Real-time self-contact sensitive finger and full-body animation of avatars with different morphologies and proportions

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ABSTRACT
We use our hands and fingers to interact with the world and it is crucial in VR (Virtual Reality) to enable users to control their avatars with realistic finger movements. However, when the user’s body and avatar proportions differ, applying the user’s motion directly to the avatar can lead to self-contact mismatches. Here, we present a real-time animation retargeting method sensitive to the self-contact concern. We evaluated this approach and found it to be preferred over traditional avatar control based on the direct captured movement.

1 INTRODUCTION
Our bodies allow us to express ourselves through various poses and gestures. In VR, when users wear a HMD (Head-Mounted Display), their physical body vanishes, making it necessary to introduce an avatar for virtual interactions.

In a multi-user VR setting, failing to accurately translate a user’s original movements onto their avatar can distort the meaning of their gestures, especially regarding poses involving self-contacts. Simply applying raw joint angles to the avatar may result in unrealistic animations (e.g., animating an avatar with a large belly for a thin user). Therefore, it is crucial to retarget the user’s motions to fit the destination avatar.

Despite the importance of self-contact congruence, many existing approaches for retargeting user motion to avatars are either offline or primarily focused on interactions with objects, as discussed in the following section. Here, we introduce a retargeting pipeline that specifically addresses self-contact consistency, even at the finger level, and we evaluate its ability to convey motion semantics through subjective assessments.

2 RELATED WORKS
Animation retargeting is covered in the literature through a large panel of techniques [3]. In particular, in [1] or [4], the authors used an internal representation of the limb structure to adapt a limb pose onto another character easily, but the focus was put on the interaction with the environment and not for self-contacts. In [2], the authors combined the former methods to provide a body-independent retargeting animation pipeline that can handle self-contact congruency in real-time. However, those approaches do not address finger-level interactions, which are crucial in interacting with the virtual world.
We compared two approaches, our animation method vs. direct kinematic, to verify the presence of an effect linked to the animation method (randomly placed and unlabeled) using each approach, and then conducted an immersive PV user evaluation in the future.

The subjective evaluation showed that, except for the ground interaction, our retargeting approach was significantly preferred over the direct kinematic animation pipeline, with an overall good appreciation for both methods. In particular, the score difference was more pronounced when the avatar’s shape differed more from the performer’s one, hence highlighting the importance of retargeting the user’s motion. The participant feedback emphasized the role of smoothness in the animation, which was not sufficiently addressed in our approach, hence providing an opportunity for improvement. Ultimately, this user evaluation sets the stage for conducting an immersive first PV user evaluation in the future.

REFERENCES


