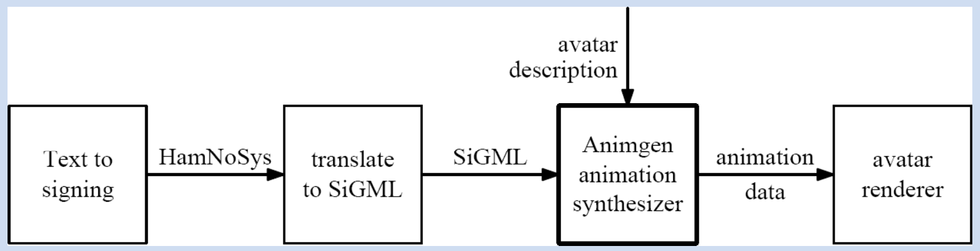
A Framework for Non-Manual Gestures in a Synthetic Signing System

John Glauert, Ralph Elliott, Richard Kennaway
School of Computing Sciences, UEA Norwich, UK

Synthetic Signing - SiGML Notation

- ViSiCAST project (2000-2003) [1]: sign language for deaf people using virtual human *avatars* – driven by motion capture data, but more flexibly by synthetically generated animation data.
- SiGML[2]: input notation for the synthetic signing system; an XML application; consists of a number of modules; *Gestural* SiGML module is used to specify *manual* and *non-manual* aspects of sign sequences.
- Gestural SiGML is based on the Hamburg Notation System, HamNoSys [3] – a well established phonetic transcription system for sign languages.
- Non-Manual SiGML can describe the action of distinct articulators: shoulders, body, head, eye-gaze, eye-brows, eye-lids, nose, mouth-gestures (speech-independent) and mouth-pictures – visible speech characterstics, defined by SAMPA codes.
- SiGMLSigning: a software system developed to generate on-screen animations synthetically in real-time from SiGML/HamNoSys input texts.
- SiGMLSigning implements a processing pipeline (below).



Synthetic Animation: Processing Pipeline

http://www.visicast.cmp.uea.ac.uk

AnimGen

- AnimGen [4] is the key component in the processing pipleline
- Given a description of the avatar's physical characteristics and an av atar-independent SiGML sign sequence, AnimGen combines these to generate a sequence of animation frames to make the avatar perform the signs.
- Each frame defines a static pose of the avatar's skeleton and face.
- A facial configuration is a weighted sum of pre-defined *morphs* – i.e. elementary deformations of the face.
- Each non-manual SiGML element is encoded as a combination of *morph trajectories*, each specifying a maximum weight for a morph, with set-up, hold, and decay times. These trajectories may be combined in series and in parallel.

```
<mouth_gesture sigmlName="L09">
  <morph name="15" amount="1" timing="mt-ft"/>
  <morph name="07" amount="1" timing="ft-mt"/>
  <morph name="15" amount="1" timing="mteml"/>
</mouth_gesture>
```

Mapping: SiGML Non-Manual to Morph Animation Sequence

References

1. Elliott R, Glauert JRW, Kennaway JR, Marshall I (2000) *Development of Language Processing Support for the ViSiCAST Project*. ASSETS 2000, 4th International ACM SIGCAPH Conference on Assistive Technologies.
2. Elliott R, Glauert JRW, Kennaway JR, Parsons, KJ (2001) *D5-2: SiGML Definition*. ViSiCAST Project working document.
3. Prillwitz S, Leven R, Zienert H, Hanke T, Henning J, et al (1989) *Hamburg Notation System for Sign Languages: An Introductory Guide*. International Studies on Sign Language and the Communication of the Deaf, vol 5. IDGS, U Hamburg.
4. Kennaway JR (2001) *Synthetic animation of deaf signing gestures*. 4th International Workshop on Gesture and Sign Language in Human-Computer Interaction. Springer-Verlag, LNAI vol 2298, pp 146-157.

Example: "MUG-TAKE-I" in BSL

VGuido: "MUG-TAKE-I" (frames 12, 42, 50)

```
<sigml>
  <hamgestural_sign gloss="mug">
    <sign_nonmanual>
      <mouthing_tier>
        <mouth_picture picture="mVg"/>
      </mouthing_tier>

    </sign_nonmanual>    <sign_manual>
      <handconfig handshape="fist" thumbpos="across"/>
      <handconfig extfidir="ol"/>
      ....
    </sign_manual>
  </hamgestural_sign>
    ....
      <mouthing_tier> <mouth_picture picture="te_Ik"/>
    ....
      <mouthing_tier> <mouth_picture picture="a_I"/>
    ....
</sigml>
```

SiGML Sequence: "MUG-TAKE-I" in BSL with Mouthing Non-Manuals

VGuido: "I" close-up, frames 50, 51, 52