An Interface for Transcribing American Sign Language

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Background. Deafness is not only a barrier of sound but also a barrier of language. American Sign Language (ASL) is a natural language used by members of the North American Deaf community and is the third or fourth most widely used language in the United States [Ster96]. While ASL shares some vocabulary with English, there is no simple word-for-word translation. Research in linguistics shows that ASL's concise and elegant syntax differs radically from English grammar [Klim79][Vall93]. Because of the differences in the two languages, most native ASL signers read English at the third or fourth grade level [Holt94]. This is why closed captioning on television is a good first effort at making spoken English more accessible to the deaf population, but does not represent a completely satisfactory solution.

At present deaf people rely on sign language interpreters for access to English which is an awkward solution at best. A digital sign language interpreter, which translates spoken English into ASL, would help bridge the gulf between deaf and hearing worlds.

We are currently developing a database of ASL that will be used as the lexical database for machine translation. The database scheme draws on the experiences of Dutch [Cras98], German [Pril89], and Japanese [Lu97] researchers who are working on similar projects for other sign languages. It includes position, orientation and shape of the hands as well as motions that comprise a sign. Just as important as the raw geometric information is the linguistic information. Certain geometric aspects of a sign may be changed based on its usage, and without linguistic information it is impossible to synthesize grammatically correct sentences. Thus the geometric information is somewhat similar to a key frame but certain aspects must be treated as parameters during synthesis.

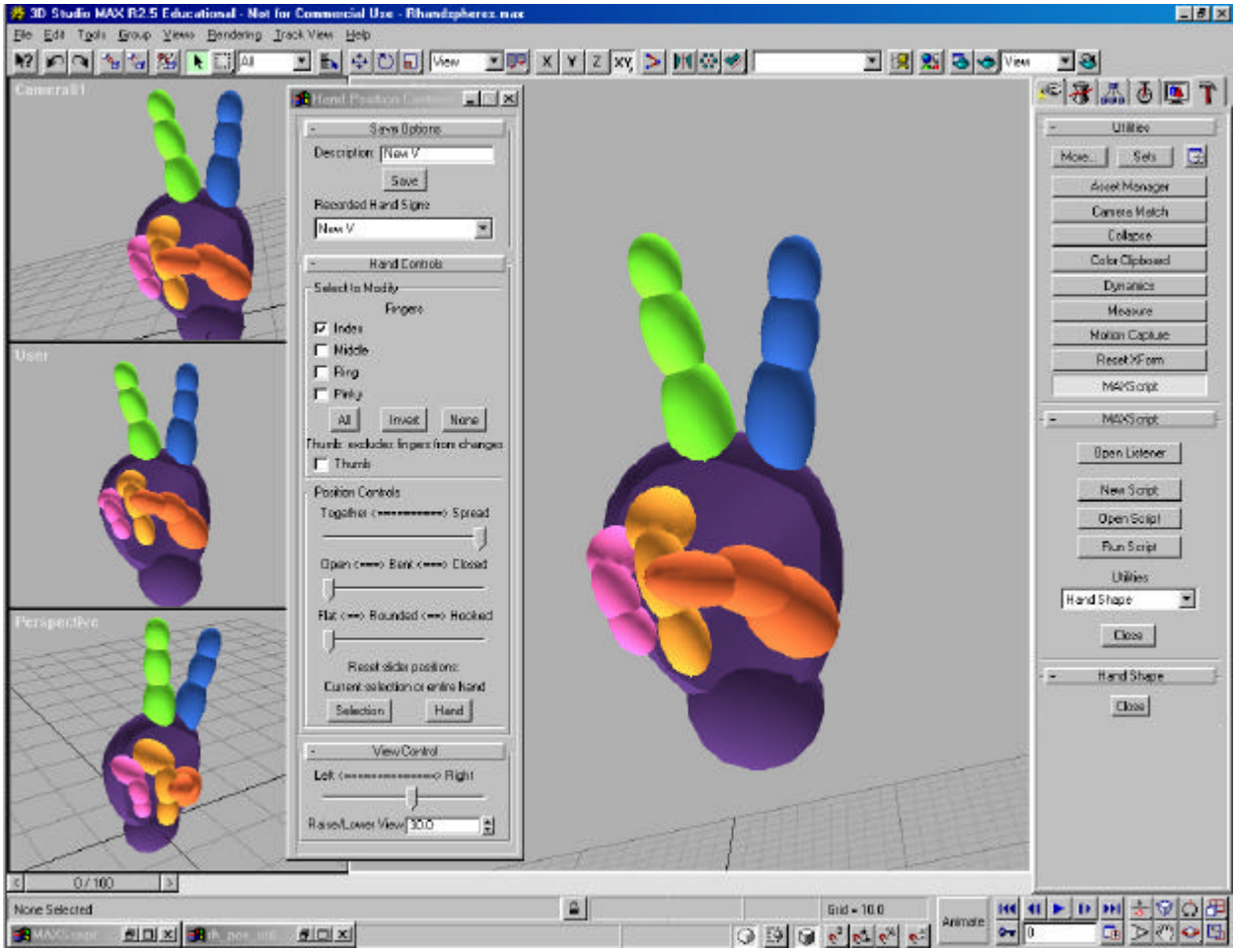
Problem. The largest task in creating a database of this type is gathering the information once the database scheme has been created. Gathering the data involves transcribing ASL, and the people who know it best are ASL signers. While motion capture initially presents an appealing option, it cannot record the linguistic aspects of a sign. It is analogous to scanning in a printed sentence and attempting to use the raw bitmap instead of extracting the characters. Further, the motion and position of a sign may be modified depending on its context. However, using a general animation package to transcribe a sign also poses severe problems. Learning such a package requires a significant investment of time. Our students reported that working through the tutorials of a commonly used animation package took between 40 and 100 hours. Few

members of the deaf community are willing to invest such a large amount of time in training before beginning the transcription process.

Our Approach. To reduce the large time investment for transcription, we have customized an animation system (3DS Max) to accommodate ASL. The controls are couched in terms that are more familiar to ASL signers than such conventional animation operations as rotations and translations. The hierarchical system allows a user to specify a sign in terms of hand shape, location and orientation. Figure 1 is a screen capture of the subsystem that specifies handshape. Data encoded by users is stored and recalled from a Microsoft Access database. We wrote a Visual Basic ActiveX control to serve as a bridge between the graphics package and the database.

Initial usability studies have been quite promising. On average, it takes 10 minutes for native ASL signers to learn enough about the system to input hand shapes, and transcribing a handshape takes an average of 82 seconds.

At present the system is capable of transcribing and recalling hand configurations. We anticipate having the entire transcription system (full body) completed by the time of the SIGGRAPH conference and will include a demonstration as part of the proposed presentation.



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