

It's the Performance, Baby!

Producing Motion Capture and Animation

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Courtesy of Digital Domain



Overview

- Discuss Motion Capture Process
- Step One – Planning
- Step Two – Shooting
- Step Three – Processing
- Step Four – Integration



Excluded

- Not an in-depth survey of motion capture hardware technology
- Not in-depth survey of motion capture software packages



The Motion Capture Process

- Note the word “Process”
- Any process is only as good as the weakest link in that process
- That link can be technical, creative or administrative



Good News/Bad News

- The good news is that there are lots of ways to be successful
- The bad news is that there are lot more ways to fail
- How can I improve the odds of success?



Process Considerations

- Creative – will mocap meet our creative needs?
- Technical – what is realistic?
- Administrative – do I know where my data is?



Potential Process Conflicts

- Creative versus Technical – Maximizing one at the expense of the other
- Lack of objective measurements about “is my data any good?”
- Key frame and Mocap or vs. Mocap?
- Game Engine Constraints – Compression



What is “good data?”

- Does the performance look good?
- Does the data reflect what we saw on-set?



Capture Process Steps

- Planning
 - Deciding what (or whether) to capture
- Shooting
 - Getting the performances you want
- Processing
 - Keeping (making) the data faithful to the original performance
- Animation and Delivery to the Game Engine
 - Making the CG character move like the original performer (or not...)



Planning a Mocap Shoot

- Understand your goals – What's important and how do I get it?
- What information should I prepare?
 - Shot list
 - Mocap pipeline technical spec
- What arrangements need to be made?
 - Talent/ Props



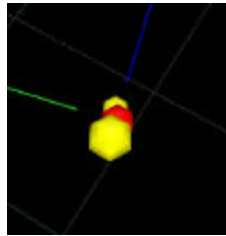
Preparing the Shot List

- A good shot list is a great cost-saver
- Err on the side of capturing too much
 - Easy to process extra data; harder to go back and shoot more
- Ready stance considerations
- Looping/Blending considerations
- File naming conventions



War Stories

- First Ice Hockey Shoot – setup and strike every day...
- Colinear Markers

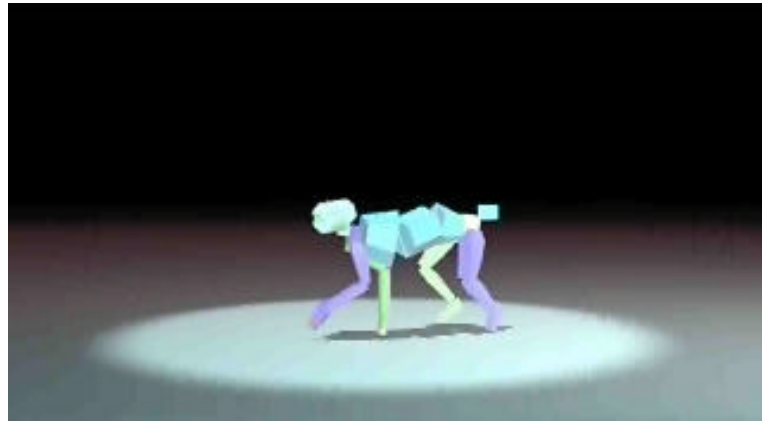


Pipeline Considerations

- Target skeleton/character topology
- Target control structure
- Gross proportional differences
- Target software platform
- Number of characters/performers
- Props
- Frames per second



Talent - Capture a dog if...



Otherwise capture a star





Why Pro Talent?

- The “Bob from Accounting” syndrome
 - Comparative costs for Talent vs. Data capture and processing
 - Quality of Actual Performance
 - Costs of Animation Motion Editing to Compensate



Performer Considerations

- Should I rehearse my talent?
 - If possible...
- Should I prepare the talent?
 - No surprises (only once)
 - Lotion...



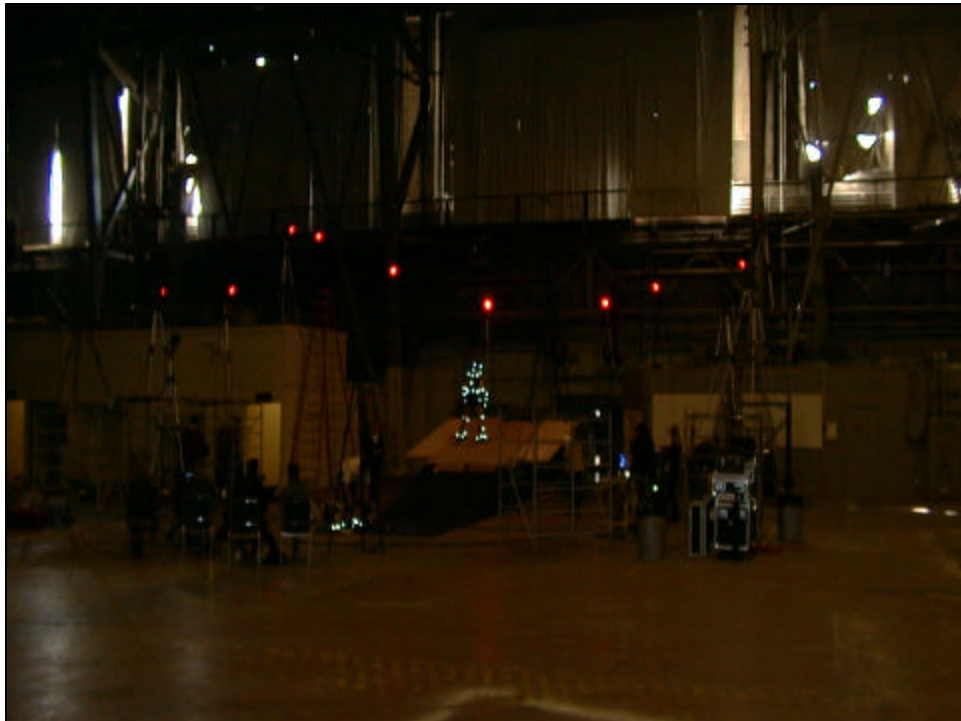
At the Shoot

- Direct the talent
- Remember it's a mocap shoot, not a film shoot
 - Looks are irrelevant (even in Los Angeles)
 - Biomechanics are important



Props

- Build or rent before the shoot starts
 - Look for motion performance
 - Get props out of the way



Shot Administration -

- Data management is key
- Why?
 - All the data in the world is useless if I don't know where it is and what it is.
- So I have my 2000 motions. How do I keep track of them?



What to Store

Performer Name
Shoot day and date
Source and target file names
Capture and delivery frame rates
Delivery format...



Administrative Challenges

- Relational databases can store info, but not the data itself
- Data usually needs to be stored at various stages
- How to ensure that my database matches my computer file system



What's hard about mocap?

- Difficulty of acquiring “good” data
- Difficulty of processing mocap data
- Hardware/maintenance costs
- Finding staff!



War Stories II

- The eye fills in what isn't there...
- When Gear Breaks – JB Fedex
- Changing the Setup – on the morning of...
- Border Crossings



Can I Capture My Own?

- Defining your needs
 - Quantity of data
 - Budget
 - Realtime vs. Non-realtime
 - Studio environment



Use a Mocap Provider

- Breadth of expertise
- Access to talent
- Pawn off tedious work
- Getting good marker data is only the beginning
- Gear



War Stories III

- Performer w/ a Short Leg
- There's no noise in that other data
- 672 files in a directory and a database that shows 658 shots shipped...



Capturing “Good” Data

- Good data now saves much pain later – proper setups!
- Focus on getting the right performance – changing the essence is not an option
- Capture more than you need
- Heavy marker redundancy



Software Advances

- Automatic marker identification (passive optical)
- Smarter noise filtering/gap filling
- Real-time skeletal solving
- Character mapping tools
- Clip composition tools



Optical Capture

- Fewer restrictions on number of sensors/cameras
- Care less about solving all problems at time of capture
- Can use forward looking data to solve problems



Final Shoot Considerations

- Communication is the key!!!
- There are no stupid questions
- Know what you don't know and be willing to learn.



Post Processing - Tolles



Why is Mocap Unique?

- Mocap is as much about art as it is science
- Not concerned about preserving original data, only original performance
- Essence of a motion is hard to quantify



General Rules of Success

- Solve problems as early as possible
- Capture what you want as closely as possible
- Minimal data alterations
- Reasonable data applications
 - Human mocap will map best onto humanoid characters



Mocap Data Processing

- Why can't I just take my data home?
 - Approve the Pipeline
 - Making Selects
 - Noise and Gap
 - Conversion to skeletal data and Props
 - Other adjustments (location, orientation, fps)
 - Mapping to target control character(s)



The Real World

- We have to animate a broad range of characters with imperfect solutions. How?
- All about deciding what's important
- Imperfect is good enough for most cases as long as ease of use exists for creative change



Conceptual Hurdles

- Artistic interpretation shifts more to mocap performer
- Alleviated by providing good motion editing tools to animators
- Almost always need to alter data somewhat



Motion Blending

- Pre-processed blends
- Run-time Blends
- Conclusion – most HOM clients doing blends at run-time
- Blending rotations vs. translations



Looping

- Special Case of Blending
- Dynamic Loops (Walks, runs, etc)
- Rest Pose Loops



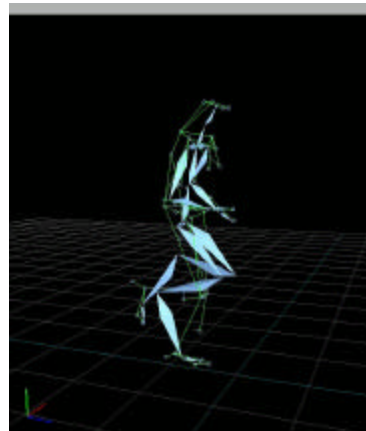
Looping Examples

- Dynamic Loop
- Looping Translations
- Looping Rotations



Practical Retargeting

- Lots of papers on special case retargeting
- How to do it in practice
- Remember that retargeting means you are **CHANGING** the data



But I NEED to Retarget It!

- Overall scaling to match what's important
- So what's important?
 - Foot plants (absolute vs. relative)
 - Hand to object relationships
 - Limb to body relationships
- Depends on the move!



Retargeting Examples

- Example 1
- Example 2



Retargeting Props

- Separate vs. Part of Hierarchy
- “Fixed” Props
- “Translating” Props
- Animating Transitions



Mapping to Control Structures

- “Just animate my character!”
- Character setups are diverse
- Animating character setups requires inverse mapping
- Mapping to a skeleton is not Mapping to a control Structure



Character Setups

- IK-driven limbs
- Various constraints for facing direction, foot orientation, gaze direction, etc.
- Expressions
- Each target package has its own set of character features



Typical Maya Pipeline

- Extract Skeleton/Mesh from Maya to Diva
- Alter Skeleton to Match Performer
- Solve onto Actor's Skeleton
- Retarget onto Original CG Skeleton
- Map data back into Maya

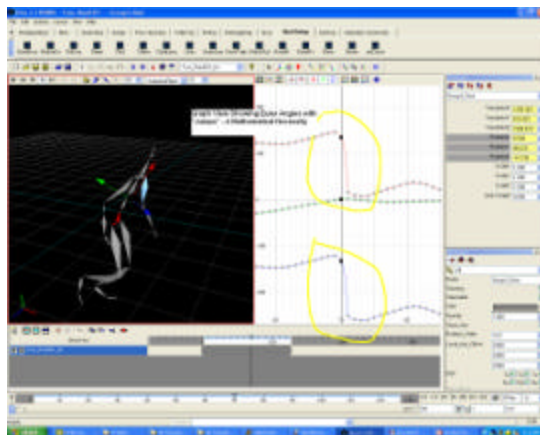


Considerations – Maya

- Euler Angles vs. Quaternion
- Sub-Frame Interpolation
- Rotation Interpolation Settings
- Key Frames Tangencies



Euler Angles – legal vs. illegal



Typical Max Pipeline

- Character Studio most common
- Import CSM (Marker) Files or convert CSM to .BIP files
- Marker Naming Conventions (Props)



Considerations – 3DS Max

- Biped Pipeline still the most common difference
- Fundamental Data – Marker Data (Global Trans.)
- Places Burden on the Animator
- Don't forget the Fig and the Cal Files



It's Working!

- Hardware systems have matured
- Software solutions have incorporated more smarts
- Methods are great when number of source/target skeletons is small compared to number of motions
- Simple retargeting hacks give good results much of the time

