It's the Performance, Baby!

The Motion Capture Pipeline

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The Motion Capture Process

• Planning
  – Deciding what you want
• Shooting
  – Getting the performances you want
• Processing
  – Making the data faithful to the original performance
• Application
  – Making the CG character move like the original performer

Planning a Mocap Shoot

• Understand your goals – What do I really want?
• What information should I prepare?
  – Shot list
  – Mocap pipeline technical spec
• What arrangements should I make?
  – Talent
## Considerations

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

## Preparing to Do Mocap

- Shot list – What moves am I going to capture?
- Technical specification – What do I ultimately want to apply the data to?
- Talent arrangements – Who can give me the performance I want?

## 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
The Mocap Tech Spec

Why Pro Talent?

• The “Bob from Accounting” syndrome
  – Comparative costs for talent vs. data capture and processing
• Directing your talent
  – Multiple takes are your friend

Can I Capture My Own?

• Defining your needs
  – Quantity of data
  – Budget
  – Number of CG character targets/performers
  – Realtime vs. Non-realtime
  – Studio environment
• More than just an “animate this character”
• Used to define mocap data pipeline
Use a Mocap Provider?

- What’s hard about doing mocap?
  - Difficulty of processing mocap data
  - Difficulty of acquiring “good” data
  - Hardware/maintenance costs
- Getting good marker data is only the beginning!

Other Shoot Considerations

- Props
- Clothing/Costuming

At the Shoot

- Direct the talent
- Remember it’s a mocap shoot, not a film shoot
  - Look for motion performance
  - Get props out of the way
Mocap Technology

System Considerations

- Passive vs. Active markers
- Cost
- Data rates
- Transportability
- Configurability
- Durability

Hardware Advances

- Real-Time optical systems
- Linear CCD array-based systems
- Nearly limitless numbers of markers
- Better precision through better calibration
Software Advances

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

Real-Time Capture

- Can provide actor feedback, quick data delivery, and/or live performance broadcast
- Requires assumptions/simplifications
  - Gap filling
  - Noise filtering
  - Processing speed considerations

Non-Realtime 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
- No actor feedback
- Unusable for live broadcast
Capturing “Good” Data

- Good data now saves much pain later
- Focus on getting the right performance
- Heavy marker redundancy
- System setup and calibration

Mocap Data Processing

- What happens after the shoot?
  - The processing pipeline is still a substantial part of the pipeline
- Why can’t I just take my data home?
  - Noise
  - Gaps/missing data
  - Conversion to skeletal data
  - Mapping to target control structure

Data Management

- 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?
Shot Tracking

- Relational databases can store info, but not the data itself
- Data usually needs to be stored at various stages
- What info do I need to store in the database?

What to Store

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

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

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
But I NEED to Retarget It!

- Overall scaling to match what's important
- So what's important?
  - Foot plants
  - Hand to object relationships
  - Limb to body relationships
- Depends on the move!

Retargeting Cheats

- Artificial limb length adjustments
- Base pose tweaking
- Marker constraint weighting

Mapping to Control Structures

- "Just animate my character!"
- Character setups are diverse
- Animating character setups requires inverse mapping
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

Inverse Mapping

- A reverse engineering problem for each target platform
- May avoid inverse mapping by changing what we capture
  - Capture desired end effector locations and limb pointing vectors
- But this makes our motion too character-specific!

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
Must Go Faster!

- User requirements are becoming more complex
- Hardware and software advances are currently outpaced by user needs and increased use of motion capture in practice