CREATING MY DIGITAL SELF

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INTRODUCTION

In 2019, in the context of building up the *Immersive Arts Space,* an art/tech lab at the Zurich University of the Arts, I was asked to investigate how to create a digital twin from a real, existing person. It was about essential questions like, figuring out how to scan him or her with different techniques or clean up the data, handle the rigging, and master the animation. The goal was to create a digital twin of that person as a final output. I decided to boldly take on the challenge, not knowing at the time the steep learning curve I would be on. I am not afraid to experiment with things I am not familiar with. I am also in constant pursuit of the latest technical innovations to understand and deepen my skills. Back then, I only had basic understandings of how to build a hyper-realistic digital human. Nevertheless, having myself available at all times as material to work with, I decided to create my digital twin.

Needless to mention that making a digital human is not a simple task. A series of carefully calculated steps needs to be executed. Otherwise, you may find yourself redoing and correcting the same steps several times. Each one, no matter how small, will affect the final result. So, before I started creating my twin, I made a list of criteria that I wanted to follow:

- The objective was to create a coherent self-presentation as close to identical with one's physical self as possible, in order to achieve a realistic, aesthetically looking digital human.
- An important aspect was to use a combination of low and high-tech solutions and equipment, so as to keep a lid on costs.
- The outcome was planned to be animated in real-time by motion capture technology and integrated into virtual environments.

Given the continuous technological progress in creating virtual humans, an essential general focus is photo-realism (Bartl et al. 2021). At the same time, there is still an ongoing debate about whether realistic-looking virtual humans are prone to facilitate the *uncanny valley effect,* which describes the phenomenon that close-to-real looking artificial humans may strike us as eerie (Mori et al. 2012). The manifold approaches for realistic 3D-reconstruction vary mainly in their technical complexity and the resulting costs involved. These two factors

influence the degree of realism that can be achieved. So far, expensive multi-camera rigs, based on high-quality image sensors — as used as in professional light stages — achieve the best quality. However, alternate approaches, based on more affordable consumer hardware, for instance, single 2D photo cameras or smartphones, are becoming more elaborate and thus more popular. Most of these low-cost approaches share the vision to make the inexpensive production of digital alter egos possible for everyone without a complex hardware setup (Bartl et al. 2021).

Together with my fellow researchers, Florian Bruggisser, Patxi Aguirre and Tobias Baumann, we focused on consumer-level hardware and invested much time in simplifying the complexity of the processes. We also had the opportunity to be mentored by an expert in the industry.[1]

CREATING MY TWIN

I used a combination of low-cost solutions, such as using a single DSLR camera to capture multiple views of my face and body. I also applied a more complex and expensive handheld device to produce detailed scans of facial expressions and body parts such as teeth and hands. The first method uses a photogrammetric reconstruction [Fig. 1] and provides a rather rough 3D reconstruction of my face and body that needs further processing and optimisation. The advantage, however, is that it produces a basic surface texture that can be used for the 3D model later on.

FIG. 1

PHOTOGRAMMETRY PROCESS WITH THE SOFTWARE *REALITY CAPTURE*. ORIGINAL PHOTO, POINT CLOUD RECONSTRUCTION, 3D RECONSTRUCTION WITHOUT TEXTURE, 3D RECONSTRUCTION WITH TEXTURE.

The second method leads to precise and very detailed reconstructions. In fact, for the facial expressions and hands, I used an EinScan Pro, which employs a modular structure light projection (it generates a striped pattern) that produces the 3D reconstruction of the scanned surface [Fig. 2]. With its much faster processing, this scanning device can provide a series of distinctly different facial expressions [Fig. 3] in a relatively short period. It also manages to capture wrinkles and other morphological details of the skin [Fig. 4].

For scanning my teeth, I asked my dentist to make me an intraoral scan, and he used the 3Shape TRIOS scanner to generate the 3D reconstruction. Both methods, in combination, generate high-quality virtual humans ready to be processed, animated, and rendered by standard Extended Reality (XR) simulations and game engines such as Unreal or Unity.

1 Matthias Wittmann, who is a member of the Digital Human research group at Digital Domain, reviewed our progress and advised on how to master complex processes.

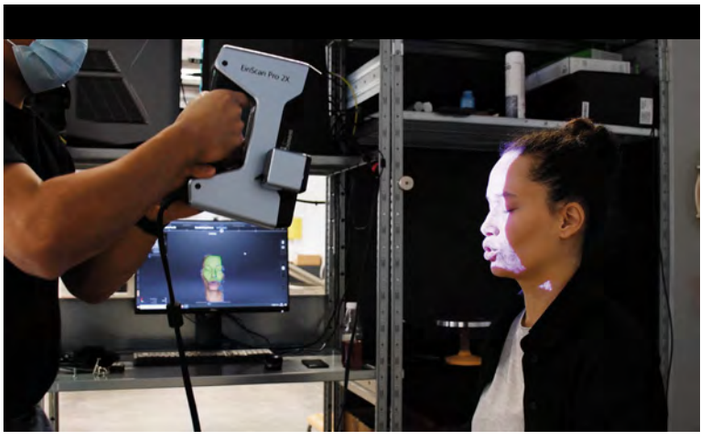

FIG. 2
HANDHELD SCANNING.

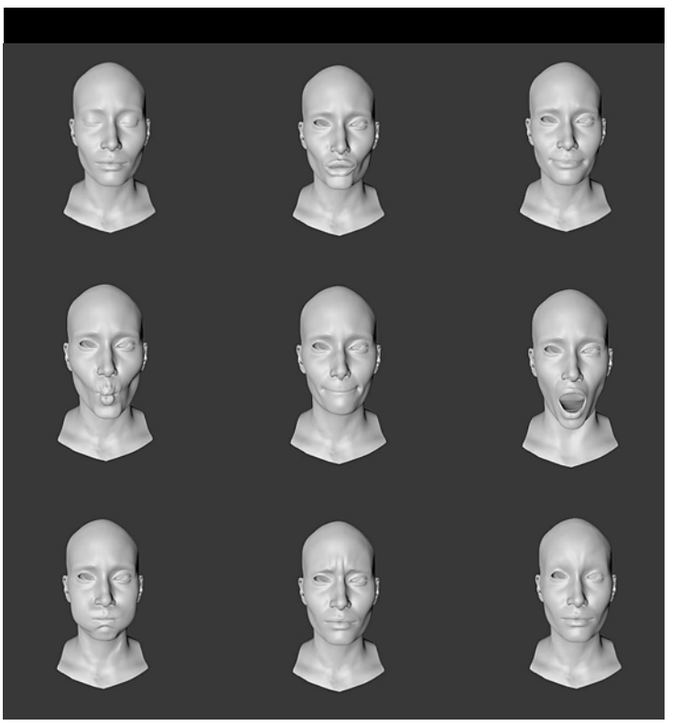

FIG. 3
SCANNING RESULTS OF MULTIPLE EXPRESSIONS AFTER CLEAN-UP.

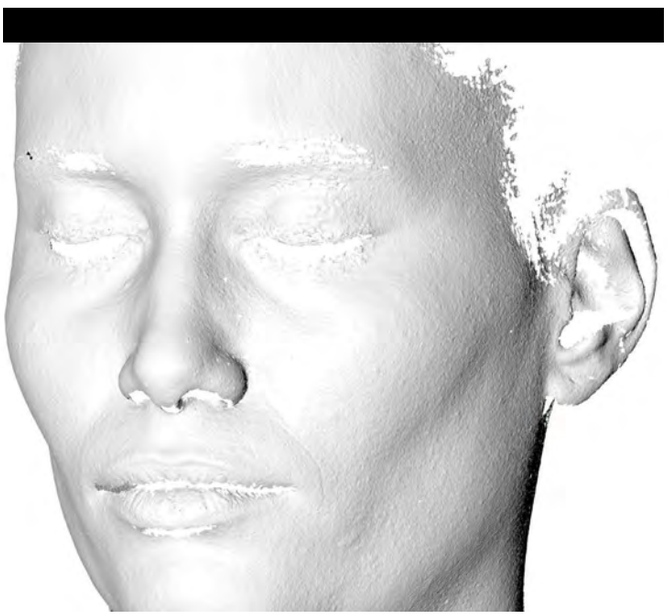

FIG. 4
MORPHOLOGICAL DETAILS OF THE SKIN.

With each iterative 3D model of myself, we compared the result in an immersive virtual environment. For this, we imported the reconstructed 3D model into the digital universe of a game engine and compared the appearance of my authentic self with the digitally reconstructed copy. My virtual variants are perceived consistent in terms of similarity to the original, human-likeness and uncanniness, even though we perceived them differently in terms of realism. As I have a more intimate awareness of my body than my colleagues, I have the impression that my virtual body is less realistic than my fellow researchers think it is. Strangely, I perceive it as plastic and synthetic. Consequently, with each additional version of my digital twin, I feel pressure to create an increasingly perfect version of how I look in real life [Fig. 5, Fig. 6].

GETTING TO KNOW MY TWIN

Once the digital twin exists and is manipulable, a new set of questions arises. How do I perceive and approach my digital self-presentation? Furthermore, will this new self-presentation affect my self-conception?

Motion capture technology offers the full-body tracking of my movements and the transfer of these movements to the digital twin. This enables consistency between one's physical body and the digital double. An additional and similar transfer can take place regarding facial expressions by means of performance capture. The importance of exact correspondence of bodily and facial movements is essential for constructing and experiencing a self-representation. The body itself becomes the immediate and sole instrument to control the digital twin and thus provides an intimate connection between one's physical body and one's digital self (Freeman/Maloney 2021).

FIG. 5

DIGITAL TWIN 1.0

MADE IN COLLABORATION WITH MY COLLEAGUES.

FIG. 6

SIDE BY SIDE COMPARISON OF ME AND MY DIGITAL TWIN 2.0

MADE IN COLLABORATION WITH MY COLLEAGUES AT THE IMMERSIVE ARTS SPACE, ZURICH UNIVERSITY OF THE ARTS.

The perceived realism of virtual humans depends just as much on their movements and behaviour as it does on their photo-realistic appearance. Until now, this project focused on appearance rather than behavioural realism. Nevertheless, this does not exclude a further investigation once the digital twin is completed and usable in interactive real-time situations.

Since the digital body can be fairly manipulated and customised, this can raise questions regarding identity, race and gender. By doing this, I have the opportunity to deviate entirely from my real-world identity, projecting myself in a way that looks nothing

FIG. 7
AVATAR MADE BY ME WITH READY PLAYER ME.

FIG. 8
AVATAR MADE BY ME WITH FACE HERO.

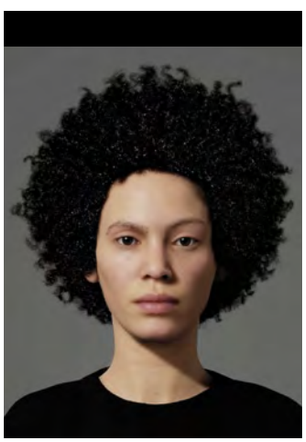

FIG. 9
METAHUMAN MADE BY ME WITH UNREAL ENGINE METAHUMAN CREATOR.

like I do in real life. Digital spaces afford the experimentation and projection of entirely new identities, but what does this mean for me as a human being? What does it mean for others that know me, but interact with my digital twin? The types of relationships we have with digital representations of ourselves can vary widely. Moreover, since the way we represent ourselves is often nuanced and complicated, it does not stay static. (Fisher, 2021a). Some people choose to create a fictional character and have an avatar that looks nothing like they do. Others will make an idealised version of themselves, whereas others like me will try and make the most true-to-life version they can (Fisher 2021b).

SHIFTING IDENTITIES AND GENDER EXPRESSIONS

I have also tried to recreate myself on different platforms, from the stylised versions [Fig. 7, Fig. 8] to a hyper-realistic version [Fig. 9].

A stylised avatar offers some level of abstraction and idealisation as well as different levels of body ownership and periodically shifting appearances. At the same time, it also enables one to "experience different forms of embodiment—including human, nonhuman and perhaps somewhere in-between" (Virtualis 2020). The sense of authenticity and the multiplicity of digital identities surface when the avatar is given a personality, unique behaviour, intentions and style. When we create avatars, we never truly and completely capture ourselves. However, nuanced presentations emerge as intertwining relationships among different dimensions of identity emerge, such as appearance, gender (female, male, binary and non-normative), race, ethnicity and age (Freeman and Maloney 2021).

Yet, there are no precise rules on how we choose to portray ourselves in the digital world. The main constraints are given by the platforms, the knowledge and capacity we have, and of course, by a great deal of resilience and motivation to experiment with those intangible differences between one's physical self and the digital counterpart.

When it comes to using virtual humans and avatars, the *Proteus effect* is a prominent research topic. It describes the phenomenon that the avatar appearance can influence users' attitudes and behaviour based on stereotypical beliefs (Bartl et al. 2021). Indeed, selective self-presentation and performance occur in people's behaviour, perception and cognition, since they conform to their avatar and the mental stereotypical characteristics and personality the avatar represent. This representation of self may be a different social identity, one without the limitations of the physical world, which leads to a seemingly unrestricted expression of self (Freeman and Maloney 2021).

SEEING MY TWIN DAMAGED AND DEFORMED

Looking at all the different avatars I have created, I believe my hyper-realistic digital twin represents me the most accurately. This is probably because of the amount of work I have dedicated to it, including all those frustrating moments in the creation process when I finally realised that other techniques would work better than the one I chose previously, including those instants of embarrassing hilarity when you see your digital twin being awkwardly deformed.

This is likely to happen during the animation process, particularly when my digital twin gets moved and animated by male colleagues trying to solve technical issues. In that

process, mistakes can happen, and then I find myself seeing my digital twin completely distorted [Fig. 10], maybe also with the wrong face texture [Fig. 11], almost like a monster. However, the fascinating thing is that there is an adequate distance between her and me, mainly on the empathic level. Even if I perceive a particular violence in the facial deformation or skin aesthetics, this violence is not perceived as directed to me, but aimed at some other entity. It may be due to my experience of playing characters in realistic games, where I have the feeling that the 3D model of myself is empty, is dissimilar enough from me, from my human person, to remove almost entirely that uncomfortable connotation that accompanies the damaged digital body. Yet strangely enough, there is still a lingering feeling of unease created by the mingling of humour with violence.

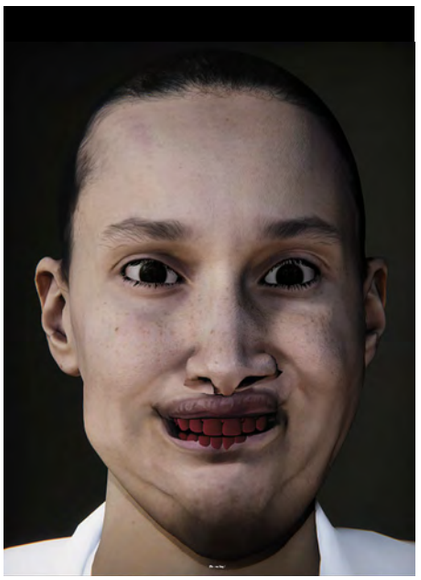

FIG. 10
DIGITAL TWIN WITH DISTORTED FACE.

CONCLUSION

I am intrigued by the possibility of experiencing my everyday self in a novel way and exploring undiscovered potential. Then again, having concretely experienced my highly realistic digital twin makes me more sensitive about my identity. I am actually a little sick of always seeing my face and body in digital form. Yet it has encouraged me to immerse myself in the idea of a different body, inhabiting unfamiliar gender and ethnic spaces.

By continuing this research, I would like to investigate diverse new practices, phenomena, and interaction consequences surrounding the self-presentation mechanisms in virtual environments. I believe it is increasingly important to understand how people represent themselves digitally and how virtual environments might influence their behaviours, especially by outlining the potential benefits and opportunities in terms of awareness of identity and gender matters. This might include raising questions about and proposing limits to the appropriation and exploitation of digital human beings. Furthermore, and perhaps in a more generalised way, I strive to create some sort of guideline to help people grow aware of digital humans and learn to discern them from real people, maybe while helping them develop some critical thinking when they come across digital humans in socio-technical systems.

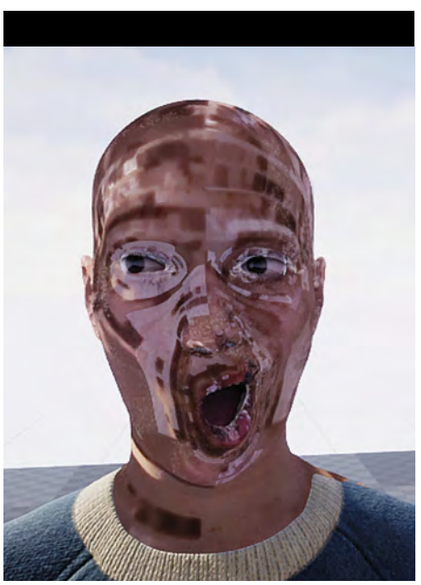

FIG. 11
DIGITAL TWIN WITH WRONG TEXTURE.

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