



# Interfaces for human-centered production and use of computer graphics assets

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## 1. Introduction

Today, computer graphics (CG) can be considered as a core enabling technology, supporting an incredible number of services and applications in many different domains, ranging from video-game and movie production to education and training. Despite its positive effects, the growing diffusion of CG is also posing significant challenges to researchers, concerning the whole pipeline, from content creation to utilization. Moreover, the set of users involved in the above processes is getting ever larger, and their skill level is becoming ever more heterogeneous.

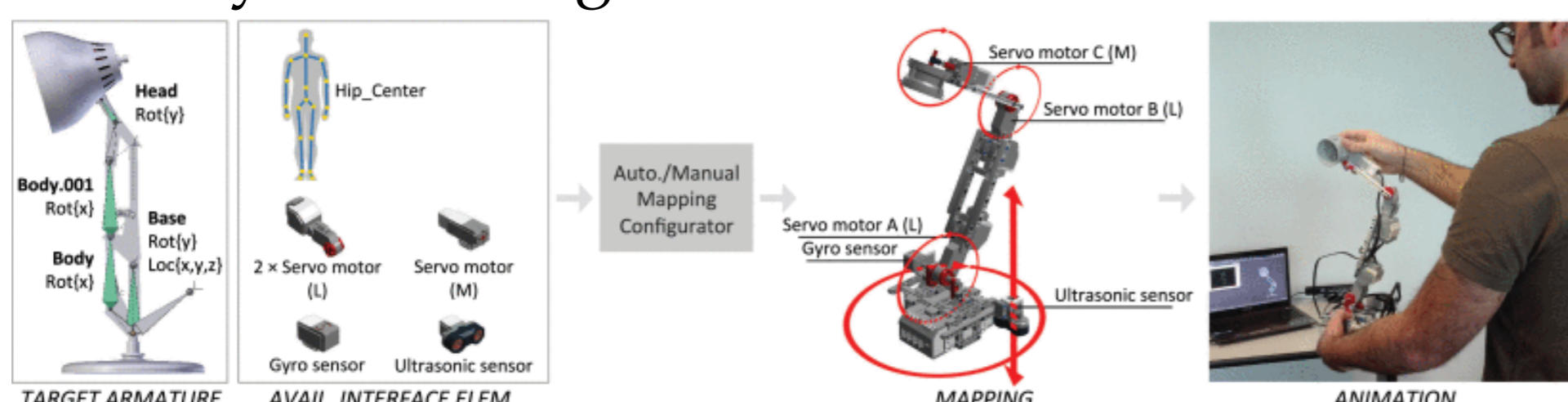
## 2. Objectives

The goal of this research was to improve the effectiveness of existing methods, tools and paradigms for the production and use of computer graphics content, by leveraging recent advances in multi-modal interaction and intelligent computing.

## 3. Methods

### 3.1 Reconfigurable Tangible Interfaces

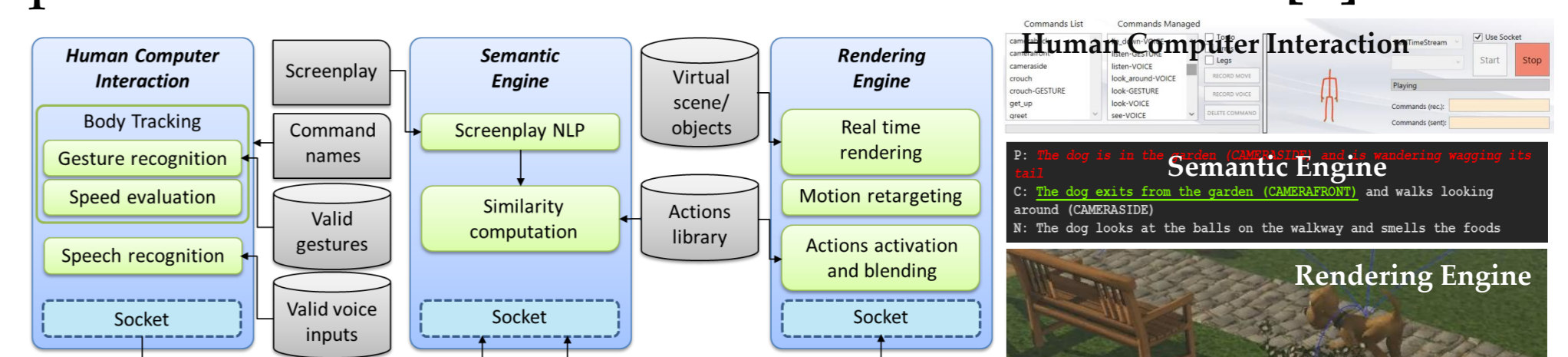
An animation tool has been created to support computer animation production processes by leveraging the affordances of reconfigurable tangible user interfaces and motion capture solutions [1]. Animation functionalities and configuration mechanisms are made available via customized voice commands. An automatic configuration mechanism assists the animator in the assembly and configuration of the interface.



### 3.2 Interfaces based on live performance and natural language processing

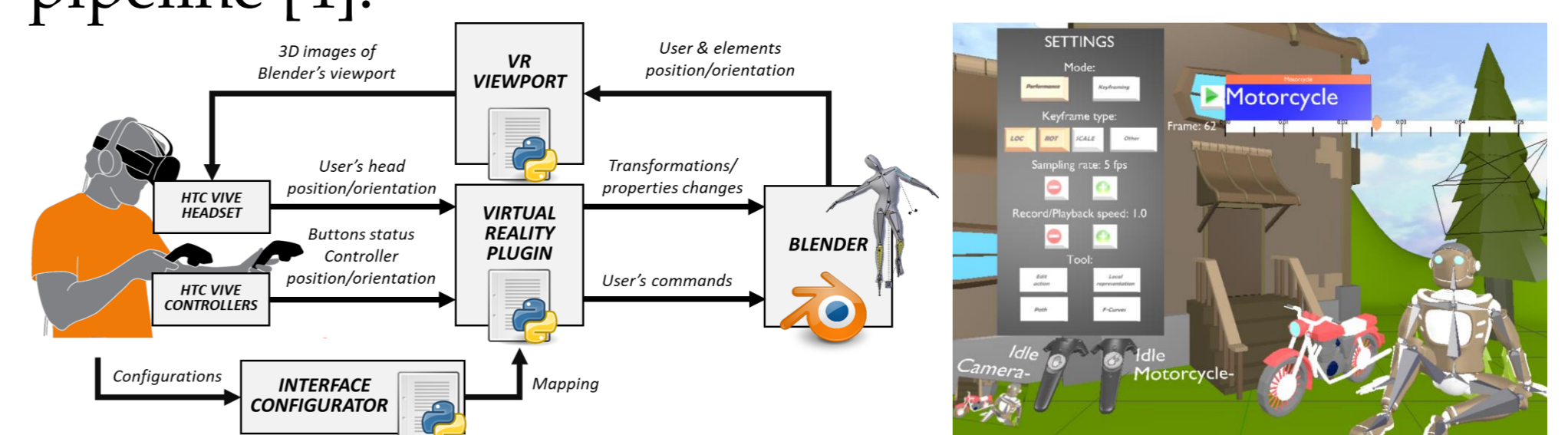
A multimodal animation system has been developed, which is able to recognize

gestures and voice commands issued by a performer, extract scene data from a text description and create live animations in which pre-recorded character actions can be blended with the performer's motion to increase naturalness [2].



### 3.3 Virtual Reality-based interfaces

A Virtual Reality plug-in has been created and integrated in a well-know animation suite for investigating the use of VR in the execution of representative animation tasks [3], supporting the whole virtual character animation pipeline [4].



## 4. Results and Conclusions

Experiments carried out by involving both professional and non-professional users confirmed that natural and intelligent interaction paradigms combined with Virtual Reality allow animators to reduce the time needed to create considered assets by maintaining a comparable quality with respect to traditional tools. New instruments were considered also as more intuitive and easier to use, since they enable spatial interactions with content that are natively 3D.

## 5. References

1. Lamberti F., et al. "Virtual character animation based on affordable motion capture and reconfigurable tangible interfaces". In IEEE Transactions on Visualization and Computer Graphics, vol. 24 (5), pp.1742-1755 (2018)
2. Lamberti F. et al. "A multimodal interface for virtual character animation based on live performance and natural language processing". In International Journal of Human Computer Interaction, vol. 35:18, pp.1655-1671, (2019)
3. Lamberti F. et al, "Is immersive virtual reality the ultimate interface for 3D animators?". In Computer, pp 1-12, (in press)
4. Cannavò A. et al., "Immersive virtual reality-based interfaces for character animation". In IEEE Access, vol. 7, pp.125463-125480, (2019)