

Accessible 3D signing avatars: the Tunisian experience

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ABSTRACT

Signing avatars have the potential to produce sign language in its visual/Dynamic form. These virtual characters are actually getting increasing interest from the deaf community and being actively uploaded to the World Wide Web (WWW). In Tunisia, we developed a system called Websign which is able to translate any text information into any signed language through an avatar. This paper outlines the importance of the avatars technology in making the world accessible to deaf people. We put a special focus on how to generate exchangeable signing avatars and the way to make them accessible, indexable and easily located on the Internet.

General Terms

Algorithms, Design, Languages, Theory

Keywords

Virtual reality, Accessibility, Sign Language, Avatars, Sign language recognition

1. INTRODUCTION

Sign language is a visual/spacial language used by deaf individuals. In Tunisia, different sign languages are used in different regions. Unfortunately, deaf individuals do not reach their potential in education especially in subjects like math science and engineering. Hearing impairment represents an obstacle to deaf and prevents them from having the same opportunities as hearing persons especially in job and social life. The main reason for the encountered difficulties to access to high level grades in curriculum is that deaf suffer from low literacy. In fact, in the USA, studies showed that less than 12% of deaf students at age 16 can read at a 4th grade reading level [1]. In Tunisia, according to a report published by the institute of promotion of people with disabilities, more than 90% of deaf are illiterate [2]. Many facts have been identified as significant reasons to low literacy of deaf: a) Sign language is strongly correlated with acquisition of reading and writing skills [3] which means that English skills improve as sign language knowledge improves.

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Moreover, “hearing” parents are almost unable to help their deaf children to assimilate concepts related to school subjects¹. b) Deaf children are deprived of "*incidental learning*" because they are not exposed to media (radio, television, conversations around the dinner table etc.) where concepts related to science may be discussed. Deaf youngsters lack access to many sources of information. Therefore, some concepts that hearing children learn incidentally in everyday life may have to be explicitly taught to deaf pupils in school.

Signing avatars have the potential to overcome the barriers faced by deaf people to access to sources of information. They are actually used for many purposes like education, communication and translation.

2. SIGNING AVATARS

A signing avatar is a 3D virtual humanoid articulated in such a way it would be able to communicate in sign language. The tremendous advances in virtual reality and computer graphics lead researchers to design realistic and sophisticated 3D characters able to perform manual signs as well as facial expressions. Nowadays, Signing avatars are becoming common and being published on the World Wide Web at an incredible rate. They are actually used in education to help deaf children and their parents to learn sign language.

3D signing avatars offer full control over the created scenes and the possibility of combining signs to create limitless number of signed “phrases” which cannot be done with videos of live signers. Virtual characters are used in virtual learning environments (VLE) and other fields like real time translation which explains their abundance on the Internet.

2.1 Signing avatars systems

Many avatars systems have been developed in the last few years. Some of them were used to make websites accessible to deaf [4] and others were able to generate signing avatars online [5]. Unfortunately, most of systems don't use standards and subsequently their avatars are not exchangeable.

Moreover, the annotation and representation of sign language has not been standardized yet, which means that research groups use different notation systems like SiGML [6] and SWML [7] to represent sign language. In this context, we aim to lead a research to identify which notation system is the most appropriate for uploading and exchanging signing avatars on the Web.

¹ Subjects whom are important to access to high levels of curriculum grades: like math sciences etc.

2.2 The WebSign project

WebSign [8] has been created in Tunisia aiming to translate written texts into Sign Language. The system is using an intuitive collaborative approach where communities can contribute by enriching their dictionaries with new signs. WebSign actually contains more than 1200 French Sign Language words (FSL) that could be combined and sequenced in order to translate written texts. If one word does not exist in the database, users can create it through a web interface².

WebSign uses many standards in order to produce exchangeable avatars. In fact, the 3D models are compliant with Web3D³ standards such as H-anim⁴ and X3D. Using these standards makes it possible to exchange and reuse the generated avatars in different scenarios.

The avatars generated using WebSign have been used for multiple purposes of e-learning[9] and the translation of some website contents into sign language.

3. SIGNING AVATARS INDEXING AND RETRIEVAL

Unfortunately, unlike text documents, the signed scenes created with 3D animated avatars are uploaded to the World Wide Web but aren't easily located. There is no search engine dedicated to 3D signing avatars and the few existing sites are a kind of directories that catalog signed scenes in thematic categories. When someone is searching for a 3D signed story on internet he has to browse these websites' structures or search for keywords contained in the filenames of the scenes. This generates irrelevant results because the scenes are not indexed according to what is being signed. The uploaded signed scenes could contain useful information for both deaf and hearing individuals. In this context, we came up with a new approach for indexing and retrieving 3D signing avatars. Our approach is based on 3D dictionaries of sign language [10] [11]. We used this approach to catalog more than 800 signed "phrases" generated from WebSign or grabbed from the Internet. In the future, we aim to develop a new approach for indexing and retrieving signing avatars based on sign language parameters classification independently of the sign language dictionaries.

4. CHALLENGES AND FUTURE WORK

Currently, we aim to upgrade the WebSign platform using HTML5 which natively supports X3D [12]. We also plan to generate signing avatars compliant with WAI-WCAG 2.0 guidelines. Moreover, our upcoming target is to write a set of guidelines for the community of developers who are involving in signing avatars. Those guidelines will cover the best practices, techniques and standards to adopt in order to get accessible, indexable and efficiently retrievable signing avatars. Also, a new approach for crawling and indexing signing avatars should be made. It will be based on sign language parameters classification instead of signs matching from specific dictionaries.

² <http://www.utic.rnu.tn>

³ <http://www.web3d.org>

⁴ <http://www.h-anim.org/>

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6. CONCLUSION

The research that we have conducted has the potential to make some parts of the world accessible to deaf people. Through signing avatars, translating videos, texts, and entire websites into sign language is possible. Our aim now is to attract more deaf communities to use our Websign application in order to create as many as possible sign language dictionaries and to develop more Websign based applications to improve communication with deaf.

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