

Virtual Humans Behavior Tutorial

The Nonverbal Behavior Generator & The SmartBody Animation System

Social Interaction Group

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Background: **Virtual Human Body**

- **Goal: Virtual human behavior that supports interaction with humans in virtual world**
- **Capabilities:**
- **Basic Physical Behavior**
 - Walking, grasping
- **Nonverbal, expressive behavior**
 - Gestures, facial expressions, gaze
- **Requirements:**
- **Spontaneous, interactive**
 - Responsiveness to events
 - Constraints on realization

Background:

Function of Nonverbal Behavior

- Nonverbal behaviors serve functions

INTERACTIONAL

Awareness/Recognition
Initiate/Break contact
Take/Give turns

PROPOSITIONAL

Emphasize/Contrast
Refer
Depict feature
Change topic
Request/Give feedback

AFFECTIVE

Express Emotion, Attitudes
Reveal Traits, Culture



Raise eyebrows

Gaze towards Posture Nod

Smile Shake head Beat

Point Gaze away Gesture

Lower eyebrows Toss head

Body orientation Pause

Virtual Humans Unleashed: Research flowing into Tools

VHuman
Brain
Reasoning
Language
Emotion

Functional
Markup

VHuman
Behavior Subsystem

NonVerbal
Behavior
Generator

Behavior
Markup



Animation

Applications

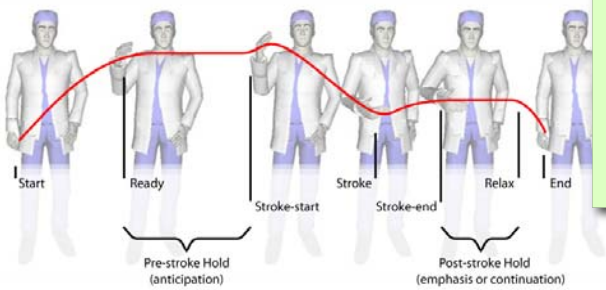


Encoding: What behaviors to use?

Realization: What is physical manner of behaviors?
How to animate, schedule & compose them?

Behavior Models & Animation Based on Research

Computational Models of Behavior



Establish International Standards



Studies Of Human Behavior

Facial Expression, Gaze, Gesture, Posture, Cultural Differences

Emotion Evoking Game



Nonverbal Behavior Generator

- **Goal**
 - Modeling relation between function and nonverbal behavior
 - Robust NVB Generation that can use markup of communicative function if provided, but can also extract/infer it from the surface text, if not

- **Research**
 - Learning the relation
 - Not focus today

- **Also a tool for application development**
 - Today's focus:
 - Tailoring to a specific application



Open-SmartBody

SmartBody: an *open source* modular framework for animating ECAs in real-time

Goals of the SmartBody project:

- **Exploit a range of animation techniques that best address ECA requirements**
- **Support community-wide research in animation techniques for ECAs**
- **Foster collaboration on components for developing ECA applications**
- **Support reuse across a range of projects**
- **Lower the barrier of entry for application development (today's focus)**

NVBG and SmartBody projects

- Over 10 projects inside USC and growing interest outside of USC
- SASO-ST
 - SmartBody controls 2 characters in a 3-party live conversation
- ELECT
 - Outside game company crafted own characters and motions
- Virtual Patient
 - Standardized patient for training health-care professionals
- Virtual Rapport



- *Versatile:*
 - Significant re-use of motions, procedural controllers.
 - Varying agent designs, speech systems, game engines.