Workshop on the Representation and Processing of Sign Languages

From SignWriting to Image Processing.
Information techniques and their
implications for teaching, documentation and communication.

Workshop on the occasion of the 4th International Conference on Language Resources and Evaluation, LREC 2004

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Preface

On behalf of the program committee for the LREC 2004 "Workshop on the Processing of Sign Languages", we are pleased to present you with the proceedings which contain the papers accepted for presentation at the Lisbon meeting on May 30th, 2004.

This volume, full of eye-catching signs, symbols, robots and screen-shots may charmingly attract readers who, although having a sound knowledge of Natural Language Processing, might be confused by the great variety of topics and approaches. How do SignWriting, avatars, XML, videos and image recognition fit together? Are they competitive approaches or different solutions to different problems? Where will future research lead us, which endeavours answer real social needs and which scenarios are still illusionary - or congenially visionary?

As always, the answers to these questions lie between slow and quick, up and down, straight and curbed. It is by drawing analogies to the processing of spoken languages that we might better understand the contribution and benefits of the different approaches, span the space of possible research and identify future tendencies in the research on the processing of sign languages.

Trivially speaking, spoken languages are spoken and heard. Sign languages are signed and seen. Spoken languages have been written on stone, wood, paper and electronic media. The technical support ranged from a chisel to a keyboard. The writing systems which developed have been under the influence of the particular language and the technical support. Having a hammer in your right and a chisel in the left makes it difficult to write from left to right. Having stable vowels motivates their representation in the written form. So how can sign languages be written for love letters, poems, verdicts and recipes?

One possible answer is SignWriting. SignWriting does not decompose a sign into phonemes, syllables or morphemes but body-parts, movements and face expressions and assigns a representation to each of them. Given such representations - e.g. an alphabet for potentially all sign languages - how may a keyboard, the input system, look like? How are the simple elements (body-parts, movements and face expressions) to be encoded in the computer and how the composed signs? As pictures, in Unicode or XML? How will this influence the input of signs, the layout and formatting of SignWriting documents, the possibilities to perform fuzzy matches on texts, in dictionaries, in the Internet? The papers written by Richard Gleaves, Valerie Sutton (*Signwriter*), Antônio Carlos da Rocha Costa, Graçaliz Pereira Dimuro, Juliano Baldez de Freitas (*A Sign Matching Technique to Support Searches in Sign Language Texts*), Angel Herrero (*A Practical Writing System for Sign Languages*), Steven Aerts, Bart Braem, Katrien Van Mulders, Kristof De Weerdt (Searching SignWriting Signs), Daniel Thomas Ulrich Noelpp (*Development of a new 'SignWriter' Program*) discuss these and related questions.

SignWriting, however, is by no means the only possible way of writing signs. Thomas Hanke in his invited talk "HamNoSys – *Representing Sign Language Data in Language Resources and Language Processing Contexts*" introduces an alternative approach, the Hamburg Notation System for Sign Languages. The purpose of HamNoSys has never been a usage in everyday communication. It was designed to comply with research requirements, e.g. for corpus annotation, sign generation, machine translation and dictionary construction. It thus differs from SignWriting in its scope and granularity. Unicode and XML solutions are available for HamNoSys, c.f. Ralph Elliott, John Glauert, Vince Jennings and Richard Kennaway in their contribution "*An Overview of the SiGML Notation and SiGMLSigning Software System*".

Once these fundamental questions regarding the writing of sign languages will be settled, derived notions such as word n-grams and character n-grams, important for computational approaches, may be used for applications such as language recognition, document classification and information retrieval. Spelling checking, syntax checking and parsing are obvious further developments once these more fundamental questions about the writing of signs will have been agreed upon.

It is a matter of fact, however, that most signers have not been trained in reading or writing in SignWriting. What is known as "text-to-speech" in the processing of spoken languages would seem a possible solution: a front-end to web-pages, mail boxes etc. would sign out the written text. As shown by Maria Papadogiorgaki, Nikos Grammalidis, Nikos Sarris, Michael G. Strintzis in "*Synthesis of virtual Reality Animations from SWML using MPEG-4 Body Animation Parameters*" and Yiqiang Chen, Wen Gao, Changshui Yang, Dalong Jiang and Cunbao Ge in "*Chinese Sign Language Synthesis and Its Applications*", avatars, i.e. virtual signers, may be constructed which translate a written form of a sign language or spoken language into signs, just like translating "d" into the corresponding sound wave.

A front-end on the input side of the system might translate signs into a written representation. Speech Recognition becomes Sign Recognition. Two different techniques are introduced. The recognition with the help of a data glove precedes from the signer's perspective and his/her articulations, c.f. Jose L. Hernandez-Rebollar's contribution "*Phonetic Model for Automatic*

Recognition of Hand Gestures". This approach may seem in line with the definition of phonemes in terms of their articulation and not their acoustic properties. On the other hand, it does not match our every-day experience in which we use a microphone and not electronic contact points at our vocal cords, tongue, velum, teeth and lips when using a telephone. The recognition of signs with the help of cameras, the second alternative, leads to the description of signs from the observer's point of view, in terms of formants and f_0, so to say. However, the articulation can be reconstructed and might be a better representation for the signs than the 'phonetic' description, as suggested by Boris Lenseigne, Frédérik Gianni, and Patrice Dalle in "*A New Gesture Representation for Sign Language Analysis*".

Both modules, sign recognition and sign generation, may serve MT systems with a sign language as source or target language respectively. A sign language as target language is used in translation experiments described by Jan Bungeroth and Hermann Ney in "*Statistical Sign Language Translation*". This corpus-based approach to Machine Translation, by the way, raises the question of sign language corpora. The only paper which really tackles the question of signed corpora in this collection is that of Onno Crasborn, Els van der Kooij, Daan Broeder, Hennie Brugman "*Sharing sing language corpora online. Proposals for transcription and metadata*". Matt Huenerfauth in his contribution "*Spatial Representations for Generating Classifiers Predicates in an English to American Sign Language Machine Translation System*", focuses on a particularly difficult aspect of sign language generation, the classifier predicates. Thus, when signing "leaves are falling", it is not enough to generate the sign "leave" and "falling", e.g. a downward movement. Instead the hand shape of "falling" should indicate the kind of object that is falling, e.g. with a flat hand.

The usage of classifiers leads us directly to the question of how to construct dictionaries for sign languages. Learners' dictionaries, reference dictionaries, dictionaries of NLP applications all need information about part of speech, lexical functions, idioms, subcategorization and semantics, which by no means is the same as in the national spoken language.
How do we search in a sign language dictionary? Have you ever looked up a Chinese or Japanese Dictionary? Paola Laterza and Claudio Baj in their paper "*Progetto e-LIS@*" propose an at least partially equivalent approach to the ordering of signs in a sign language dictionary.
How do you present the dictionary content to a learner? In the national spoken language or in SignWriting? The complexity of the question can be gauged from Elana Ochse's contribution "*A Language via Two Others, Learning English through LIS*". Should we use videos, photos, animations or drawings to represent the entries in dictionaries? A number of authors discuss these and related topics in the context of specific dictionary projects: for static presentations, i.e. paper dictionaries, Inge Zwitserlood and Doeko Hekstra propose the "*Sign Printing System – SignPS*" to compose pictures of signs. Eleni Efthimiou, Anna Vacalopoulou, Stavroula-Evita Ftinea, Gregory Steinhauer focus in their paper "*Multipurpose Design and Creation of GSL Dictionaries*" on the content, i.e. the types of information to be included in a sign language dictionary. Chiara Vettori, Oliver Streiter and Judith Knapp focus on different user requirements and the possible role of SignWriting in a sign language dictionary. Rubén Nogueira, Jose M. Martínez and present a dictionary project of a particular kind: "*19th Century Signs in the Online Spanish Sign Language Library: the Historical Dictionary Project.*" Ingvild Roald finally gives a practical account on the history of techniques for the creation of sign language dictionaries, discussing advantages and drawbacks of the respective approaches.

When writing these lines, the preparation of the workshop and the proceedings is almost finished. This workshop wouldn't have been possible without the energy many people have invested in their spare time. First of all we would like to thank the authors who have done their best and provided superb papers. Our thank goes also to the reviewers for their detailed and inspiring reviews. Last but not least we want to thank Sara Goggi who accompanied the workshop on behalf of the LREC Programme Committee.

In closing we would like to thank you for attending the workshop, and we wish you will have a great time.

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