

Towards interactive web-based signing avatars

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1 Introduction

A signing avatar is a virtual human capable of expressing natural language utterances while using Sign Language (SL). Currently there is a growing research in this field with a special attention directed towards the *precise modeling* of the actual functioning of the sign language in order to enhance the *acceptability* by a large class of deaf persons [1]. In this context, we are interested to make available to most people, applications using signing avatars through the Internet. Indeed this will prove useful for the deaf people community, but also for the growing community of hearing persons that wish to be informed about or to learn Sign Language. Up now, little work has been carried on web-based signing avatars [2]. Most operational web-based applications focus on video recording of human subjects that provide a poor *interactivity* between the user and the system. As for current research on sign avatars in standalone applications, it relies on two main approaches:

- Animations are synthesized a priori and then selected according to the context: for example, motion capture is a heavy technology requiring post processing; rotoscoping has been used successfully but relies on the talent of the computer graphic designers. These techniques provide good realistic gestures but lack in flexibility and make interactivity very difficult to achieve;
- Automatic generation from modeling languages: for example, SigML [3] uses encapsulated animations that provide a better flexibility at the cost of realism and interaction is very difficult; VRML-based descriptions use a web language and make the interaction possible but it is still very limited for animation purposes [4].

With this in mind, we propose to develop a web-based framework with the two following requirements: a) The signing avatars are designed to be easily and rapidly integrated into web applications and services; b) Multimodal interactivity between the avatars and the users will be a major concern.

2 A web-based architecture for signing avatars

We developed a web-based toolkit called DIVA (DOM Integrated Virtual Agents) which can support virtual characters that are completely integrated with the DOM (Document Object Model) tree structure of the web pages [5]. The two main objectives of the toolkit are: 1) an open programming framework making it easy and quick to develop and deploy new experimental ACAs in web-based applications; 2) to take advantage of the new rich-client web technologies (e.g. cf. the new Chrome navigator) to enable the animation engine to run in JavaScript, thus offering a total control of the interaction.

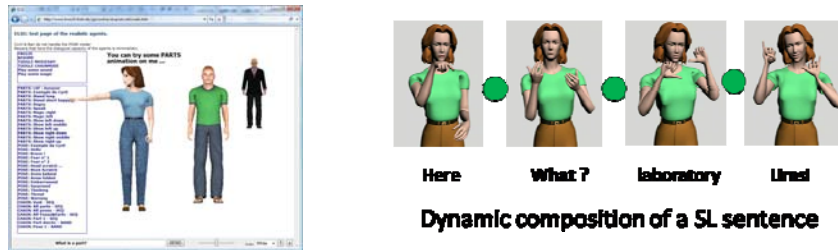


Fig. 1. On left, is the animation test page of DIVA (available via [5]) with character Elsi performing a deictic gesture towards an object of the DOM structure of the web page. On right, are displayed the various structural elements composing a SL utterance (articulation stances are not showed).

In order to optimize the implementation of signing agents on the toolkit, animations are produced using the rotoscoping approach. Hence we produce predefined animations movies, associated with signs, gestures [6] etc. Because the animation engine controls the animations at a fine level, it is possible to generate dynamically interactive SL utterances and to play them in real time (optionally with other multimodal reactions). The two key issues that we have to face here are:

- 1) The management of the spatiotemporal organization of the sign language utterances: for the time being, we predefine several realizations of the same sign (e.g. pointing); however their number is limited because we restrict to context dependent utterances;
- 2) The coarticulation of the elementary items in the SL utterances: we use one or more intermediary stances (chosen according to the context) between the animations. Moreover, each animation contains a prolog and an epilog stance, typically hands are in front of the bust for signs, or with the dominant hand on right for dactylogy.

Further Work: more research needs to be carried on the intermediary stances and their automatic selection from the context. At present, the prototype is operational and we need to carry evaluation tests with the deaf people community.

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