

Automated 3D Animation System to Inflect Agreement Verbs

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Abstract

Automatically generating 3D animations of American Sign Language (ASL) requires the inflection of agreement verbs. Previous research in ASL linguistics has characterized the behavior of this class of verbs (Fisher and Gough 1978, Baker-Shenk 1980, Kegl 1985, Lillo-Martin 1986, Aarons et. al 1992, Cormier 1998), however, no one has addressed the issue of an automatic inflection for person and number that is visually acceptable to people fluent in ASL. This presentation describes a system that automatically generates inflections of agreement verbs from the citation form of the verb.

Procedure

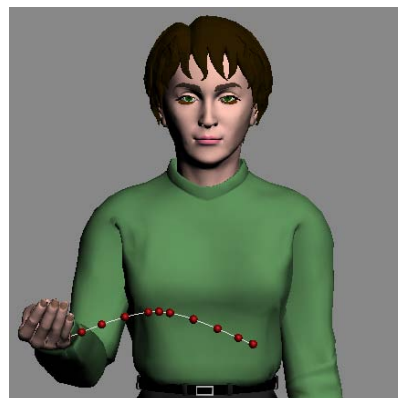
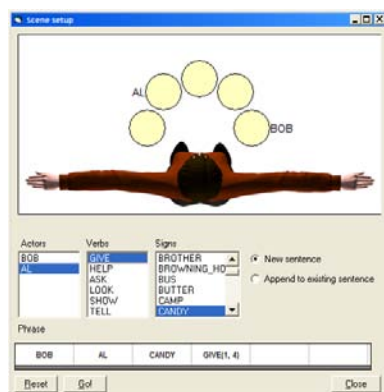
Six verbs were used in the study (ASK, LOOK, TELL, GIVE, HELP, SHOW). Demonstrations of the inflections were gathered from interviews with Deaf teachers of ASL. This information was used to create an inflection module in previously existing software (Wolfe et. al. 1999, Furst et. al 2000, Toro et. al. 2001, McDonald et. al. 2002, Lancaster et. al. 2003). Seven different combinations of subject and object were rendered and tested with Deaf signers (1s-2s, 1s-3s, 1s-2p, 1s-3p, 2s-1s, 3s-1s, 3s-3s). A total of 42 different animations of verb conjugations were created. A total of 27 Deaf signers were used in the study.

Results

The recognition of the conjugation strongly depended on the proper establishment of the subject and object, as well as their number (singular or plural). Once the pronouns were clearly defined to the Deaf user, on average, 97% recognized the verb conjugation in less than 2 tries. 78% of the animations were rated above 80% in terms of quality. Most of the comments gathered were related with the structure of the phrase, and the quality of the pronoun used (fingerspelling and indexing), as opposed to the recognition of conjugation.

Future work

The system has been tested on verbs with only one dominant hand (ASK, LOOK, TELL, GIVE, HELP, SHOW). Verbs in which the handshape/palm orientation changes in between the starting and ending positions several times were not tested (e.g. FLATTER, PAY). Future plans also include implementing facial expressions and head movement to create wh-questions and role prominence markers (Bahan, 1996).



B-O-B INDEX₃ A-L INDEX₄ CANDY ₃GIVE₄

References

Aarons, D., Bahan, B., Kegl, J., and Neidle, K. *Subjects and Agreement in American Sign Language*. Perspectives on Sign Language: papers from the Fifth International Symposium on Sign Language Research. Salamanca, Spain, pp. 13-28, 1992.

Bahan, B. *Non-Manual Realization of Agreement in American Sign Language*. Ph.D. Dissertation, Boston University, 1996.

Baker-Shenk, C., and Cokely, D. *American Sign Language, A Teacher's Resource Text on Grammar and Culture*. Clerk Books, Gallaudet University Press, Washington, D.C., 1980.

Cormier, K. *Grammatical and Anaphoric Agreement in American Sign Language*. M.A. Thesis, The University of Texas at Austin, August, 1998.

Fisher, S., and Gough, B. *Verbs in American Sign Language*, in: Stokoe, W. (ed) *Sign Language Studies* (18), pp. 17-48, 1978.

Furst, J., Alkoby, K., Berthiaume, A., Chomwong, P., Davidson, M., Konie, B., Lancaster, G., Lytinen, S., McDonald, J., Roychoudhuri, L., Toro, J., Tomuro, N., Wolfe, R. *Database Design for American Sign Language*. Proceedings of the ISCA 15th International Conference on Computers and Their Applications (CATA-2000). 427-430.

Kegl, J.A. *Locative Relations in American Sign Language Word Formation, Syntax, and Discourse*. Ph.D. Dissertation, Massachusetts Institute of Technology. Distributed by MIT Working Papers in Linguistics, Cambridge, MA, 1985

Lancaster, G., Alkoby, K., Campen, J., Carter, R., Davidson, M., Ethridge, D., Furst, J., Hinkle, D., Kroll, B., Layesa, R., Loeding, B., McDonald, J., Ougouag, N., Schnepf, J., Smallwood, L., Srinivasan, P., Toro, J., Wolfe, R. *Voice Activated Display of American Sign Language for Airport Security*. Technology and Persons with Disabilities Conference 2003. California State University at Northridge, Los Angeles, CA March 17-22, 2003, Electronic Proceedings available www.csun.edu/cod/conf/2003/proceedings/103.htm

Lillo-Martin, D. *Verbs and role-shifting in ASL*, in: Padden, C. (ed) *Proceedings of the Fourth National Symposium on Sign Language Research and Teaching*, pp. 44-57. National Association for the Deaf, Silver Spring, 1986.

McDonald, J., Alkoby, K., Carter, R., Christopher, J., Davidson, M., Ethridge, D., Furst, J., Hinkle, D., Lancaster, G., Smallwood, L., Ougouag-Tiouririne, N., Toro, J., Xu, S., Wolfe, R. *A Direct Method for Positioning the Arms of a Human Model*, Proceedings of Graphics Interface 2002, May 27-29, 2002, Calgary, Alberta, Canada, 99-106.

Toro, J., Wolfe, R., McDonald, J., Furst, J., et. al. *A Graphical Environment for Transcription of American Sign Language*. Proceedings of the ISCA 16th International Conference on Computers and Their Applications (CATA), Seattle, WA, March 28-30, 2001.

Wolfe, R., Alkoby, K., Barnett, J., Chomwong, P., Furst, J., Honda, G., Lancaster, G., Lavoie, F., Lytinen, S., McDonald, J., Roychoudhuri, L., Taylor, C., Tomuro, N., Toro, J. *An Interface for Transcribing American Sign Language*. SIGGRAPH 99 Sketches, August 11, 1999.