Developing Natural Full-body Motion Synthesis in Virtual Humans

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Background

- The system under development is a two-phase immersive virtual reality training program with interactive virtual human agents [1].
- The system uses realistic, parametrized gestures in various contexts.
- Phase I (modeling): Experts model needed gestures/actions via demonstration using motion capture hardware.
- Phase II (training): Captured motions are reused to train apprentice users.

Study I - Gaze Model

- Gaze behavior is an important non-verbal communication channel for effective full-body motion synthesis.
- We focus on analyzing gaze behaviors in demonstrative tasks.
- Time stamps of key gaze events are annotated.
- Temporal parameters of gaze behaviors are analyzed and modeled.

1. Temporal delay ($\Delta t$) between action stroke point and starting of gaze-at-viewer event.

2. Correlations between duration of gaze-at-viewer and viewer positions.


Study II - Body Positioning

Motion Capture

- Upper-body actions and gestures are parametrized with Inverse Blending [2].
- Lower-body walk and stepping sequence is generated with either Motion Graphs or a locomotion planner.
- The coordination of upper- and lower- motions is critical for generating human-like movements.
- The focus is on the short blending window at the end of locomotion and beginning of upper-body action/gesture.

Motion Analysis

- Top: hand trajectory of captured pointing motion.
- Bottom: annotation application showing gaze phase-plane and reconstructed environment.

Study III - Coordination

User Evaluation

- These early findings on gaze modeling, body positioning and locomotion-action coordination will inform the design and utility of interactive training and educational applications with virtual humans [3], and shape the future work in this domain.

Motion Capture

- Horizontal Target Plane
- Vertical Target Plane

Vertical Target Plane

Motion Analysis

Study I - Gaze Model

Motion Capture

Motion Analysis

Horizontal Target Plane

Vertical Target Plane

Study II - Body Positioning

Study III - Coordination

User Evaluation

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