

A Tool for Sign Language Analysis through Signing Space representation

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1 Introduction

Our work stands in the field of computer-aided sign language analysis. Our goal is to design tools dedicated to the analysis of video corporas. The design of those tools implies to study at least three different aspects of the representation of the discourse:

- An external form, that is a human-computer interface consistent with the language model we want to study and that avoids as much as possible the use of an foreign oral language.
- An internal representation of the language that assures the consistency of the transcription and allows the automation of some parts of the analysis.
- A file format that represents the structure of the language.

In this paper, we will present how these aspects are taken in account in a tool that permits the transcription of a video sequence through a representation of the use of the signing space.

2 Framework

Previous work lead us to propose an annotation tool [2] which makes it possible to build a transcription of the sequence as a set of tracks which could be filled either manually or by automatically based image processing and linguistic models. Actual work on that application concerns the integration of that automatic processing capabilities for a partial automation of the transcription task or to compare the interpretation of the user to the results obtained by the exploitation of the internal language models.

Another aspect of sign language transcription tools is the track named “gloss”, wich, in existing system [8][4][7], uses a foreign language language (eg. English) to transcribe the meaning of each sign. Our works led us to the conclusion that a formalism closer to sign language would be more desirable to transcribe lexical notions. Actually, we use the SignWriting¹ formalism. Existing tools for the edition of SignWriting symbols use an XLM representation for that symbol that is difficult to manipulate. So we studied an unicode encoding of these symbols [1] in order to use the transcription in other applications (word processors, text editors, statistical toolstext interfaces, ...). Current work on that field concerns utilities to help data capture, such as automatic completion, or the use use of a canonical form for a given sign.

3 Signing space representation

An interesting way to represent and study the structure of sign language utterances is to use the signing space as a representation of that utterance. This section will describe the main aspects of our contribution in the design of such a representation.

The first aspect of this a tool concerns the human-computer interface. The signing space is presented as a 3D scene where the user cans interactively place the entities that are evoked in the discourse. We are working on automatisisation of this process dy image analysis. An internal language model [6] is used to assure the consistency of the signing space construction. This model considers the structure of the sentence as a set

¹<http://www.signwriting.org>

on entities and relationships and defines the type of each entity depending on the relationships involving it (eg. *places* for entities that are only involved in spatial location relationships). The structure of the model is based on the iconicity theory by C. Cuxac [3]. Finally, we use an XML representation of the current signing space construction as a file format for the storage of the data and internal manipulation of the model.

4 Conclusion and further works

Some parts of the set of tools we presented are still under development. Most of the current work concerns the integration of the image processing capabilities. We already have a set of operational operators (skin segmentation, feature tracking and identification, ...) but they still need to be integrated in the annotation tool.

Concerning the syntactic aspects of sign language, we proposed a behaviour model that is able, being given a modification of the signing space, to infer a qualitative description of the components that were involved in that evocation [6]. But this model was designed on a subset of the French sign language grammar and need to be generalised to a larger part of the grammar of that language. Connection to image processing [5] as yet to be specified, but further experimentations are needed to validate the choice of the image processing functionalities. Moreover, our signing space representation consists on a qualitative description of the entities that were evoked. It means that, in the case of an automated analysis, one needs to be able to perform a fine characterization of hand configuration to take into account the lexicon, which can only be done in a reduced context limiting that lexicon.

However, interactive signing space manipulation tool provides, as it, a very interesting approach for sign language analysis. Actual work on signing space model concerns the extension of that model to dialogs transcription, especially through the representation of the way the signers interact to build the signing space.

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