

A signing avatar on the WWW

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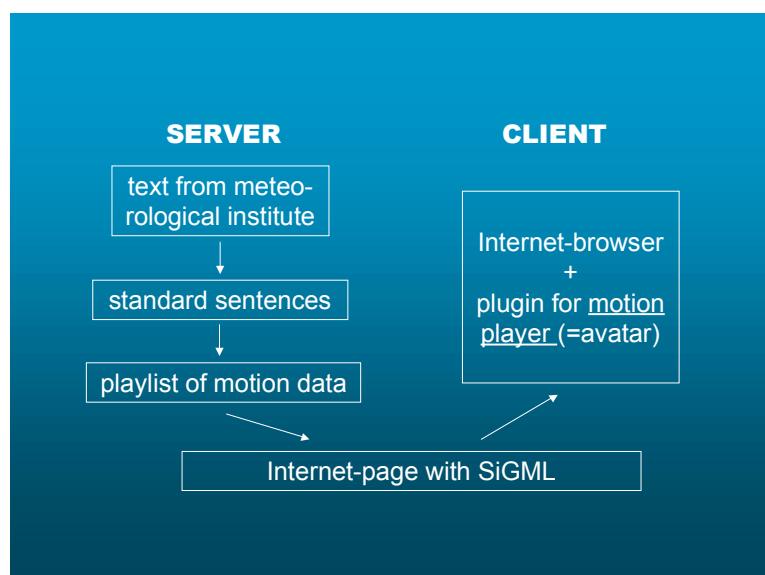
The work presented is part of the EU-subsidised ViSiCAST project. The project aims to achieve semi-automatic translation from text to sign language. With the use of a computer, sentences in a written language are analysed and transposed to a sequence of signs. Then the – pre-recorded – signs are displayed using computer animation of a Virtual Human, i.e. an “avatar”. One of the application areas for this technology is the world-wide-web. For this, a browser plug-in has been developed and to provide initial sign language content, the weather forecast was chosen. This has the advantage of corresponding to a limited language domain, while at the same time being of interest to most deaf people.

At the Gesture Workshop 2001, we will demonstrate how recorded fragments of sign language stored in a computer can be displayed by means of an avatar. We will also demonstrate how several aspects of the signing avatar can be adjusted, such as hand shapes and body movements. Finally we will show how a weather forecast is translated and how several fragments are blended to generate fully-signed sentences.

Our demonstration will be accompanied by a poster to present various aspects of the application, such as the design of the user interface, the collecting of signs, and the technology involved in the visualisation of the signs in a webpage.

Some details of the application

Before the weather forecast of a particular day can be signed through a webpage, it has to undergo several conversions, sketched in a flow chart below. In the following two pages the techniques and the work involved in these conversions are described in some more detail.



Conversion from text to motion data

The signed weather forecast that will be presented on the Internet is based on the forecast written by the Royal Dutch Meteorological Institute (KNMI). The text in these forecasts comprises free-form sentences. To make this input suitable for (semi) automatic conversion to sign language, the sentences are standardised, while maintaining the content. For this, a model is used, consisting of 20 sentence patterns and all possible words and phrases that could fill each slot in the pattern. An example of a sentence pattern is "*The weather forecast of the KNMI, drawn up on [WEEKDAY][NUMBER][MONTH], and valid till midnight.*" This pattern has three slots, respectively for the day of the week, for the month and for the day of the month. In a pattern, the slots are indicated with the category of the word that could be filled in. Many patterns consist entirely of slots, for example "[TIME] [WEATHER CONDITION]". The category TIME consists of phrases such as "*in the morning*", "*in the afternoon*", "*during the whole day*", "*now and then*", etc., and the category WEATHER CONDITION of phrases as "*rain*", "*snow*", "*sunny*", "*fog*", "*clouded*", "*heavily clouded*", "*veil clouds*" etc. The model is based on 100 real life weather forecasts from the Netherlands, representing most types of Dutch weather. Subsequently a mapping has been developed, from the patterns in written language onto patterns in sign language. With this mapping, the standardised sentences of the written weather forecast are converted to a sequence of (filenames of recorded) signs, a so-called playlist. How the signs were recorded is described below.

Recording and visualisation of the motion data of signs

All signs occurring in the weather forecast model described above were recorded (hence "captured"). That is, the motions of a signer were tracked with the following input devices: an optical system for tracking facial expression, a magnetic body suit for posture, and data gloves for hand and finger shapes. The signer's movements were captured at a very high resolution (far higher than is usually used for animation or video games). This is important for the generation of animated sign language, where even the slightest difference in speed, direction or gesture has a bearing upon meaning. Signs of three different sign languages have been captured: Sign Language of the Netherlands, German Sign Language and British Sign Language, each with native signers. The signs were post-edited to correct shapes or gestures that may have been performed or recorded inaccurately. For post-editing, as well as for the use of signs in an application, the captured motion data need to be visualised.

Once captured, the movements can be visualised through an avatar (Virtual Human). Data from the three tracking systems for face, hands and body are combined to achieve a realistic animation of a signing avatar. The avatar designed for ViSiCAST is called 'Visia'. The captured signs can be re-performed by Visia one by one separately, but also in a fluent sequence. Significantly, real-time visualisation software blends one captured sequence into another, creating a smooth signed performance – something that would be unachievable with joined-up clips of video. In the ViSiCAST weather system, it allows sections of signing to be built-up which include variables, such as temperatures, weather types and wind directions.

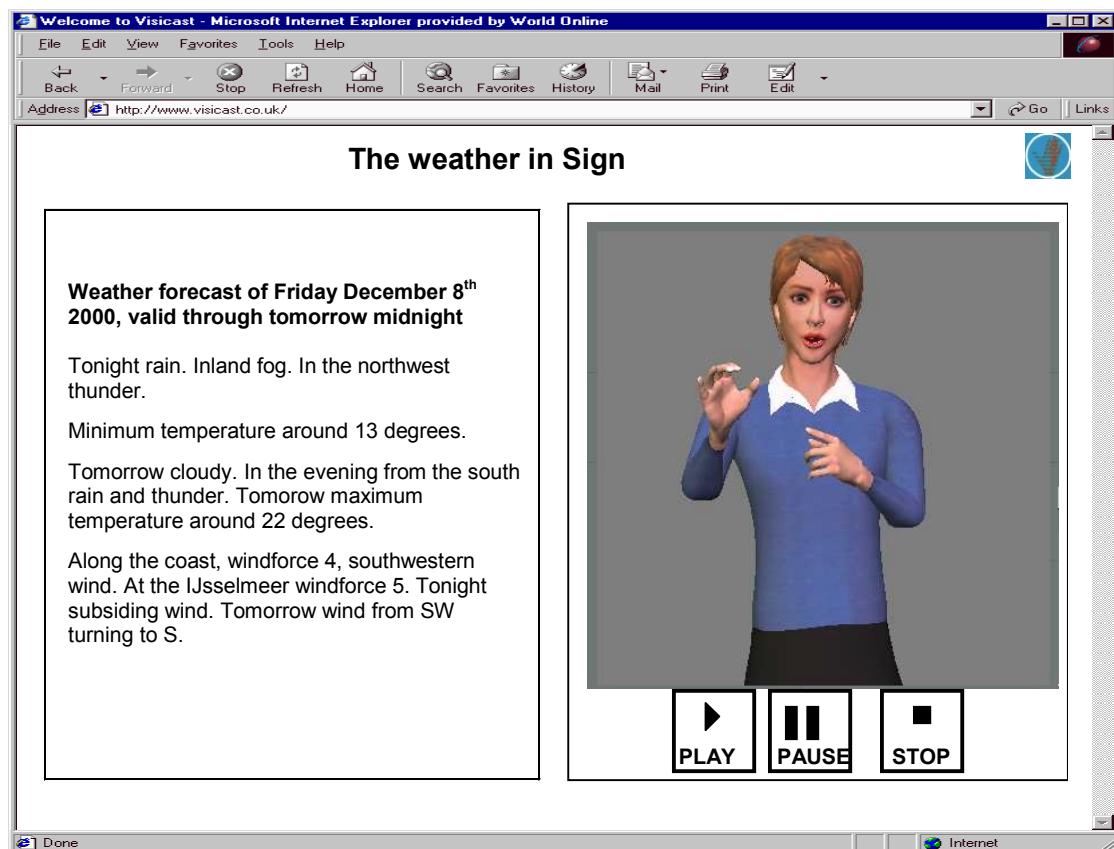
The software needed for capturing, for post-editing and for visualising of the motion data has partly been developed in a project prior to the ViSiCAST project. In the ViSiCAST project this software is constantly being improved, extended and adapted to the particular way it is applied in this project. The software for visualisation of the signing has been developed to run under Active X control. This has permitted the creation of versions compatible with Microsoft/Windows applications – particularly Internet Explorer. Below, the embedding of the avatar in a webpage is described in short.

From motion data to a webpage

The signed weather forecast as well as the avatar software has been embedded in a webpage. The playlist of captured signs corresponding to the weather forecast is coded into a special mark-up language for signs (called SiGML) so that it can be part of an HTML-webpage. The

user needs a browser for the Internet, and Visia-avatar software that functions as a plug-in to the browser. When the user visits the page and requests Visia to sign the weather forecast, Visia subsequently performs the motions for the separate signs on the user's own PC by means of this plug-in. The design of the user interface was based on an inventory of user requirements by teachers of deaf computer users. It was kept simple with the aim of making the system clear and pleasant to use for all users, also for deaf people with limited literacy abilities. The weather forecast is presented both in text and in sign language, for those users for whom both languages are complementary. The text and avatar are presented in one page, to avoid having to switch between the two forms of the forecast.

The picture of the application below gives an impression of the webpage with the avatar 'Visia' and buttons for the user to control the avatar.



Acknowledgements

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- for the avatar software: Televirtual (United Kingdom);
- for implementation of the webpage and user interface to the avatar: University of East Anglia, School for Information Systems (United Kingdom).

A number of these people might be present at the workshop as well, to tell about their part of the work described here.