Chapter 6

Providing Ubiquitous Access to Synthetic Sign Language Contents over Multiple Platforms

Fernando López-Colino
Universidad Autónoma de Madrid, Spain

Jose Colás
Universidad Autónoma de Madrid, Spain

ABSTRACT

This work presents the design of a distributed sign language synthesis architecture. The main objective of this design is to adapt the synthesis process to the diversity of user devices. The synthesis process has been divided into several independent modules that can be run either in a dedicated server or in the client device. Depending on the modules assigned to the server or to the client, four different scenarios have been defined. These scenarios may vary from a heavy client design which executes the whole synthesis process, to a light client design similar to a video player. These four scenarios will provide equivalent signed message quality independently of the device's hardware and software resources.

INTRODUCTION

Sign language (SL) synthesizers have been designed as PC-based applications because they require complex calculations, specific libraries, and 3D capable devices. Current mobile device hardware and software resources do not fulfill all these requirements. Although several mobile devices can manage simple 3D contents and real time animations, they cannot manage the previ-

ous steps that generate the final animation of the virtual avatar. Unfortunately, there are many real situations where a mobile device is the only alternative to obtain access to signed contents, such as: real-time translation, virtual museum guides, transport information services, etc.

Existing approaches to providing signed contents focus only on a single platform. The adaptation between different technologies is an expensive process that requires repeating the comprehensibility evaluations in order to check that the signed messages obtained with the new implementation are comprehensible.

The purpose of this chapter is to present a global and unique solution to providing synthetic signed contents to most kinds of devices, from PCs to mobile phones and gaming consoles. Instead of reducing the synthesis features using a low quality avatar or adapting the synthesis method to the device resources, our approach assigns to the user's device only the modules that it can manage. The signed messages must present the same quality and intelligibility device independently. The architecture uses a unique module responsible for the definition of the avatar's animation, which defines the message comprehensibility; therefore we avoid repeating this evaluation.

BACKGROUND

Literature provides several examples of SL synthesizers. In order to represent synthetic signed messages, two main techniques have been developed:

1.   The first approach to SL synthesis consists of creating a composition of small segments of video (Solina, Krapež, Jaklič, & Komac, 2001). This approach to SL synthesis requires image processing and a great number of pre-recorded sequences in order to act as a synthesizer, and thus significant storage capacity.

2.   The second main approach to SL synthesis uses virtual avatars. H-Anim (ISO/IEC 19774, 2005) is the most widely used avatar structure; it is a standard definition for human representation on VRML (ISO/IEC 14772-1, 1997) or X3D (ISO/IEC 19775, 2004). Within avatar animation category, there are two different approaches related to the definition of the animation. The first one uses continuous motion data obtained from (a) an expert signer using different motion capture techniques or (b) manual animations created by an expert animator. Although the results obtained with this technique are natural, Kennaway (2002) described several disadvantages of this approach based on the difficult adaptation of the recorded data to avatars with different anatomies. The second approach to define the animation for avatar-based SL synthesis uses a parametric definition of the signs in order to generate the animation (Bangham, Cox, Elliot, Glauert, & Marshall, 2000; Irving & Foulds, 2005; Kennaway, Glauert, & Zwitserlood, 2007; Zwiterslood, Verlinden, Ros, & van der Shoot, 2004). The resulting avatar animation is not as natural as the one obtained using the continuous motion data approach. However, the animation quality is the same over the whole sentence and the storage requirements are highly reduced. The parametric synthesis is the only approach that provides enough flexibility to define all the SL linguistic variations.

Our synthesis approach presents the signed message using a 3D avatar and is based on parametric sign definitions. Hence, it is also interesting to review the existing research focused on handling 3D contents over mobile devices. All authors agree that mobile device resources, specifically those required resources for running 3D applications, are limited. Boukerche and Pazzi (2006) proposed the use of a remote rendering technique to deal

Related Content

On Combining Sequence Alignment and Feature-Quantization for Sub-Image Searching
Tomas Homola, Vlastislav Dohnaland Pavel Zezula (2012). *International Journal of Multimedia Data Engineering and Management (pp. 20-44).*
www.irma-international.org/article/combining-sequence-alignment-feature-quantization/72891

Counterfactual Autoencoder for Unsupervised Semantic Learning
Saad Sadiq, Mei-Ling Shyuand Daniel J. Feaster (2018). *International Journal of Multimedia Data Engineering and Management (pp. 1-20).*
www.irma-international.org/article/counterfactual-autoencoder-for-unsupervised-semantic-learning/226226

Creating Global Classrooms Using Universal Design for Learning
Victoria Brown (2018). *Digital Multimedia: Concepts, Methodologies, Tools, and Applications (pp. 145-168).*
www.irma-international.org/chapter/creating-global-classrooms-using-universal-design-for-learning/189472

Semi-Supervised Multimodal Fusion Model for Social Event Detection on Web Image Collections
Zhenguo Yang, Qing Li, Zheng Lu, Yun Ma, Zhiguo Gong, Haiwei Panand Yangbin Chen (2015). *International Journal of Multimedia Data Engineering and Management (pp. 1-22).*
www.irma-international.org/article/semi-supervised-multimodal-fusion-model-for-social-event-detection-on-web-image-collections/135514

Digital Video Authentication
Pradeep K. Atrey, Abdulmotaleb El Saddikand Mohan Kankanhalli (2009). *Handbook of Research on Secure Multimedia Distribution (pp. 298-314).*
www.irma-international.org/chapter/digital-video-authentication/21319