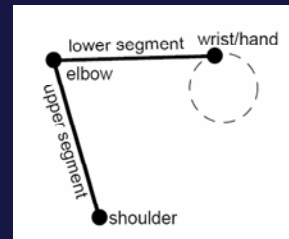## Perceptual Studies

Jason Harrison, Ron Rensink, and Michiel van de Panne, Obscuring Length Changes During Animated Motion. ACM Transactions on Graphics, 23(3), Proceedings of SIGGRAPH 2004.

Perceptual Studies

Movie

Conclusions

Numbers showing change in limb length that should not be perceivable:
    3% with full attention
    20% when not the focus of attention
Sensitivity to growing higher than to shrinking (why?)
Slower changes are less noticeable
Changes are less noticeable during fast motions

Strengths? Weakness?

Distractor task is a good experimental design. Explored space where one or both segments changed, fast/slow velocities, duration of change.

Study somewhat distant from real question—if you don't see it on the line drawing does that really mean that you won't see it on the cute little kid?

Is perceivable or not the right question? With the little kid, the question we really care about is whether it looks natural or not?
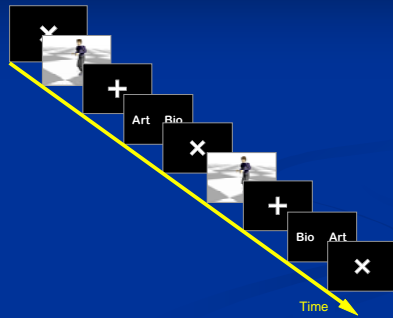
Follow-on Studies?

Is change in limb length of benefit even if it is noticeable? Makes the kid look like he is trying harder?

Sub-threshold effects? Higher LOD in soccer players increases rating of skill.

Slide 1

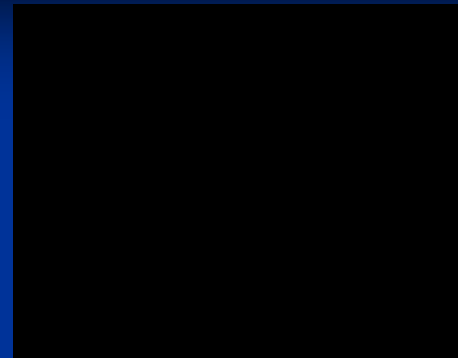**Response to Model**

Experimental paradigm

Art Bio
Bio Art

Time →

Collaborators: Thierry Chaminade, Mitsuo Kawato, ATR

13 Dots
25 Dots
Ellipses
Robot
Alien
Clown
Human

Slide 2

Response to Model

13 Dots
25 Dots
Ellipses
Robot
Alien
Clown
Human

Slide 3

Response to Model

Motion capture

Keyframed motion

13 Dots
25 Dots
Ellipses
Robot
Alien
Clown
Human

Slide 4
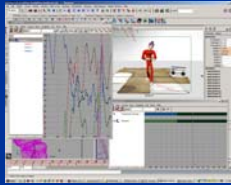
Behavioral Experiments

Analysis

Subject Sees ⇒ Responds ⇓	Motion capture	Key framed
Biological	Correct	Error
Artificial	Error	Correct

Do models influence perceived naturalness of motion?
→ test effect of model on proportion of biological responses.

Slide 5

Behavioral Experiments

Results: biological responses
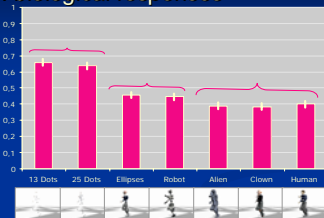
Dot models cause increased biological response rates when compared to others (all pairwise comparison $p<0.05$).

Ellipses and Robots different from Alien, Clown and Humans (all pairwise comparisons $p<0.05$ except Human vs Robot, $p=0.11$);

Within groups comparisons are not significant.

Slide 6

Experiments

Relationship between the model (rendering style) and the perception of motion. More complex/anthropomorphic models are less likely to be perceived as being biological motion

Reinforces common wisdom in animation community – motion must be fully rendered to be assessed

Repeated experiments with fMRI. Model has an effect on STS activity

fMRI

- What is measured?
  - Blood flow to areas of the brain
  - About 2 seconds after event
  - Scan completed every ~2 seconds
- Data processing
  - Align brain scan with "typical" brain
  - Look for differences in activation between regions for various stimuli
  - Running the machine costs $600/hour
    - few subjects

fMRI

- Conclusions
  - X area lights up when we show human motion but not when we show similar frequency non-human motion
  - X area has known to be associated with y so it's interesting that it also turns up in our study of z
- A powerful tool?
  - Resolution may not prove to be fine enough?
  - Individual differences between brains

Behavioral Studies

Perceptual experiments tell us what we can perceive—but not necessarily what makes a compelling character.

We really want to know how the audience will respond to a character—maybe behavioral metrics get closer to that?

Enactment

Interference

Imitation

Terror management

Behavioral Studies—Immersion in VR

Use heart rate, galvanic skin response to measure immersion. Test frame rate, lag, walking vs. flying, and other factors.

http://www.cs.unc.edu/~eve/walk_exp/

Method: Use enactment as a metric

Extensively studied behavior

Classic experiment:

hear, see, or perform ~50 phrases like
"carry the suitcase"

delay or distracter task

tested with recall or recognition

measure percentage correct and reaction time

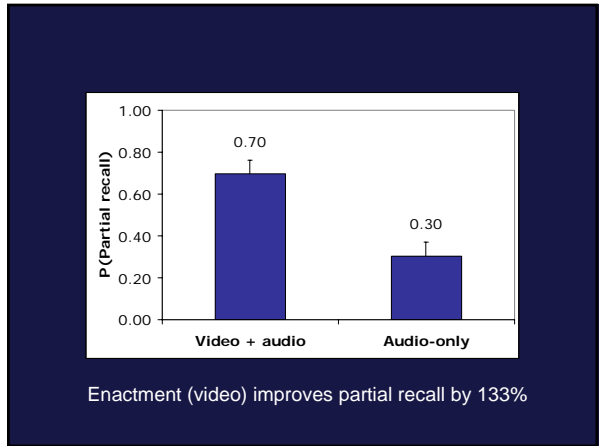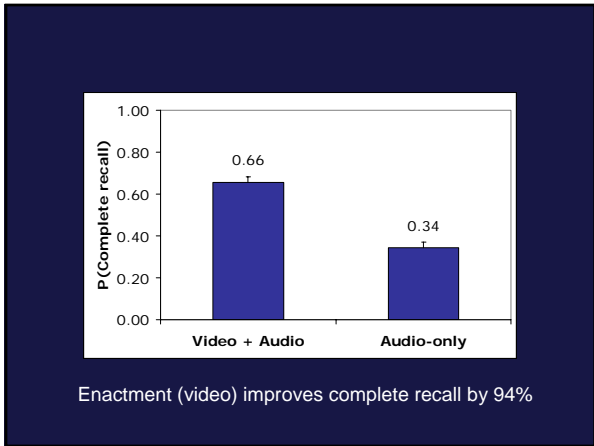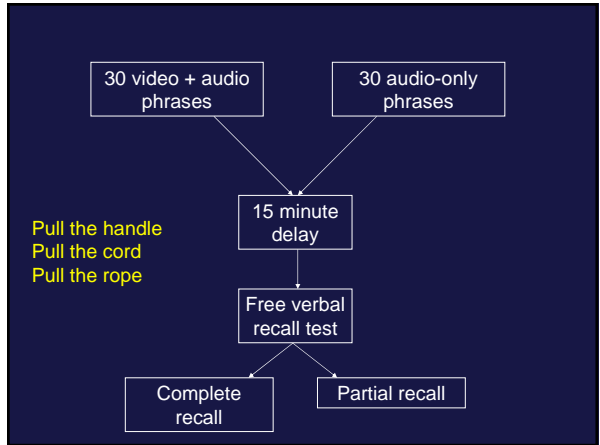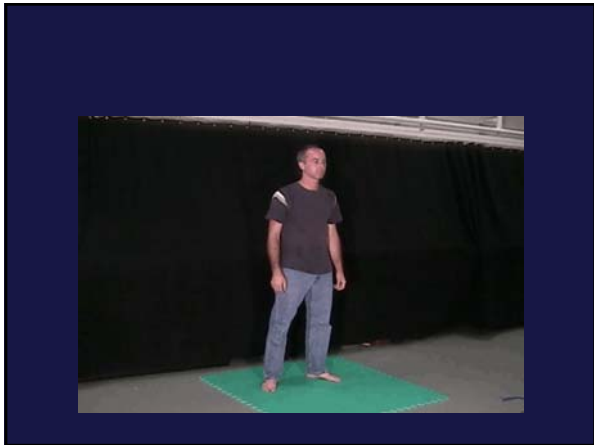| 13% Verbal	27% Experimenter performed	46% Subject performed

Data from an experiment in the literature

Method: one verb, multiple objects

3

30 video + audio phrases → 30 audio-only phrases

Pull the handle
Pull the cord
Pull the rope

15 minute delay

Free verbal recall test

Complete recall

Partial recall

Enactment (video) improves complete recall by 94%

Enactment (video) improves partial recall by 133%

4
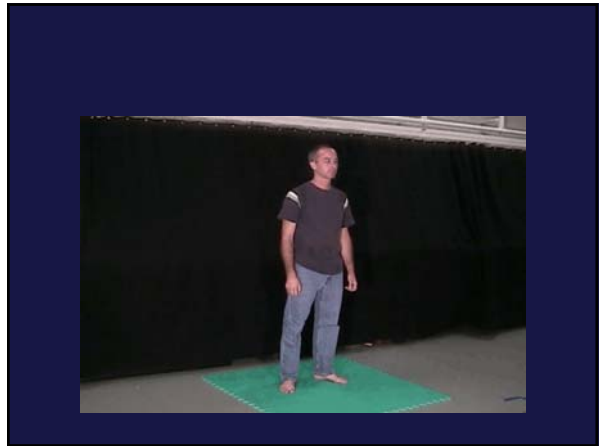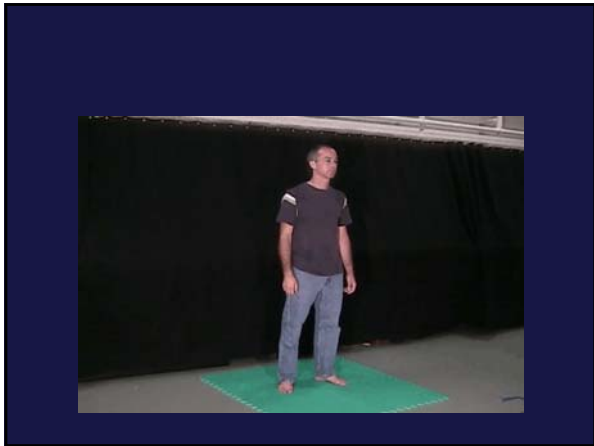
What to test?

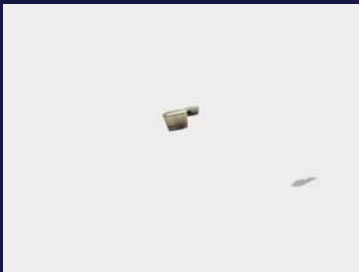Animated character pantomime

What to test?

Animated character with object

What to test?

Object

What to test?

Animated character pantomime
- rendering styles
- degraded motion
- different characters

How might we fail?

Hard to create good animations of these phrases
Might not be a fine enough discriminator
Only have n% to work with
- more phrases
- recall rather than old/new
- longer delay

Verbal

Experimenter
performed

Subject
performed

What else might work?

Imitation behaviors
- Yawning
- Walking in step

Interference behaviors
- Performing one arm motion while watching another
- Harder for human arm motion
- Not for automation robot?

What else might work?

Terror Management Theory (Karl MacDorman)
Survey questions
- How angry is this character?
- What color is her sweater?
- Who pushed who?

Are any of these really measuring what we care about in animated characters?