FP7 - Information and Communication Technologies

Collaborative Project

Dicta-Sign

Sign Language Recognition, Generation and Modelling with application in Deaf Communication

Grant Agreement Number 231135

Deliverable D3.3: Animation Tools with Inter-operability Features.

Leading Partner: University of East Anglia (UEA)

1. Introduction

This document provides a brief report describing **D3.3 Animation Tools with Inter-operability Features**, the final deliverable of **WP3 Synthesis and Animation**. The core of the deliverable is encapsulated in the final Dicta-Sign release of the **JASigning** software system that is accessible via the URL:

http://vhg.cmp.uea.ac.uk/tech/jas/095h

This distribution includes **Françoise**, the Dicta-Sign avatar in ARP format [Jennings 2010] developed in conjunction with partner CNRS. The software is installed on client computers via the website of partner UEA. The distribution could be hosted on other servers, but the security requirements of Java applications make this inconvenient.

The remainder of this report highlights particular enhancements to the JASigning software for D3.3 along with a description of a number of additional components developed for the project prototypes (D7.1, D7.2, D7.3) and the project demonstrator (D8.1). We report development of the Dicta-Sign avatar and work to improve cross-platform use of the avatar signing software.

2. Françoise: the Dicta-Sign Avatar

To support inter-operability the project has developed an avatar named **Françoise** that can be used both within the JASigning software and by the Octopus and GeneALS software of partner CNRS. This is based on a virtual signer skin developed by CNRS which has been adapted according to the ARP specification [Jennings 2010].

Figure 1: Initial Avatar Designs

The initial designs were evaluated by WebSourd and a revised design now forms the basis of the avatar that has been produced:

Figure 2: Final Avatar Design

Exporters written for the ARP system provide access to the avatar through a range of industry standard tools. The main export is in a 3ds Max project containing the avatar and some animations. This can be read for use in the standard animation packages, 3ds Max and Maya. An exporter has also been written to generate BVH data files for animations, for import by CNRS.

Françoise is included in the JASigning distribution and will be installed automatically for users of the Sign-Wiki.

During the third year of the project, CNRS has made progress on the two generation programs developed:

- **Octopus:**. A new version, still under development, has been started during the last months, with the aim to accelerate the animation calculation process.

- **GeneALS**: The new skeleton definition, together with a set of physiological rules have been integrated. The program is now able to generate the postures described in Zebedee for most of the signs contained in the Dicta-Sign Basic Lexicon Database (D6.1).

3. Enhanced Flexibility and Precision in SiGML

In deliverable D3.2 we reported enhancements to SiGML that allow more continuous attribute values to be used in place of the discrete values inherited from HamNoSys. Hence locations in signing space can be provided numerically, and the HamNoSys concept of an attribute value “between” two other values was extended to allow specification of any point from one extreme to the other.

When a transition in a sign involves a change in hand posture, HamNoSys allows modifications to several attributes to be described. Firstly there may be a movement involving a change in hand location. Secondly there may be a change in hand shape, and finally there may be a change in hand orientation (palm and extended finger direction). The model used by Animgen, the software that generates animation data from SiGML, assumes that all these changes are synchronised so that the final handshape is only achieved when the movement has been competed.

However, colleagues at UHH suggested that orientation and shape were often established early in a movement. [Hanke 2011] reports enhancements made to SiGML and the Animgen software, and reports early experiments on whether the resulting animation is seen as more realistic. The SiGML document in Fig 1 shows a test of the new facilities where the additional XML attributes **orientation_lead** and **shape_lead** can be used to cause hand orientation or shape to be established earlier than by the default model. It remains to be seen whether the default behaviour should build in a lead for either orientation or shape.

```
<?xml version="1.0" encoding="UTF-8"?>
<sigml>
  <hamgestural_sign gloss="Timing test">
    <sign_nonmanual/>
    <sign_manual both_hands="true" lr_symm="true">
      <handconfig handshape="finger2345" thumbpos="out" extfidir="o" palmor="u"/>
      <location_bodyarm location="chest" side="right_at"/>
      <rpt_motion repetition="fromstart">
        <seq_motion>
          <tgt_motion>
            <directedmotion direction="o" size="big"/>
            <split_handconfig>
              <handconfig handshape="fist" thumbpos="across" shape_lead="0.822" orientation_lead="0.822"/>
              <handconfig handshape="fist" thumbpos="across" shape_lead="0"/>
            </split_handconfig>
            <handconfig extfidir="o" palmor="d"/>
          </tgt_motion>
        </seq_motion>
      </rpt_motion>
    </sign_manual>
  </hamgestural_sign>
  <hamgestural_sign gloss="=wait">
  </hamgestural_sign>
</sigml>
```

Figure 3: Use of shape_lead and orientation_lead parameters

Figure 4: (a) Without and (b) With shape_lead and orientation_lead parameters

4. Extended SiGML Model

Building on earlier work to accommodate the linguistic approach of Liddell and Johnson, new ways to structure SIGML have been explored [Glauert 2011]. Segmentation in Liddell/Johnson style can be derived from SiGML descriptions, as has been demonstrated in the project by partner ILSP in support of sign recognition work. However, we believe that there is benefit in adopting this style as an option when annotating signs in the first place.

A characteristic of this analysis is to create a timeline for the postures and transitions that make up individual signs, or sign sequences. In work for the Sign-Wiki, and in particular for handling linguistic structures studied by WP4, XML languages were developed that contain descriptions of sign language sequences. The DTDs for these languages are available from the project website.

SiWikiML describes a complete Sign-Wiki document. The document structure is specified along with information about signs making up sequences. Signs may be extracted from the Dicta-Sign lexicon (see D6.1) which contains SiGML data for the signs. Signs may also be expressed directly in SiGML. In addition, timing information gives the duration of individual signs and hence of a sequence.

LimSiWikiML is a representation in Liddell/Johnson style that provides timing for different tiers of information describing signs. A SiWikiML document is processed according to linguistic structure rules (see WP4) to produce corresponding LimSiWikiML. At present, animation of this format involves conversion to SiGML but in future work it is intended to merge the LimSiWiki representation with the extended SiGML notation from [Glauert 2011].

5. Components to Support WP7 and WP8

The JASigning software is based on provision of Java components that have been used to build a number of free-standing Java application and Java applets that can be used on web pages.

An important contribution of WP3 has been the creation of synthesis and animation components to support the project prototypes and demonstrator. We summarise the work done in this area.

D7.1 Search by Example Tool: A sign search server developed by partner UniS connects to an animation client developed by UEA. The latest version is available at:

http://vhg.cmp.uea.ac.uk/tech/jas/ss/095z/sbec-d

The main enhancement to the animation component is the ability to display up to four avatar panels, playing signs in synchrony.

D7.2 Sign Look-up Tool: The architecture for the Sign Look-up Tool is superficially similar to the Search by Example tool, but a number of enhancements were made to both server and client software. The latest version is available at:

http://vhg.cmp.uea.ac.uk/tech/jas/095z/sltc-a/

Work on both tools is reported in [Elliott 2011].

D7.3 Sign-Wiki and D8.1 Project Demonstrator: The Sign-Wiki is web-based and therefore uses an enhanced Java applet for animating signs and sign sequences. As with the software developed for D7.1 and D7.2, the component is responsible for communicating with a server that aims to recognise signs based on a training lexicon. The component is downloaded automatically when a user visits the Sign-Wiki at

http://signwiki.cmp.uea.ac.uk/dictasign

Most of the facilities added to the applet are concerned with communication with the recognition server but a number of features were added to support the general Sign-Wiki functionality.

As mentioned, a SiWikiML document contains information about duration of signs. However, if no explicit duration is specified, a default value is needed. This value will be the "natural" time that Animgen uses when animating a SiGML sign. The applet has been enhanced so that the Sign-Wiki can interrogate the natural timings for signs in order to inform processing of linguistic strictures to generate LimSiWikiML data.

Simple features have been provided for editing postures in signs. The processing involves extracting attributes from a sign posture to allow the user to modify them as desired. After previewing the sign, which involves reconstructing the full SiGML representation, the user can choose to replace a sign by the edited version. Support for this process uses some additional functionality provided by the applet.

Finally, the applet is used to coordinate processing of linguistic structures in a SiWikiML document to prepare LimSiWikiML data en route to animation.

6. Cross-Platform Support through WebGL

The JASigning software is supported on both Windows and Macintosh platforms. This is achieved by the use of Java with OpenGL for rendering and compiled C++ native code for the Animgen component. Unfortunately, support for the OpenGL interface is patchy and has ceased to work on the latest browsers on the Macintosh platform. Happily the software performs acceptably in Firefox 3.6 which is still supported.

With the development of HTML5 and the WebGL standard that is supported on most leading browsers (Firefox, Chrome, Safari, but not Internet Explorer) it becomes attractive to move to more integrated browser support. With this in mind, a WebGL implementation of the renderer has been developed.

At

http://vhg.cmp.uea.ac.uk/webgl/avatar_viewer.htm

is a viewer that uses only WebGL and should work on browsers with appropriate support (see http://get.webgl.org). An example of a page including Françoise and with support for general SiGML processing is at

http://vhg.cmp.uea.ac.uk/tech/wglarp/

The WebGL implementation should become more reliable as browser support for HTML5 increases. It will also make it practical to provide the software on operating systems such as Linux and potentially on mobile devices without producing bespoke implementations.

An example of a further application of this approach is the creation of a prototype offline movie server that will generate a movie from given SiGML data. This server is currently only available at the site of partner UEA because of firewall restrictions.

7. References

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