Animation of 3D avatar driven by Motion Capture data for Portuguese to Brazilian Sign Language translation software

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ABSTRACT

The project consists of a 3D avatar that performs Brazilian sign language based on real interpreter motion captured data. Using motion capture data to drive a 3D avatar that interprets deaf sign language is a complex task. It r equires designing a specific markerset and a long postproduction step. Fingers precision and facial expressions need advanced technics to achieve functional results.

INTRODUCTION

The research project is the documentation of the workflow and the open source toolset involved in transferring optical motion capture data to 3D humanoid avatars, aimed to be running an interactive real-time Portuguese to Brazilian sign language translation.

The primary target of this research is to establish a consistent and flexible work flow to animate 3D avatars with motion capture data. It aims to build a large sign language database so it can be used in assistive softwares.

METHODOLOGY

In addition to the Vicon system, the project evaluation takes advantage of the open source tools Makehuman and Blender, integrated by Python script language.

Several tests lead to a specific marker set with 41 markers disposed over the upper body of the subject. The established model is calibrated to each individual interpreter.

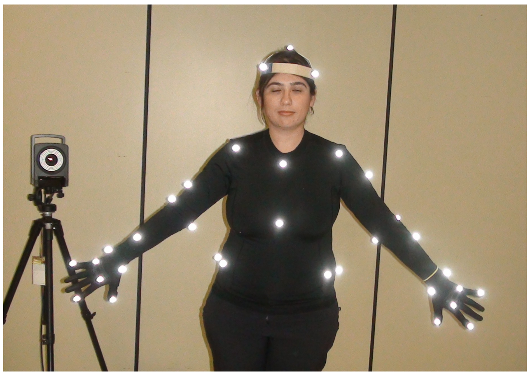

Fig. 1 Motion capture session with 41 retro-reflective markers of LIBRAS markerset.

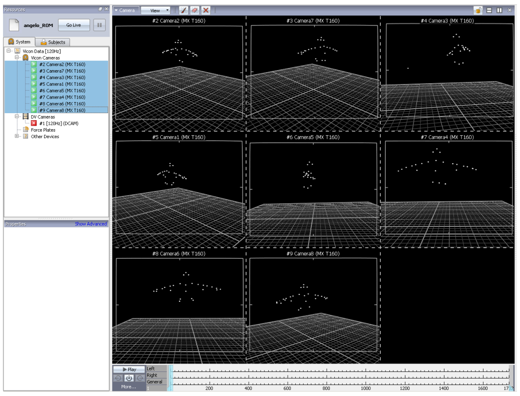

Fig. 2 Optical data of 8 infrared cameras with 16 megapixels captured under 120 frames per second.

After the recording session, all signs must be reconstructed in a virtual 3D space. The markers are labeled and all trajectory gaps are filled with various interpolation methods. Further, each sign is exported to C3D files.

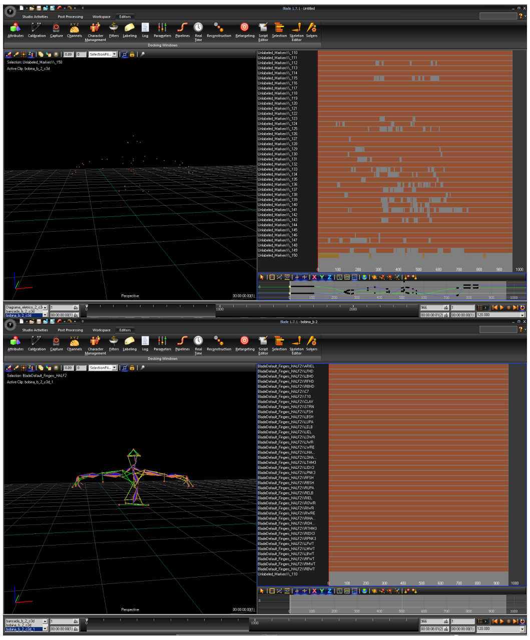

Fig. 3 e 4 Diagram of data health before and after labeling and filling gaps process

Makehuman software allows the customization of the 3D avatar with precise measurements of the subject in addition of many features to set up the character. The avatar is exported as a MHX rig, allowing fine control over skeleton posing and facial expressions.

In Blender, C3D and MHX files are imported and combined with a complex constraint setup. It is being taken advantage of inverse kinematic to drive spine and arms. With this model it is possible to manage data of only thumb, index and pinky fingers of each hand. Middle and ring fingers are constraint driven by index or pinky depending of the specific sign.

Head is driven by four vertices of a plane hooked to head markers. Facial expressions are keyframed animations of shapekeys, despite it is not so present in technical signs.

Post production is required in around 85% of signs processed, leading to trajectory corrections and prevention of unnatural or impossible body movements. Once the movement is ready, the constraint set is baked to quaternions generating actions ready to be concatenated in video or interactive (game engines) rendering.

Fig. 5 Final rendering of 3D avatar animated by motion capture data

CONCLUSIONS

The technics used in this process are quite innovative. It is in a very early stage of research, but presents improvements over the most common 'retarget' method. Nevertheless, it needs some balance between degree of freedom limitations and motion capture data accuracy.

REFERENCES

[1] http://c3d.org/c3ddocs.html

[2] The Motion Capture Society

[3]http://www.blender.org/documentation/blender_python_api_2_62_release