Synthetic animation of deaf signing

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VISICAST
Automated deaf signing of broadcast television

- Translation of text to sign
- Animation of signs
- Transmission over broadcast channel
- Rendering of avatar
Motion capture

- Very lifelike animation
- Time-consuming to set up
- Blending of signs
- Combining signs from different signers
Hand-crafted animation

- Can give good animation
- Time-consuming (1/2 hour per sign)
- Blending of signs still required
Synthesis from semi-abstract transcription

- Quick to create lexicon (a few minutes to transcribe a sign)
- Instantly retargettable to any avatar with humanoid topology
- Automatic blending
- Low bandwidth
HamNoSys:
Hamburg Notation System

DGS “GO-TO (by car)”
SiGML: an XML-isation of HamNoSys

<sign_manual both="true">
  <handconfig extfidir="uo" palmor="l"
    handshape="finger2" thumbpos="open"/>
  <tgt_motion>
    <directed_motion direction="o" curve="u"/>
    <handconfig extfidir="do"/>
  </tgt_motion>
</sign_manual>
Animation of HamNoSys

Make explicit everything HamNoSys leaves implicit or fuzzy:

- position
- elbows and shoulders
- speed
- trajectories
Naturalistic animation

A hard problem in general (e.g. walking).

Easier for signing: no interaction with environment, ignore gravity.
desired position

error

gain

desired velocity

error

gain

acceleration
A simple linear control system

Simulated physics

desired position

actual position

error

desired velocity

actual velocity

force/torque

gain

*\textbf{K}_1

*\textbf{K}_2
Controller response
Inverse kinematics

Hand position and orientation given by HamNoSys

From these, compute joint angles from clavicle to wrist (*inverse kinematics*).

3 degrees of freedom per arm left undetermined: respect the limits of the joints avoid the arm passing through the body
Stick-figure avatars

Useful for developing animations:

• easier to render, so more frames per second

• skeleton gives clearer view of motion

• prototyping tool only, not intended for end user!
VRML for prototyping

Virtual Reality Modelling Language

Textual description language for 3D animated scenes.

H-Anim standard for articulated humanoid figures.

H-Anim incorporated into MPEG-4.
Ambient motion

If only arms, hands, and face are animated, the result is stiff.

Mix synthetic animation with motion-captured “ambient motion” for the spine and head.
Next steps

Implement the whole of SiGML/HamNoSys

Facial animation:
blend motion-capture data
implement HamnoSys 4

Tests