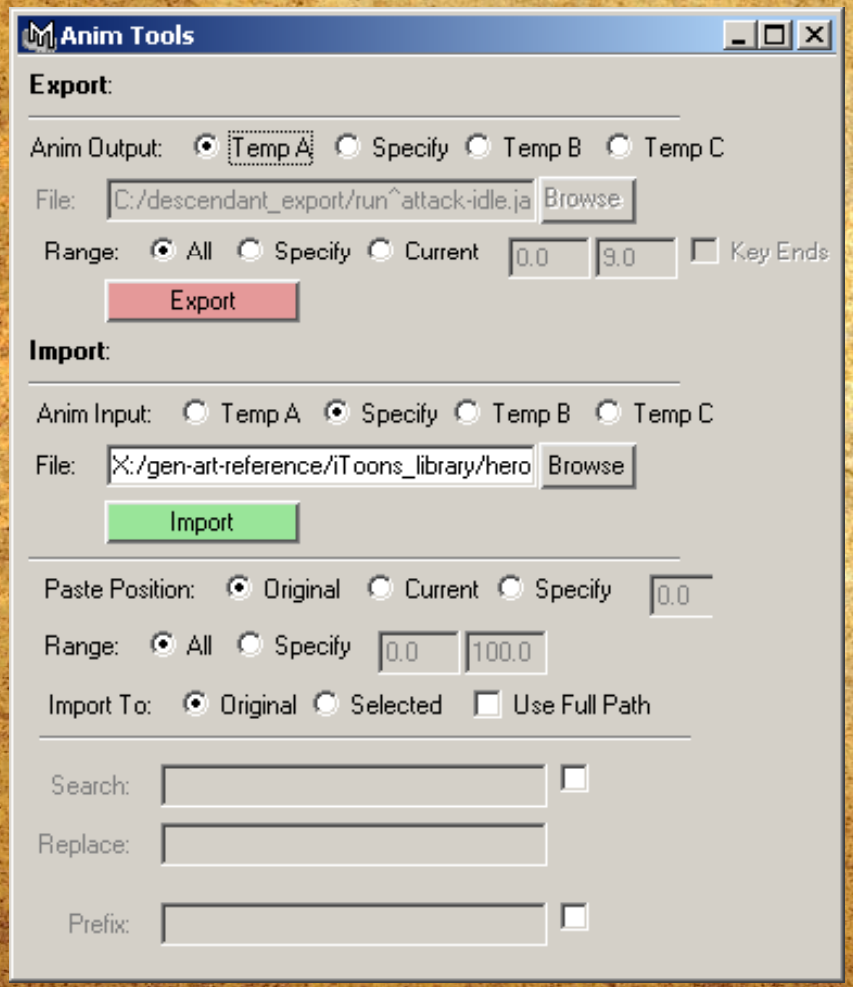
1:15-1:20

# Tools:
# Animation Import/Export




- 300 frame animation of entire character roughly 1 second to import

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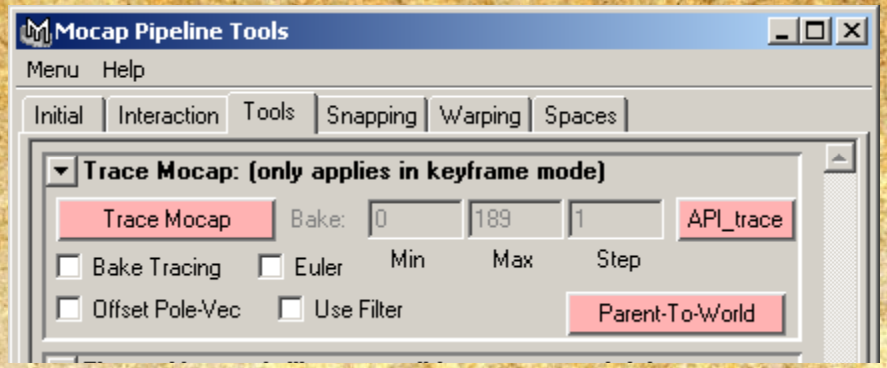
1:15-1:20

# Tools:
# Motion Capture Editing Tools

## Trace Mocap




## Flatten to Mocap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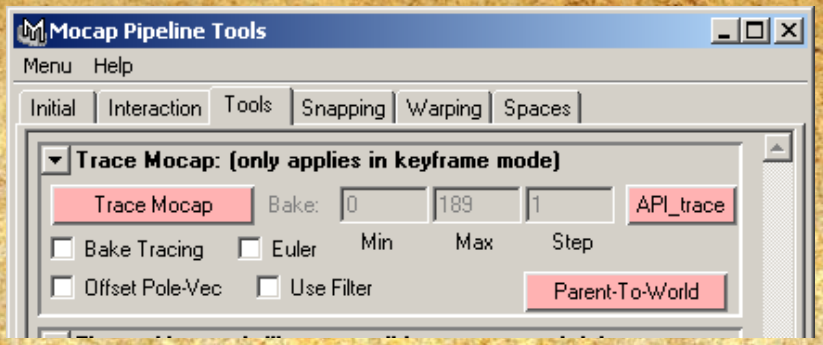
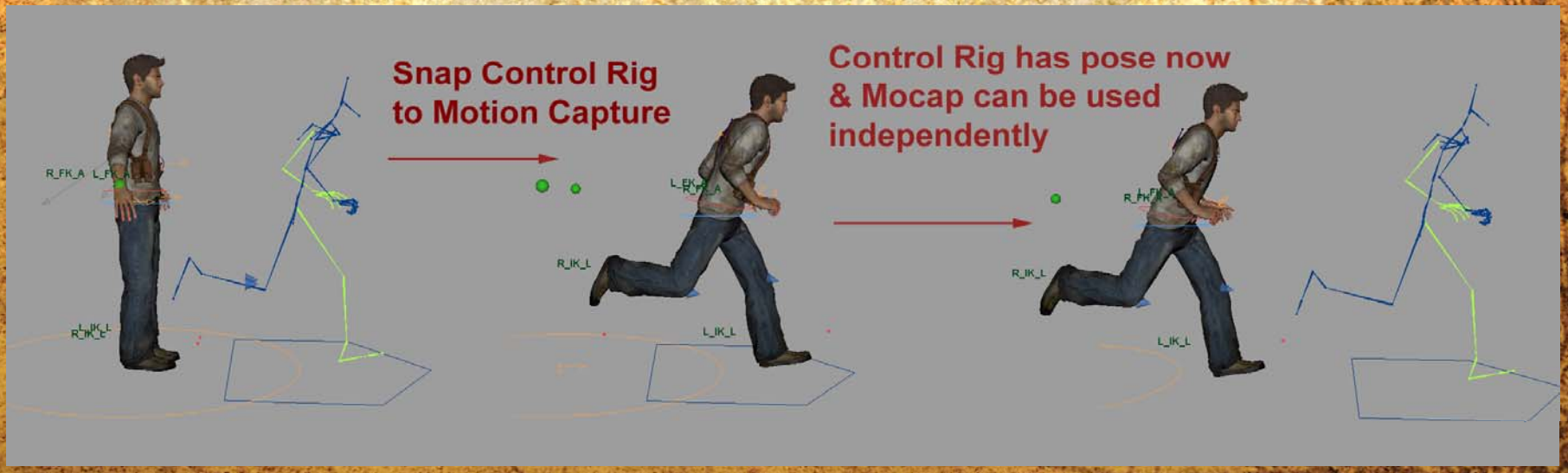
1:15-1:20

# Motion Capture Editing Tools
# Trace Motion Capture:

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1:15-1:20

# Motion Capture Editing Tools
# Flatten to Motion Capture:



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1:15-1:20

# Tools: Keyframe/Selection Tools (KT)


ndiKTSetUI

Sets Window Favourites Tools

**Prefix:**

hero:
hero_def:
<NONE>

**Sets:**

hero:arm__L
hero:arm__R
hero:control_master
hero:dummy_constraints
hero:faceMaster
hero:fingers_FK__L
hero:fingers_FK__R
hero:fingers_IK__L
hero:fingers_IK__R
hero:gimbalHelpers
hero:head
hero:leg__L
hero:leg__R
hero:mocap_arm__L

**Objects:**

hero:l_arm_constraint_loc
hero:r_arm_constraint_loc
hero:head
hero:face
hero:l_thumba_anim_fk
hero:l_thumbb_anim_fk
hero:l_thumbc_anim_fk
hero:l_indexa_anim_fk
hero:l_indexb_anim_fk
hero:l_indexc_anim_fk
hero:l_middlea_anim_fk
hero:l_middleb_anim_fk
hero:l_middlec_anim_fk
hero:l_ringa_anim_fk

**Functions:**

Key Sel Del

Descendants
Current Master
Current Set
Current
Active Sets
Active Objects
Current Prefix

**Tools:**

MOCAP File GE Pose Reset

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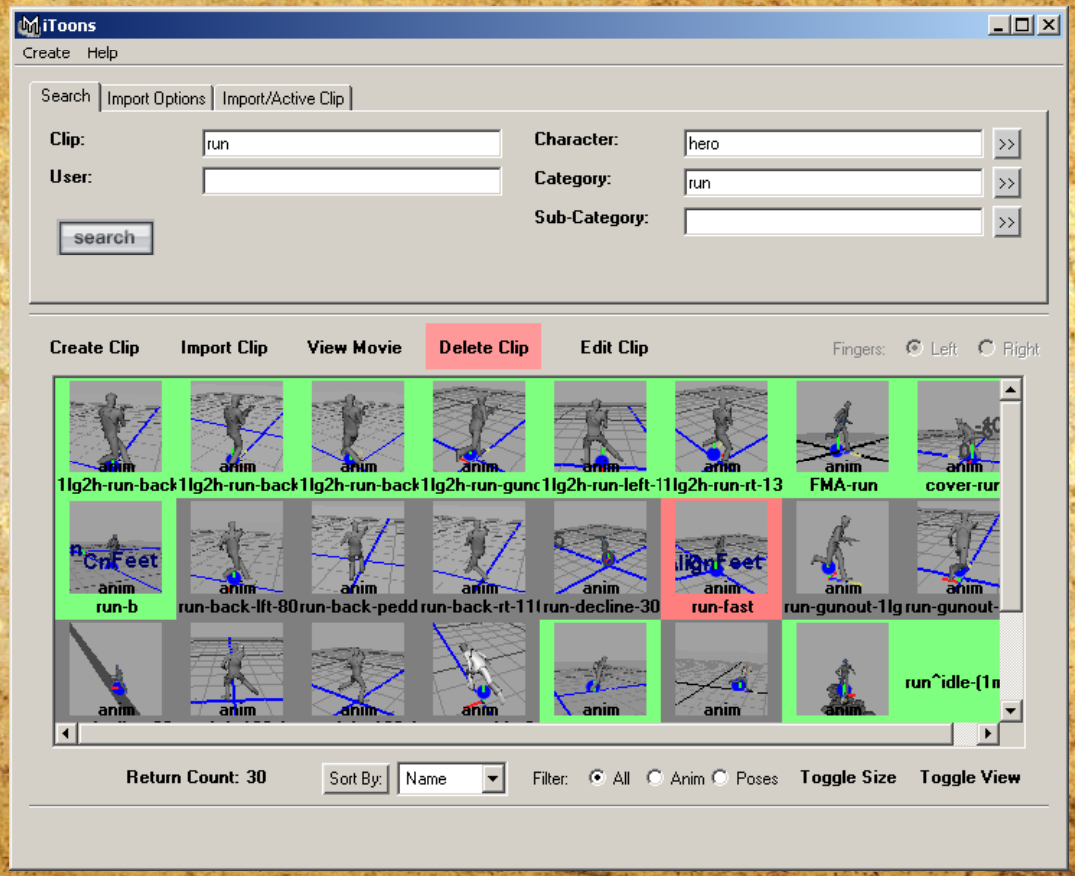
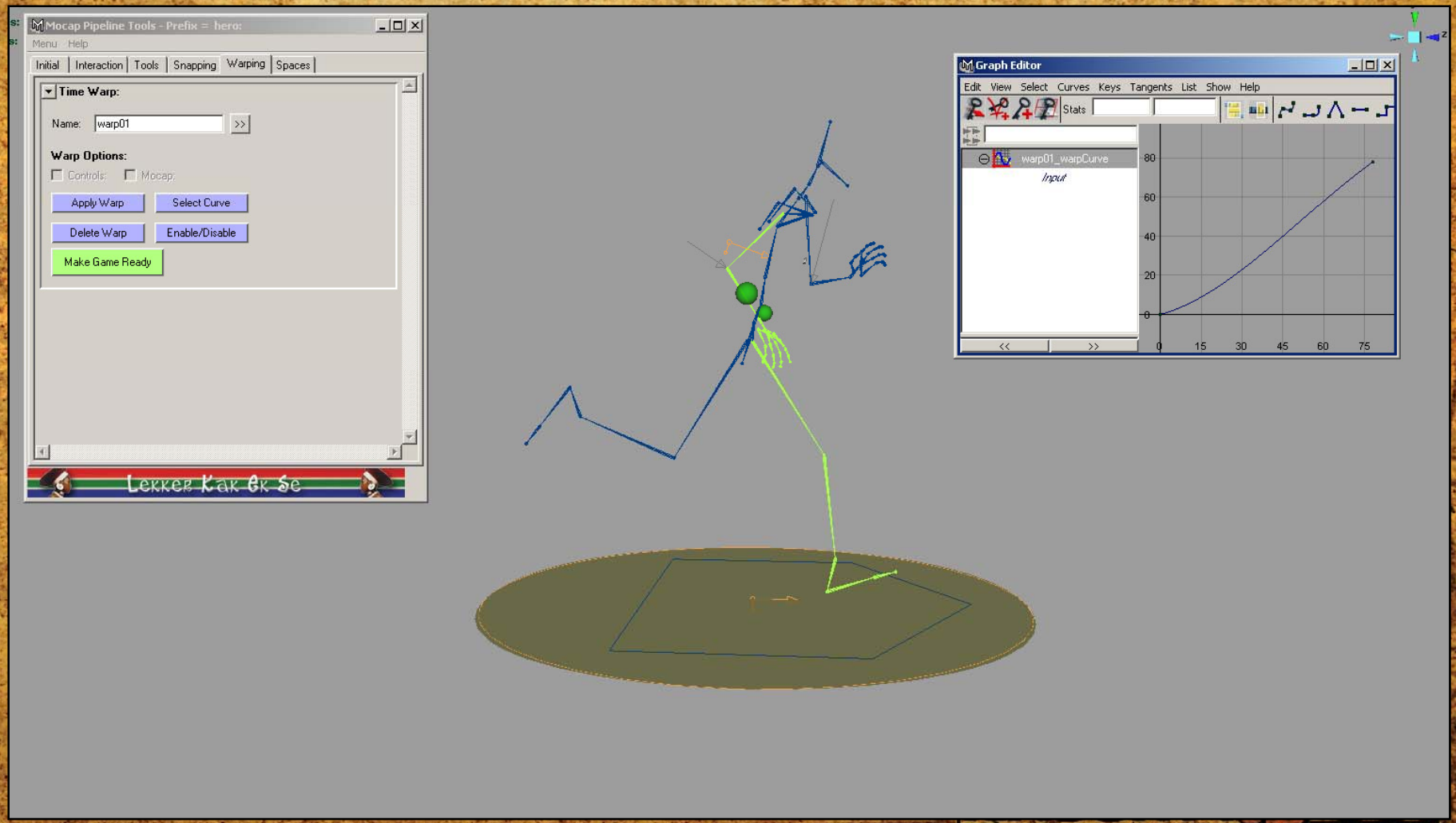
1:15-1:20

# Tools:
# Animation Library (iToons)

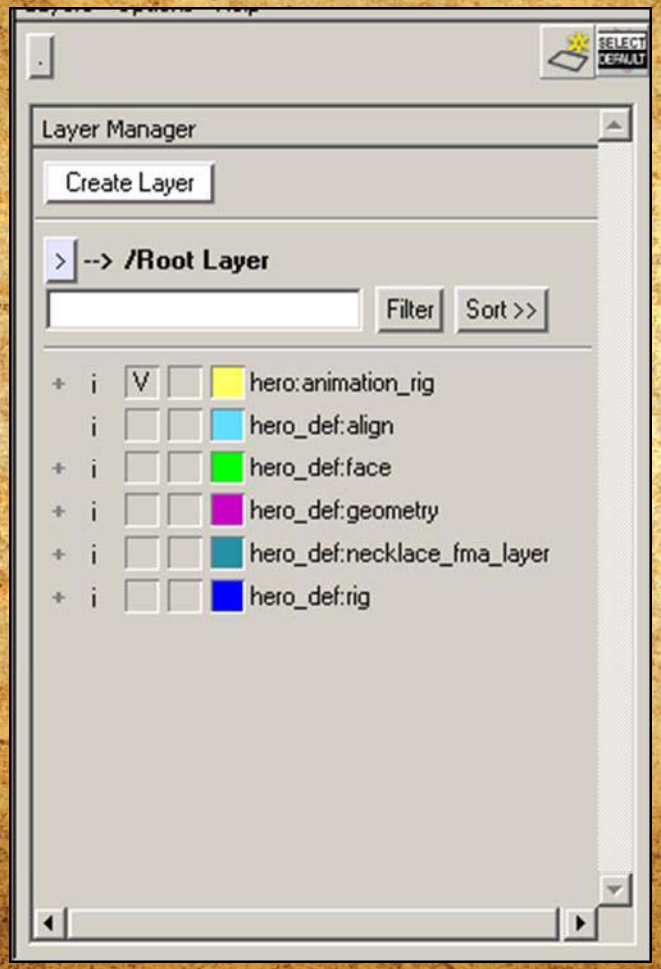


# Tools:
# Animation Time Warping




1:15-1:20

# Tools:
# Layer Manager

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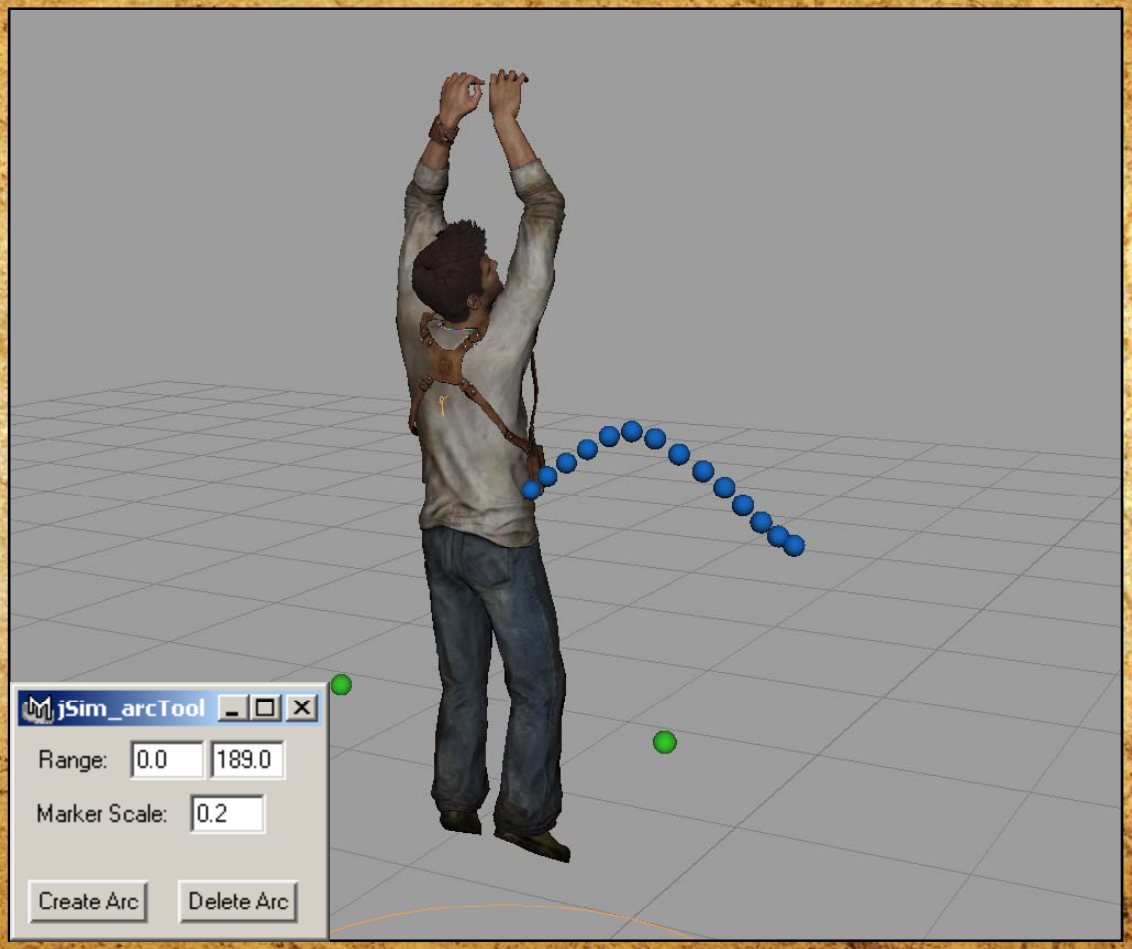
1:15-1:20

# Tools:
# Arc Tool

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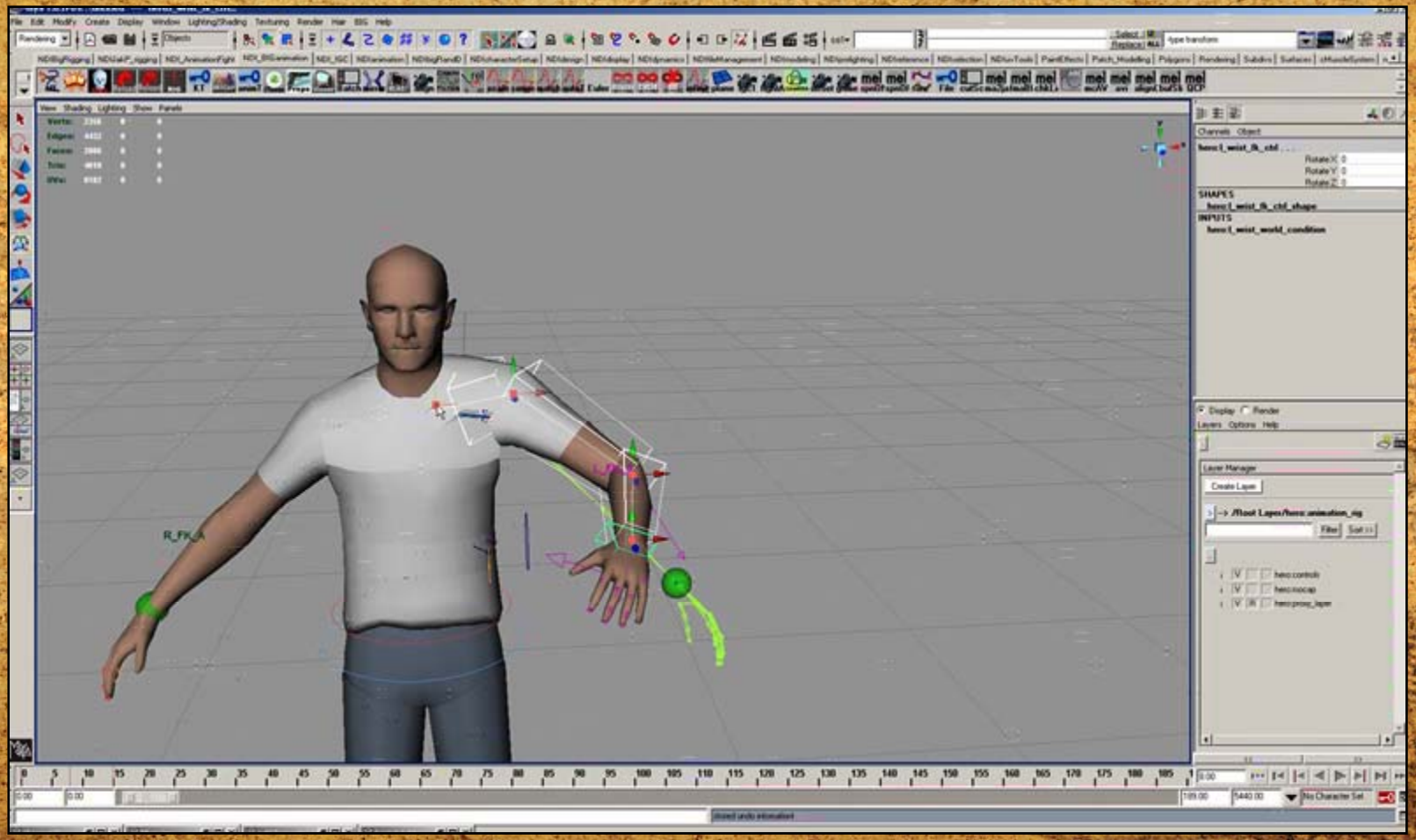
# Tools:
# “True” IK/FK Spline Tool



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# Part 2: Animation Workflow & Runtime

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1:15-1:20

12:30-12:40

# The Road to Realism

- Crossing over from cartoon to realistic

[pre vis]

[cartoon drake]

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12:30-12:40

# Mocap vs. Keyframe


What we Knew…

- Wanted a hyper real look
  - (Realistic motion with Naughty Dog style)
- Needed mocap
  - Grounding in reality
- Needed keyframed motions
  - Traversal, daily production needs, hard to capture stunts

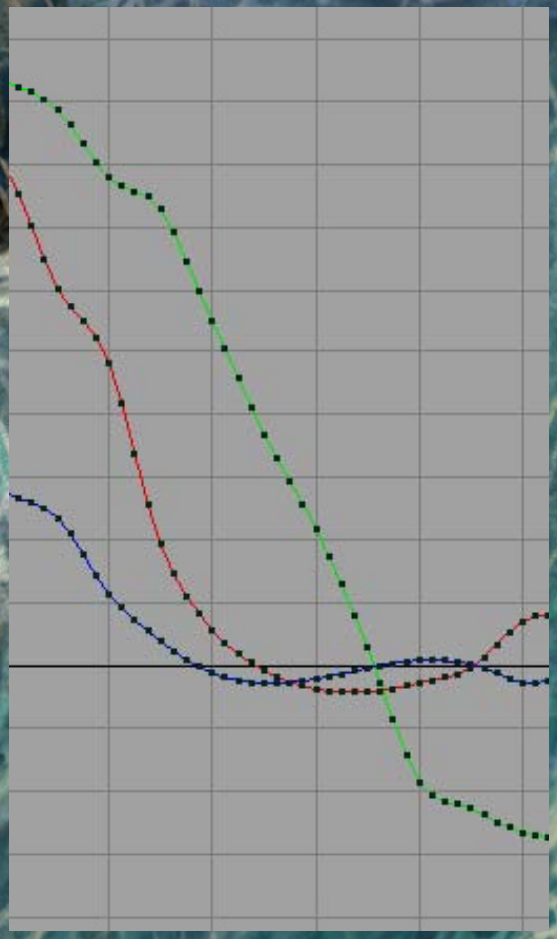
- Film examples: Matrix, LotR

12:30-12:40

# Mocap vs. Keyframe

## Differences?

- **Motion capture**
  - Hi fidelity movement
    - Dense key data
  - Real world physics
  - Slower movement



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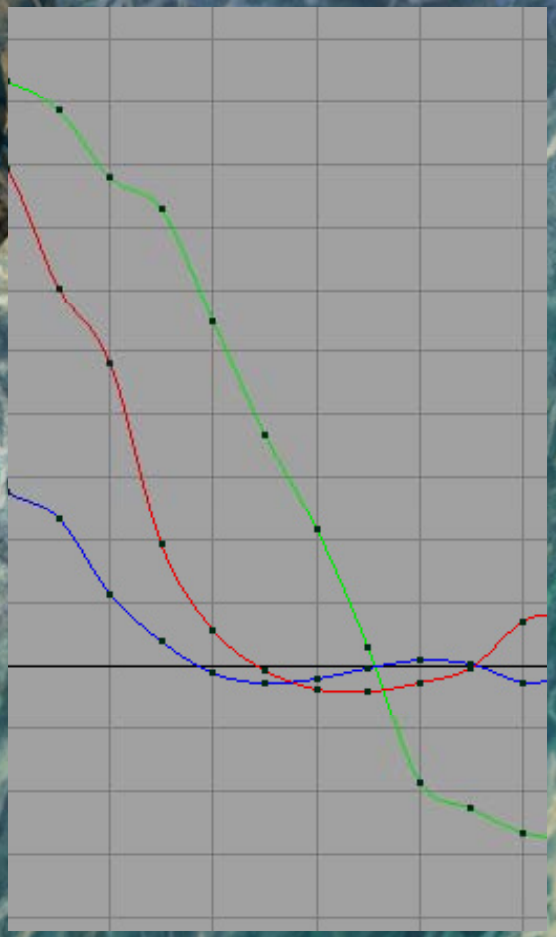
12:30-12:40

# Mocap vs. Keyframe

- **Keyframed animation**
  - Low fidelity movement
    - 70% interpolated
  - Smoother motion
  - Interpreted physics
  - More exaggerated



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12:30-12:40

# Mocap vs. Keyframe

**How do we make this seamless?**

- Bring quality and fidelity of keyframed animations to same level as mocap?
- Work with mocap in such a way that it looks closer to the keyframed animation?

12:30-12:40

# Mocap vs. Keyframe

**How do we make this seamless?**

- Keyframe approach:
  - "Poor Mans Mocap" [poor-mans-mc]
    - Video reference
    - Reference key poses from video ("trace")
    - Add "punch" to timing
    - Accentuate poses

12:30-12:40

# Mocap vs. Keyframe

**How do we make this seamless?**

- Mocap approach:
  - "Snap" extreme poses (trace tool)
    - Interpolation / smooth motion
  - Add "punch" to timing
    - Timing accentuated
      + remove unnecessary pauses
  - Accentuate poses
  - Similar workflow

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12:40-12:47

# Keyframe pipeline
## walk through:

12:40-12:47

# Keyframe pipeline
## walk through:

Video reference (p/s camera)

– 30 fps [video]

12:40-12:47

# Keyframe pipeline
## walk through:

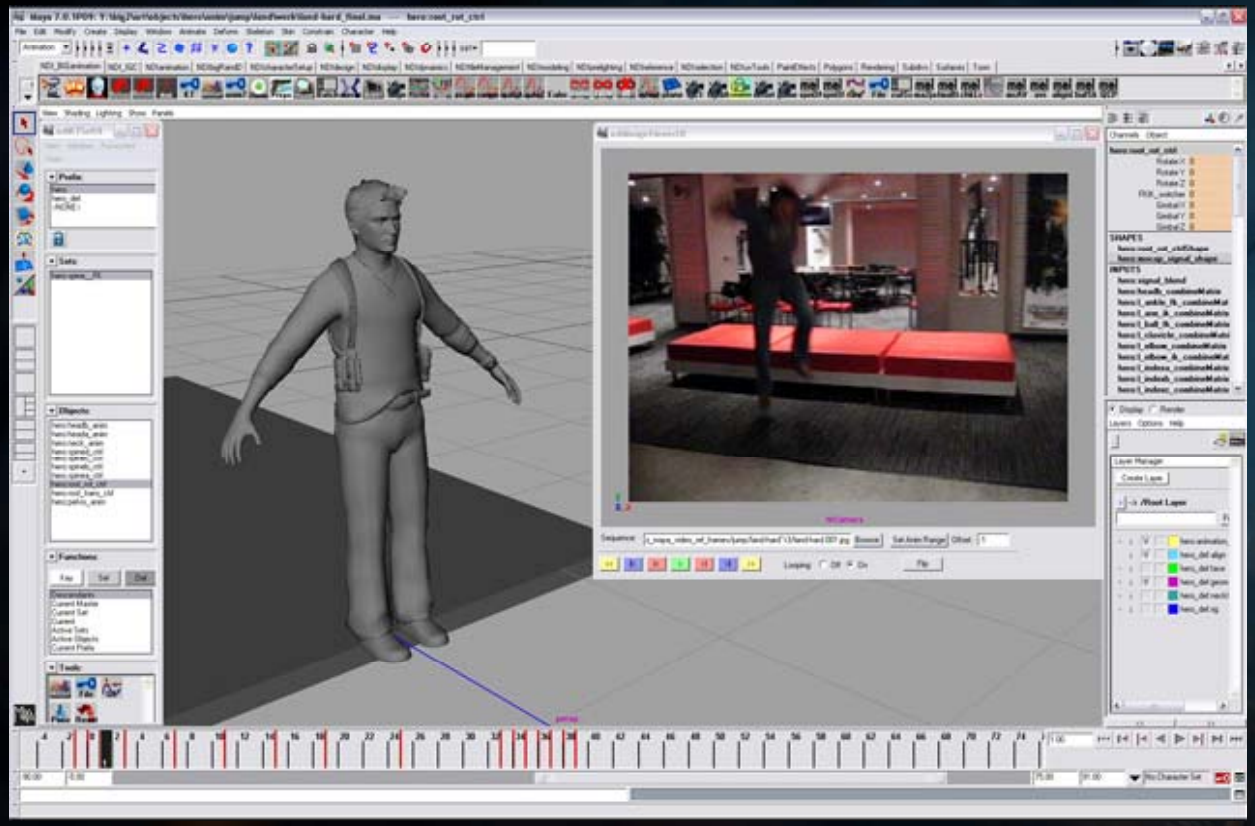
- QuickTime Pro (edit/crop)
  - Export image sequence

12:40-12:47

# Keyframe pipeline
## walk through:

### Video reference tool

Image sequence in Maya viewport

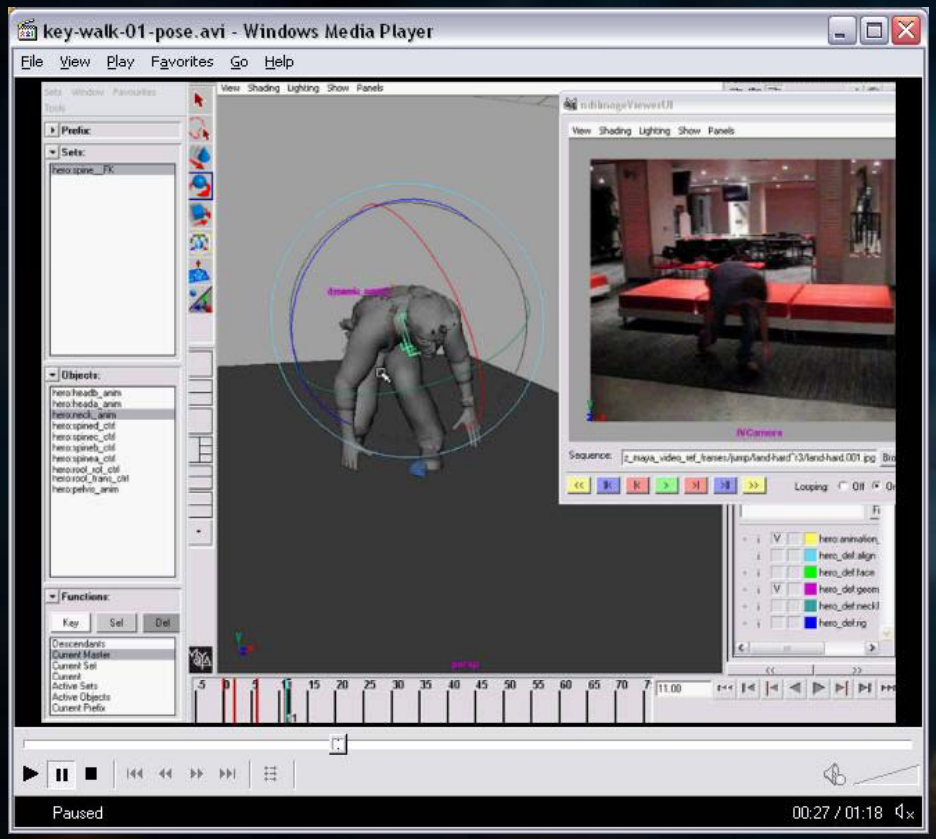


12:40-12:47

# Keyframe pipeline
## walk through:

“Trace” extreme poses from video

[posing] [stepped] [interpolate]



12:40-12:47

# Keyframe pipeline walk through:

- Accentuate timing [timing]
  - Add more snap/impact
  - Make more responsive, etc
- Accentuate poses [break]
  - More dynamic/interesting
  - Readable silhouettes


1:30-1:35

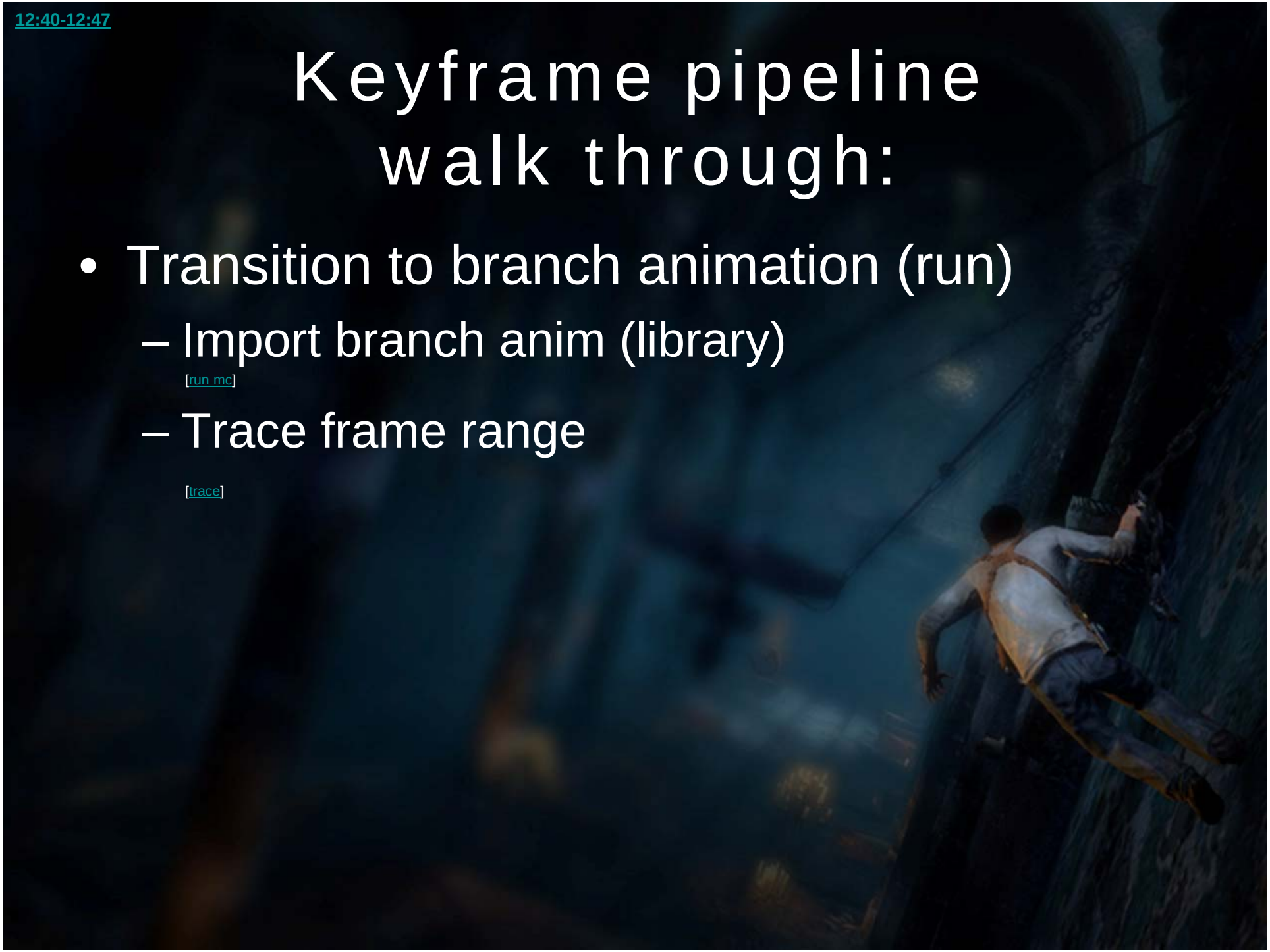
12:40-12:47

# Keyframe pipeline walk through:

- Transition to branch animation (run)
  - Import branch anim (library)

    [run mc]
  - Trace frame range

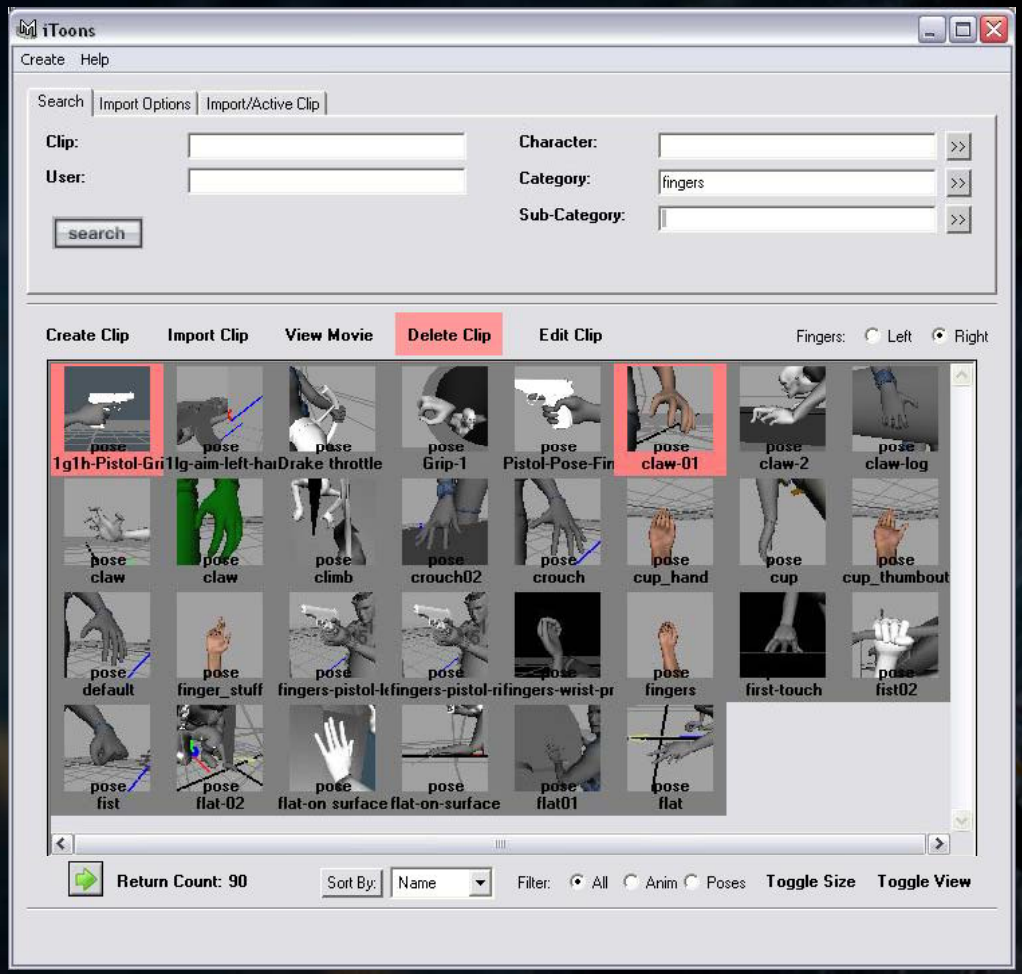
    [trace]



12:40-12:47

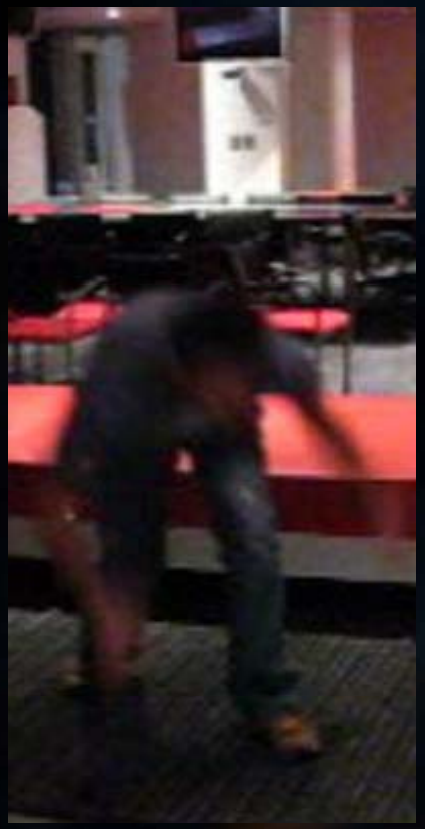
# Keyframe pipeline
## walk through:

- Fingers (library)
  - itoons



12:40-12:47

# Keyframe pipeline
## walk through:



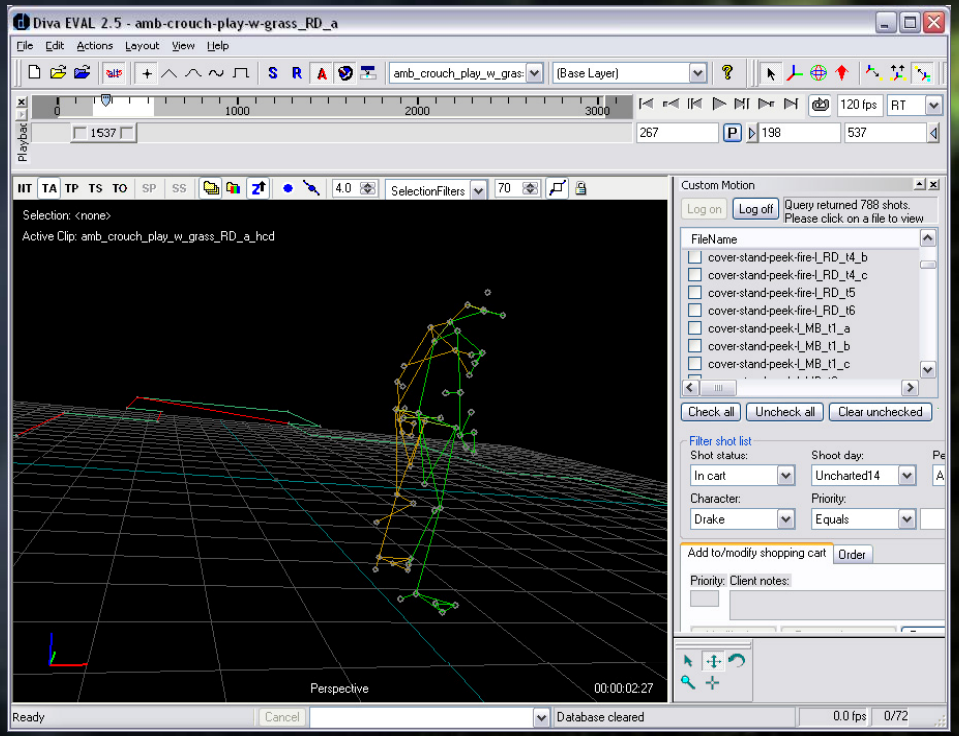
1:30-1:35

# Mocap pipeline walk through:

12:47-12:54

# Mocap pipeline walk through:

- Get it right on the stage
  - Acting (cast talent) / Direction
  - Orientation
  - Origin
  - Z-axis
  - Naming convention, etc
- Diva View (House of Moves)



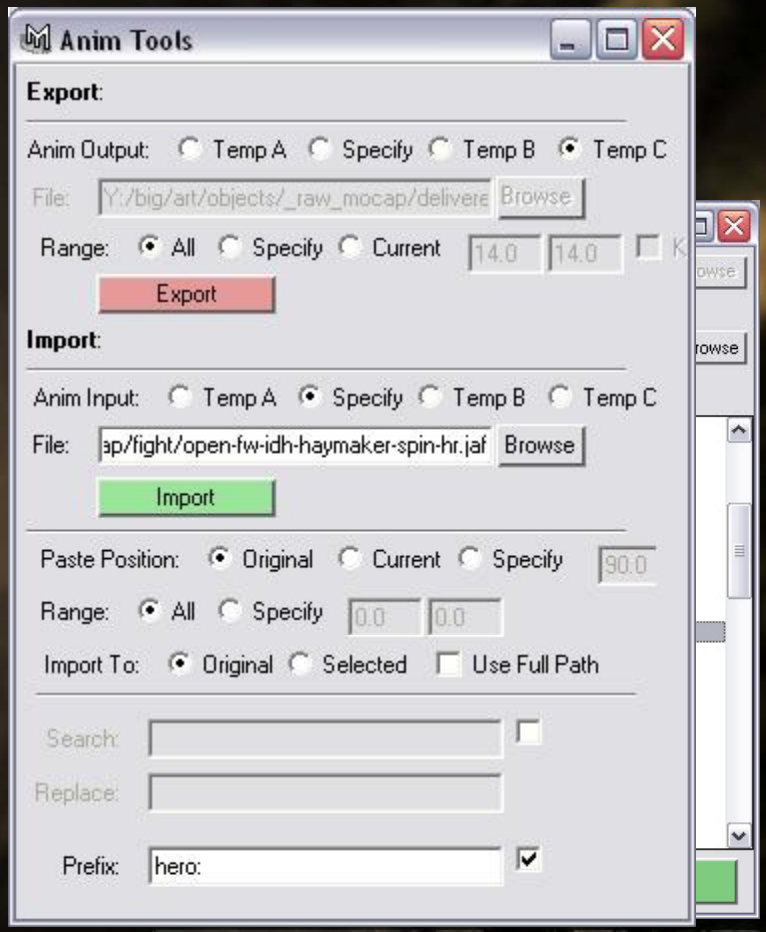
12:47-12:54

# Mocap pipeline walk through:

- Batch mocap data to .jaf
  - Auto library
  - Batch Avis
- Import onto mocap layer
  - Prefix

    * [import]
- *Move into place

    * [move]

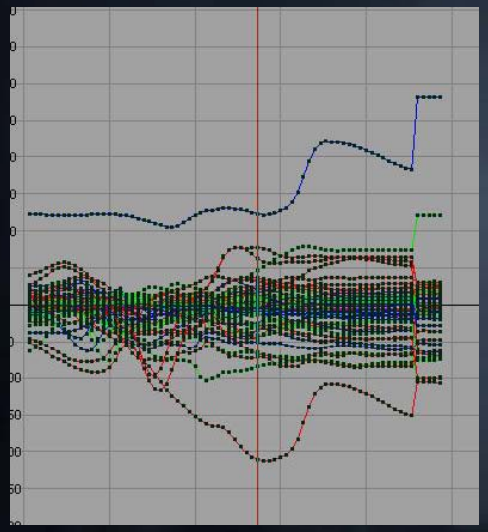


1:35-1:40

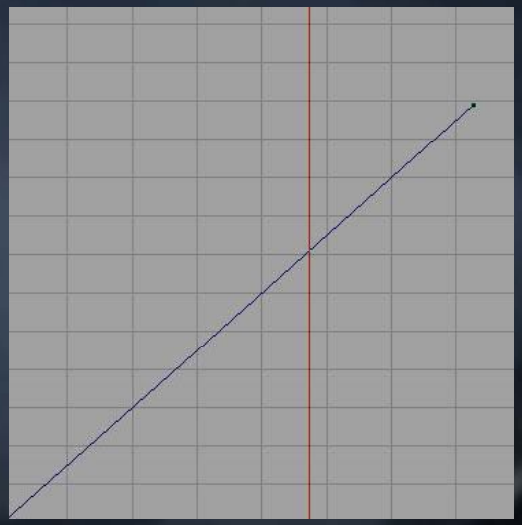
# Mocap pipeline walk through:

- Time warp
  - Great for dense key data
  - Use to make motion **Responsive**, add **Snap** / **Impact**, **Correct Cadence**

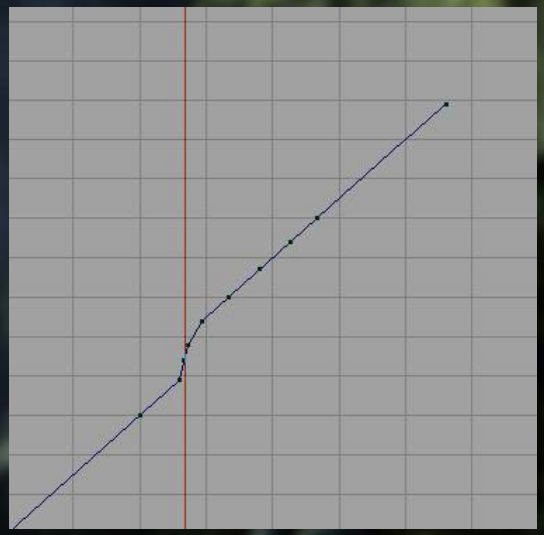
[before] [tw] [after]



**Dense key data**



**Timewarp curve (Before)**



**Timewarp curve (After)**

12:47-12:54

# Mocap pipeline walk through:

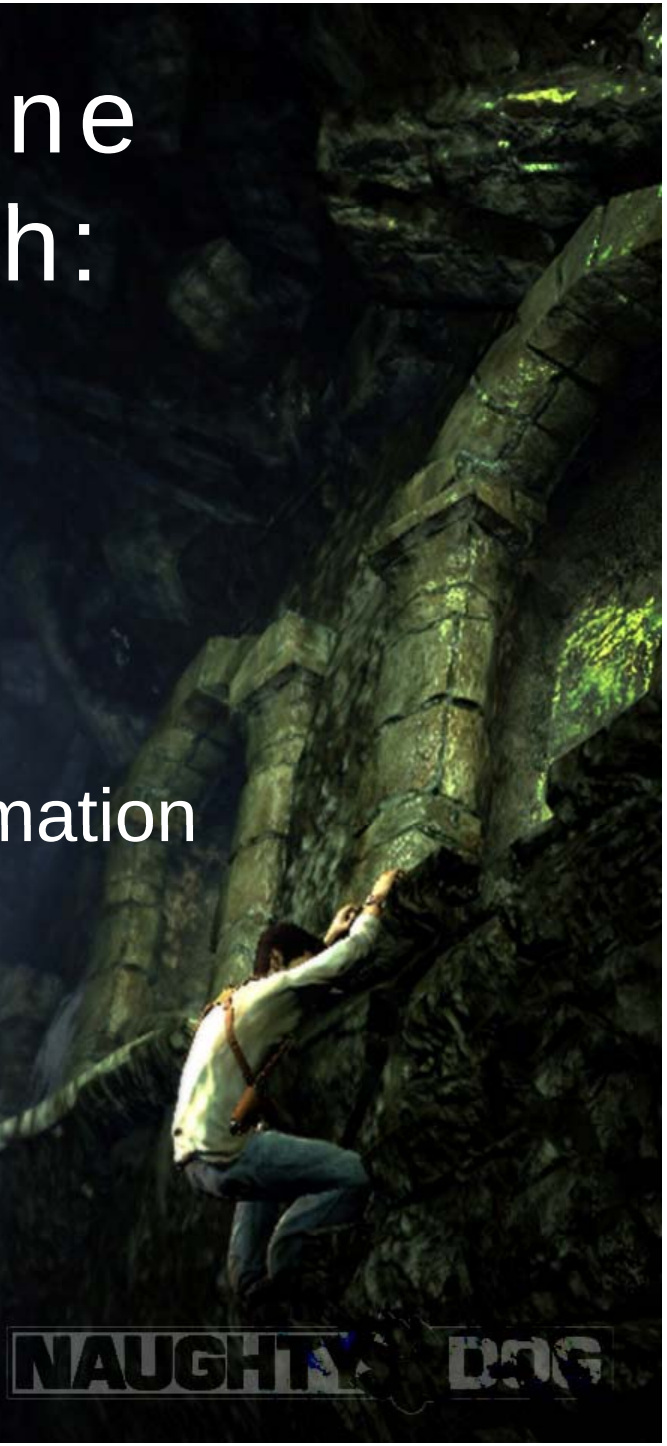
- Trace poses
  - Trace extremes
    - Helps recreate the motion with few keyframes
    - Easier editing
    - Smoother interpolation

[trace] [trace after]

12:47-12:54

# Mocap pipeline walk through:

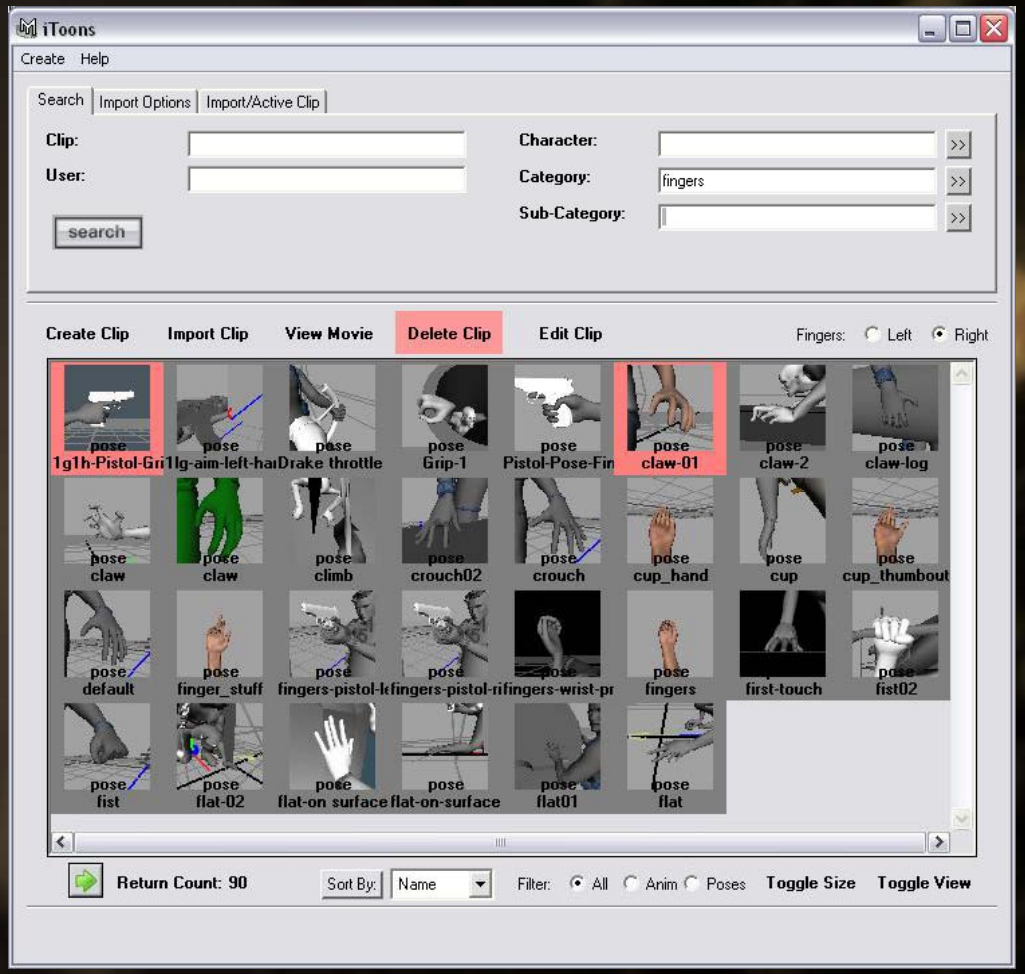
- Accentuate poses [enhance]
  - More dynamic/interesting
  - Readable silhouettes
- Create breakdowns
  - Any additional keyframed animation



12:47-12:54

# Mocap pipeline walk through:

- Fingers (library)
  * [fingers]
  - Itoons



12:47-12:54

# Mocap pipeline walk through:

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# Layering Animations

- Realistic character
  - Problem:
    - Weight vs. responsiveness
  - Solution: Layers
    - Overlapping actions

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1:45-1:55

# Layering Animations

- **Full body layers**
- **Blending**
- **Additives**
- **Partials**

# How Drake Stacks up...

- Facial
- Flinch
- Fingers-gun-grip
- Spine-reload
- Arms-reload
- Breathing
- run-randomness
- Lean-Left
- Lean-Right
- Look-up
- Look-down
- Look-Left
- Look-Right
- Run downhill
- Run uphill
- Run
- idle-to-run

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12:54-1:04

# Layering Animations

- Additives: Standard uses
  - Aiming (up, down, left, right)
  - Firing animations [pistol]
  - Leans * [run] * [lean]
- Additives: New uses
  - Randomness (run, breathing, etc) [run] [rnd] [run+rnd] [breath]
  - Flinches [flinch]

12:54-1:04

# Layering Animations

- Additives: New uses
  - Idles (cover, fight, hang, stand)
    - Emotional context

[base] [pose] [base+pose] [cover-idles-all]

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12:54-1:04

# Layering Animations

- Partials
  - Facial [facial]
  - Reloads [pistol] [ak] [gren] [game-reloads]
- Additive/partial combinations
  - Additive spine
  - Partial arms


1:45-1:55

12:54-1:04

# Layering Animations

*For more information on*
*the use of **additive animation** see:*

*Christian Gyrling's:*
***Creating a Character in DRAKE'S FORTUNE***
*Friday @ 9:00 am*

# Motion capture post mortem

**Why not mocap everything?**

- **Mocap stage is a vacuum**
- **Square peg into a round hole (custom)**
- **Timing**
  - **Production organic**
  - **Specific motions asap**
  - **Slow turn around (days)**

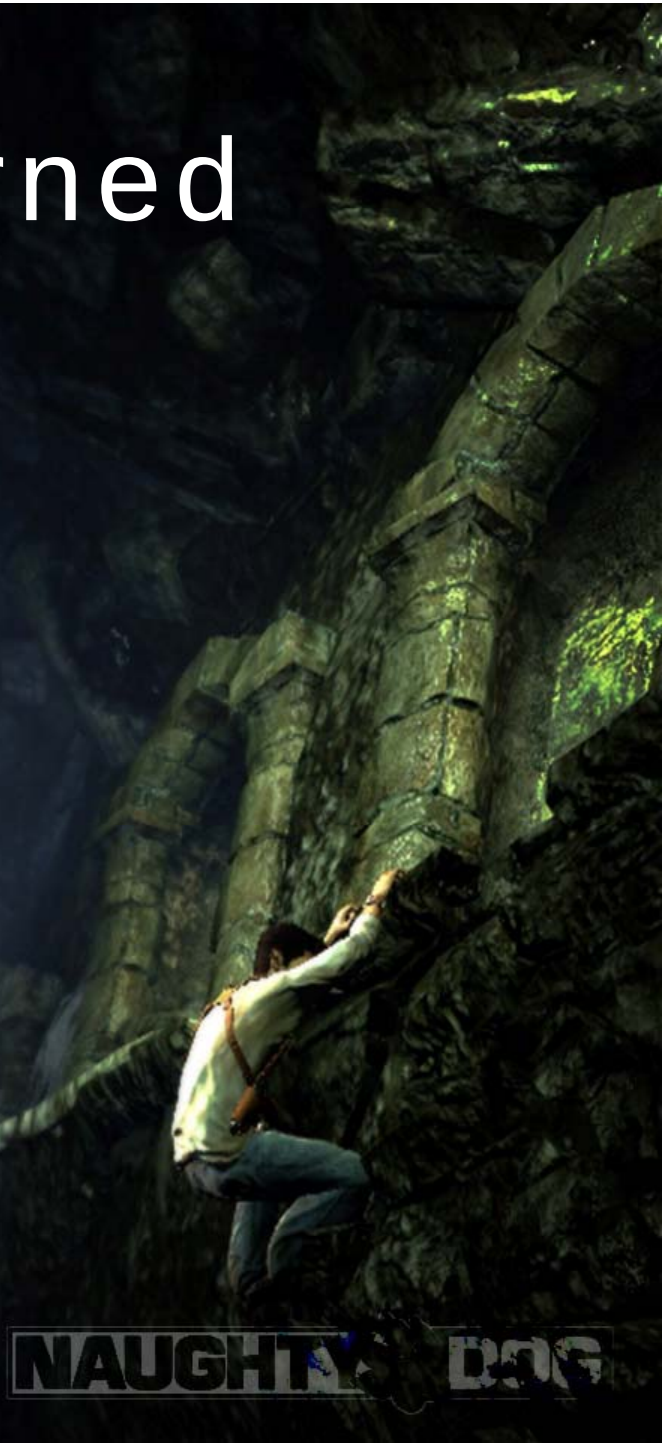
# Lessons Learned

# Lessons Learned

- No politics
  - Throw office politics and bottlenecks out the window!

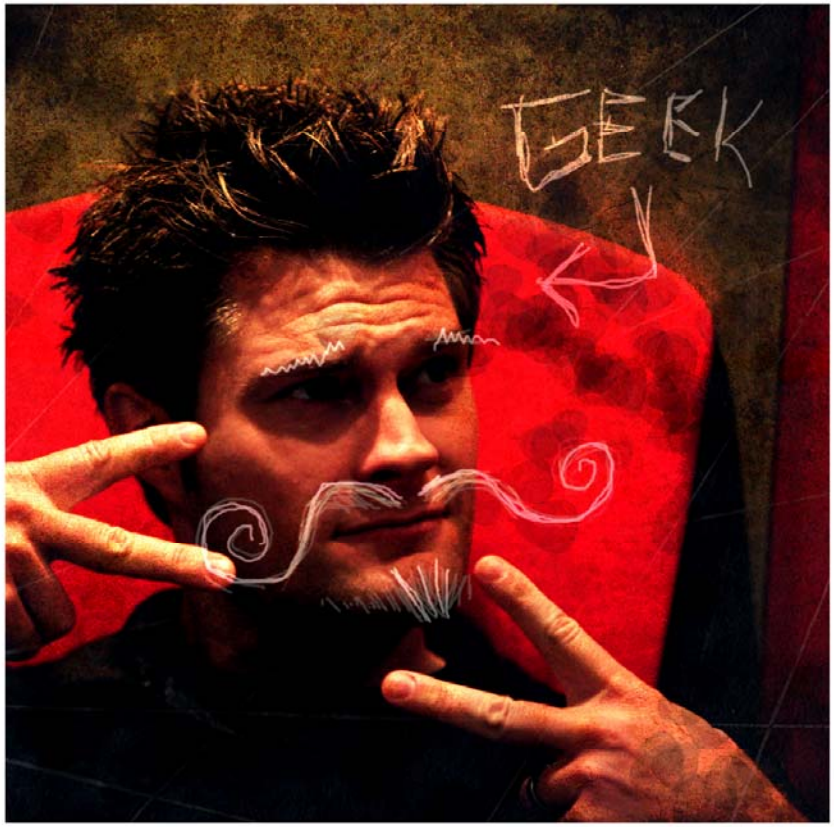
# Lessons Learned

- Close collaboration between animators and programmers
  - Other studios…
  - At ND…
    - Sit together and tune
    - Make decisions together



# Lessons Learned

- Great big ideas are fine,
  but start out simple and build on it!

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5 min slideshow

NAUGHTY DOG