frontiers | Frontiers in Virtual Reality

EDITORIAL
published: 29 April 2022
doi: 10.3389/frvir.2022.906118

Editorial: Creating Lifelike Digital Humans

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Keywords: digital human, modeling, photorealism, immersion, animation

Editorial on the Research Topic

Creating Lifelike Digital Humans

Digital humans populate digital worlds that are becoming more and more important in our daily life. Used for decades in the entertainment industry for video games and movies, they are now as ubiquitous as virtual environments, digital twins or so-called metaverse are. But there are still various limitations slowing the massive adoption. In particular the realism and embodiment are not yet at the expected level. Yet, creating and interacting with lifelike digital humans is still an active research topic. Many scientific challenges are to be tackled to overcome the uncanny valley effect. Human perception is extremely precise when it comes to detecting flaws in digital humans, due to modeling, rendering, or animation. That is why this field of study is deeply multidisciplinary, thus the goal of this research topic was to gather state-of-the-art advances related to digital humans.

The first stage of shape and appearance modeling has been largely studied and multiple techniques exist today to reconstruct digital humans. They all have their advantages and drawbacks that would depend on the target application. Selecting technology is however not straightforward. This lack of comparison led Bartl et al. to conduct a study evaluating output results from a high-end and a low-cost 3D reconstruction setup. They also showed the relationship between model quality and user perception.

Reconstruction of digital humans has mainly been focused on the external shape in the context of computer graphics. But the challenge of the uncanny valley is pushing the limits of photorealism, and it calls for the modeling of the internal organs that also impacts appearance. Modeling the inside of digital humans is proposed by Komaritzan et al.. Anatomical layers of muscles, skins and bones are added to a scan, and bring a new step to the complete modeling of humans.

Nevertheless, having a realistic digital human may not be adapted to all purposes. How would a realistic avatar fit in a cartoon-like scenario ? Adapting or stylizing a character is the focus of Olivier et al.'s work. They develop two methods for caricaturing one's digital 3D face. This will enable the use of digital humans in a wide range of scenarios made possible by today's many digital worlds.

These worlds must also react to digital human behaviors to contribute to their lifelikeness. In this sense, the digital human model may be wider than the body itself. For instance, Alvarado et al. modeled the ground deformation due to character gait. Rendering footprints on soft ground contributes to the perception of the character's weight, balance, or speed.

Finally, what would be the use of digital humans if they do not facilitate real-word communication? This aspect is addressed by Regateiro et al. through a deep learning based system to represent volumetric videos of humans. Understanding the relationship between 3D skeletal pose and 4D shape and appearance is at the heart of the solution.

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Specialty section:
This article was submitted to Technologies for VR, a section of the journal Frontiers in Virtual Reality

Received: *28 March 2022*
Accepted: *14 April 2022*
Published: *29 April 2022*

Citation:
Danieau F, Guillotel P, Hoyet L, Tonneau S and Zhao Y (2022) Editorial: Creating Lifelike Digital Humans. Front. Virtual Real. 3:906118. doi: 10.3389/frvir.2022.906118

In this way, this compilation of articles highlights some of the typical challenges of this exciting research area. We believe that the synergy created by these different novel works contributes to the creation of lifelike digital humans.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

ACKNOWLEDGMENTS

We are grateful to all authors, journal editors, and peer reviewers who contributed to this Research Topic.

Conflict of Interest: FD and PG are employed by InterDigital.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.