The Screens of Virtual Production

What Is Real?

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Photogrammetric Race-Making in the MetaHuman Creator

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Introduction

The idea of perfection permeates mediated beauty culture in the form of social media filters that erase facial flaws, and beauty trends such as glass skin that blur pores and fine lines. While the aspiration for mediated human appearance trends towards smoothness, the benchmark for *digital* humans is texture. A high-quality digital human has features that are slightly unbalanced that make it more realistic, skin with scars and wrinkles that make it relatable, and hair with kinks and frizz that make it distinctive. These irregularities and idiosyncrasies have traditionally required more resources to model and animate. A new wave of digital human software tools such as Epic Games' MetaHuman Creator is making it easier to manufacture visual character by synthesising, adjusting, and tweaking a purportedly diverse catalogue of detailed and dynamic skin tones, hair textures, and facial features. The tool promotes its extensive epidermal variation as proof of representational diversity in character creation. This breadth and fidelity of digital human diversity is made possible – according to tool developers – through photogrammetry, which scans and matches up points of interest across multiple images of the same physical object to create points in 3D space, which are composited to form a 3D mesh that can be computationally manipulated. Scans of real humans are the raw material for MetaHuman's 'diverse series of presets' (Epic Games 2022a) that creators blend and sculpt into their own 'high-fidelity digital humans', which are rigged for animation and motion capture.

Within the visual economy of digital humans, imperfection enhances engagement by imparting a sense of character to artificial beings. A convenient proxy for character is racial diversity – fetishised as the ultimate mark of graphic fidelity and promoted by tool proponents as a remedy to the default white male player character that has been a fixture of videogame culture (Cote and Perry 2020). While the racial diversity of MetaHuman's presets is proudly showcased in promotional videos and sample projects, the tool developers featured in demonstrations, tutorials, and interviews are conspicuously white. This form of 'diversity surfing' (Freedman 2022) casts race as a cosmetic rather than political category, producing compliant digital humans

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who are positioned to stand in and speak for Black and creators of colour (Sobande 2021). This chapter analyses how photogrammetric scanning of real humans – key to photorealistic real-time 3D (RT3D) production, including virtual production – pushes race-making beyond criticisms of its abstraction or depoliticisation of diversity (Halualani 2011). Building on scholarship of post-race, this chapter considers how race is abstracted by digital human tools not as social facts, but as mathematical variations derived from databases of human scans.

Drawing from MetaHuman Creator as a case study, I analyse how digital human tools' photogrammetric foundations buttress familiar truth claims around human scanning and graphical fidelity that emerge from data-centric and asset-driven modes of RT3D production. Examining Epic Games' promotional texts since the tool's launch in 2021,[1] I discuss how RT3D mediates human bodies into what are considered core and peripheral assets: the rig representing human kinesiology is core to the tool's proprietary functionality, while the 'ever-growing library of variants of human appearance' (Epic Games 2021a) is relegated to a fungible asset. As an imaging technology, MetaHuman marginalises minority representations, considering them optional, fragmented, and peripheral to its default techno-physiological model. By synthesising race computationally, MetaHuman dissolves racial concepts within the latent space of statistical compression. Beyond these post-racial logics, the MetaHuman Creator radically reverses dominant understandings of diversity as a target or quota, for example, of representations of characters or inclusion of creators from minority or underrepresented backgrounds (see BAFTA 2020 for Games Awards Diversity Standards). The MetaHuman creator reverses this understanding of racial classification as the precursor to diversity. Instead, MetaHuman positions diversity as preexisting in the statistical compression of its photogrammetric database, preceding the need to classify or even recognise race.

Racialisation of Digital Humans

The MetaHuman Creator is a cloud-based app that enables artists and designers across videogames, animation, and visual effects to create realistic 'digital humans' by automating aspects of character creation, animation rigging, motion and facial capture, and dynamic lighting. Developed by Epic Games to work strategically with its Unreal Engine software framework, assets, and other popular Digital Content Creation (DCC) tools, the MetaHuman Creator and other digital human tools are poised to become an integral part of 'real-time filmmaking', where the ability to instantaneously visualise scenes without long render times enables creative iteration during the production process itself. For example, the animation of digital humans in real time using relatively accessible motion and facial capture techniques has been promoted by Epic Games (2022b) as 'creativity at the speed of thought', especially for small teams and solo creators. While real-time functionality is a standard feature of

Figure 11.1 Black and Asian presets in promotional video (Epic Games 2021a).

the Unreal Engine framework, the unique selling point of MetaHuman's characters is its digital human diversity, which according to Epic Games (2024a) features 'near-infinite variations of facial features and skin complexions' (This argument is also taken up in Sean Redmond's chapter in this collection).

This variation is achieved by choosing a preset character, blending it with other selected presets, and using sliders and sculpting tools to adjust and instantly preview aspects of the 3D model. The tool's 'democratisation of complex character technologies' means that the creation of diverse and photorealistic digital humans (Epic Games 2023a) can be achieved without the specialised expertise needed to model 3D meshes, create textures, and add skeletal and facial rigs. MetaHuman Creator's library of presets prominently featured Black and characters of colour available as starting points. The promotional videos and sample project at launch featured a dark-skinned Black woman with short textured hair alongside an East Asian man with slightly uneven eyelids, straight medium-length hair, and sparse stubble. Intercutting between these characters mid-sentence to imply their interchangeability, the tool's launch video states obligingly that 'I could be one of many or I could be the one. You create the narrative. I am MetaHuman' (Epic Games 2021a) (Figure 11.1).

These MetaHuman presets operate within a visual culture where digital humans, such as virtual influencers, are marked by their racialisation and marketed through their interchangeability. In their analysis of the top 100 virtual influencers in global fashion, Yeongyo Shin and Selee Lee (2023) found that Black digital humans had distinct characteristics such as short afro or buzz cut hairstyles and bodily decorations with primitive overtones. The MetaHuman's interchangeability – emphasised through close-ups of body parts such as East Asian male preset's eyes, hair, and lips – is also evident in the virtual

influencer Imma, presented by Tokyo-based firm Aww[2] as a young Japanese female character with a bubblegum pink bob. Esperanza Miyake (2023) offers that Imma's social media feed featured close-up images of her individual eyelashes and lips. Beyond showcasing the technical achievements of Imma's anatomical precision, Miyake adds that such fragmentation is typical of racialised depictions of Asian femininity. This is a techno-orientalising gaze – framing Asianness as machine-like and not quite human (Chun 2019), as parts that don't quite add up to a whole. This framing is observable in MetaHuman's close-ups of its subtly feminised Asian male preset's body parts.

The Black and Asian MetaHuman presets, like digital human applications such as virtual influencers, draw from the familiar visual playbook of orientalist and primitivist racisms (see Eglash 2002). Set against a featureless yet dynamically lit background – despite being composited from the photogrammetric scans of real humans – these MetaHuman presets are racial abstractions reminiscent of Benetton's 1989–1991 'United Colors' advertising campaigns. Les Back and Vibeke Quaade (1993, 69) observe that these campaigns visualise a form of racial atavism, where 'human difference is reduced to a set of simplified caricatures which are presented as archetypes'. Like the Benetton models, MetaHuman's presets embody rudimentary racial traits – such as cropped textured Black hair and creaseless Asiatic eyelids – suspended in a virtual state of purity and ready for remixing.

The atavistic racialisation of digital humans is nonetheless upheld by its proponents as providing tools for more inclusive representations. For example, computer science researcher of digital humans Mike Seymour remarked in an online panel on MetaHuman Creator[3] produced by Epic Games that the tool was more responsibly reflecting human diversity as it exists in the world:

> [MetaHuman Creator] allows me as an artist to go for a large range of genders and ethnicities and ages … So we didn't just end up with a lot of middle-aged white guys like me, but a much more inclusive set of digital humans.
>
> (Epic Games 2021b)

Responding to this statement, a developer from Brud explained that their virtual influencer Lil Miquela – depicted as a racially ambiguous young woman – was designed to elicit empathy from marginalised people on the outskirts of society: 'the way she was created, her backstory, everything about her was meant to be inviting to you to make you feel like you also can be represented by this' (Epic Games 2021b). MetaHuman Creator provides this sanitised version of inclusiveness to brands who see 'diverse' virtual influencers as reaching broader audiences and engaging consumers that identify with them (Ferraro et al. 2024). Capitalising on this simplistic approach to on-screen diversity, Epic Games provides an online course on 'broadening representation' by bringing variety into the creation of 'more diverse and authentic characters' for videogames (Epic Games 2023b). Supported by Unilever

brand Dove, this four-part course uses the vocabulary of commodity activism (Mukherjee and Banet-Weiser 2012) to encourage MetaHuman creators to be 'part of a bigger movement' to improve consumer well-being and self-esteem by improving their identification with more diverse characters in videogames (Epic Games 2023b).

Digital humans have been critiqued as a form of 'diversity surfing' (Freedman 2022) in which white toolmakers set the conditions of racial inclusiveness in their tools' representation of the world without including Black and developers of colour (also see Yu-Lun Sung's chapter in this collection). For example, in a video interview of MetaHuman developers in Serbia-based firm 3Lateral, acquired by Epic Games in 2019, a series of white developers talked over the aforementioned racialised presets, gushing about how 'this person that's come from your imagination that doesn't exist in real life is suddenly there looking at you, smiling at you. That is kinda magical' (Epic Games 2021c). Missing from these recorded discussions of the team's years-long design of databases and rigs was any mention of Black and people of colour who were scanned for the photogrammetric database touted as the tool's selling point.[4] Extrapolating from these developer testimonies, the magic of digital humans lies not in the photogrammetric 'raw material' extracted from racialised bodies, but in the design of systems that ventriloquise racialised representations. As virtual influencers are increasingly enlisted by brands, Francesca Sobande (2021) states that Black identity is being digitally depicted and remediated by digital humans. In this context, claiming diversity without engaging or employing actual Black people produces compliant digital humans that replicate 'anti-Black and colonialist ways that Black African people and their cultures are treated as a marketable and digitally mediated commodity' (Sobande 2021, 36).

At the crux of these accounts of digital humans' racial essentialism, ventriloquism, and commodification is the misconception of diversity as a distribution with discrete indicators. Instead of a target to be met in terms of the representation in and production of media content, Anamik Saha and Sandra van Lente (2022, 1811) clarify that diversity is 'a set of practices and methods through which the dominant culture attempts to maintain its status' by placating the demands of minoritised groups while regulating how their production is ascribed commercial and cultural value. Drawing on Herman Gray (2016), Saha and Van Lente explain that 'diversity' is not about demographic parity but about power, to define the marked and unmarked categories and meanings of race itself. In this sense, diversity is a practice and method of race-making. In the case of the MetaHuman Creator, 'diversity' makes race through truth claims to photogrammetry as a database for racial blending that abstracts race from a social into a mathematical fact.

Photogrammetric Truth Claims

Photogrammetry is a method for compositing 3D models from extensive sets of photographs of a subject from various overlapping positions and angles. As operational images, these photographs are captured and processed not as

images but as data (Loder 2021). These images are digitally processed through distinct stages using various algorithmic approaches to produce 3D geometry and texture details (Polidori 2021). Close-range photogrammetry has become widely used in the videogame industry, replacing additive modelling that has been used since the early 1990s by starting out with simple polygon shapes and incrementally adding details to create various 3D game assets (Statham 2018). Game assets include objects, environments, as well as characters, which have long been created through facial photogrammetry of human actors using multi-camera rigs that are animated with established motion-capture equipment and techniques. Instead of inventing a new technique or achieving greater quality in the creation of digital humans, the MetaHuman Creator's main innovation is its accessibility as a software tool and lowering of production costs through the automation of existing processes (Giuliana 2022).

The MetaHuman Creator is merely the latest application of photogrammetry in the games industry, where increasingly detailed and life-like representations are upheld as benchmarks for 'graphical fidelity'. This kind of realism as fidelity is seen less as an artistic style and more as demonstrations of graphical innovation, which are used to promote new instalments of blockbuster game franchises such as the military shooter *Call of Duty* (2024, Activision). Rather than acknowledged as an aesthetic, the realism of graphical fidelity is depoliticised as technical achievement from technological advancement of hardware and software. Photogrammetry's emphasis on capturing and compositing rather than composing graphical assets is key to this depoliticisation.

Photogrammetry is often promoted as allowing 'artists to produce realistic assets with a high level of quality at a relatively quick turnaround, *freeing them to focus on* aesthetics issues such as design, composition, lighting, etc.' (Statham 2018, 301, emphasis added). In this sense, photogrammetry is understood less as remediating and more as capturing and reproducing reality.[5] For example, the Unreal Engine's documentation states that the 'scan data is the closest thing you'll get to a ground truth for the subject in 3D' (Epic Games 2021d). Such biometric truth claims are not unique to photogrammetry or videogame production. They are legacies of anthropometric measurement of human bodies as components and as morphol ogy, in order to assess variations within and among populations across ethnicities, cultures, and age groups (Bartol et al. 2021). Anthropometric approaches, including photogrammetry, should be considered biopolitical techniques that govern 'people by sorting them into social groupings based on biological demarcations' (Roberts 2011, 4).

Photogrammetry's connections to anthropometry are whitewashed through MetaHuman's claims to a universal database of human appearance(s). Unlike previous generations of character creation systems, MetaHuman and other digital human creators emphasise their graphical fidelity to real humans, derived from photogrammetric databases that are not only anatomically precise and in high-definition, but also exceedingly diverse (Giuliana 2022). Toolmakers often cited the 'huge effort of collecting *all possible* appearances that, you know, people can take' as the key to MetaHuman Creator's functionality and uniqueness (Epic Games 2021b, emphasis added). Despite the secrecy of

MetaHuman's photogrammetry pipeline (Statham 2018), it is clear that Epic has not *collected* all possible human appearances. MetaHuman's lead toolmaker explained during an online panel:

> We approached this problem with a data-based strategy where we are scanning real people and measuring their offsets against some universal models. Yes, we have made a great deal of care to make the database *evenly* distributed so that we can *similarly well* describe any human appearance.
> (Epic Games 2021b, emphases added)

The intricacies of this data-based strategy may be hazy, but what is clear is that MetaHuman's claims to photogrammetry's veracity hinge on ideological claims of its database's representativeness, where statistical diversity stands in for social equity. Responding to familiar criticisms of 3D characters dominated by 'middle-aged white guys like me', MetaHuman's diversity of presets and blends is presented as progressive. Despite this self-promotion as a social innovation, the tool's claims to authenticity and inclusiveness draw from a post-race playbook that has informed neoliberal stances towards race, especially in U.S. society since the late 1990s. As outlined in the previous section, the racialisation of digital humans in general glamourises cosmetic and compliant forms of diversity. However, what is distinctly post-racial about MetaHuman's *photogrammetric* racialisation is its articulation of an abstract or raceless diversity:

> an abstract, idealized, and/or raceless representation and reality, in which cultural communities are collocated, while simultaneously emptied of any particular histories, social structures, or structural inequalities.
> (Halualani 2011)

The various MetaHuman presets may have individual names, hairstyles, and even outfits. Yet, they are suspended in a contextless non-space where their 'diversity' lies not in socio-historical contexts or even instantiations of colour and form, but in the latent space of 'universal models' where any human appearance can potentially be described. This photogrammetric branding of diversity is the MetaHuman Creator's technocultural innovation. However, MetaHuman's latent space of human appearance does not have the 'near-infinite' variations as advertised – they are limited by what Epic Games brands as physically racially realistic (Figure 11.2).

The selling point of MetaHuman's character creation is the ability to blend presets. This blending is limited to a few presets at a time, and at launch, the scope of customisation of features such as nose shape, hair, and eye colour was locked to statistically 'plausible' variations. According to the Unreal Engine's documentation when MetaHuman was launched, blending is constrained to the range of skin tones and hair colours as well as user adjustments 'to fit within the limits of the examples in its database' (Epic Games 2021d). Digital humans are synthetic and therefore can be blended without constraints.

Figure 11.2 The MetaHuman Creator's presets (Epic Games. 2021c).

Epic made a decision at launch[6] to blend presets in a 'data-constrained way' (Epic Games 2021a) and to restrict customisation to a 'carefully selected range of skin tones and hair colors [*sic*]… to help ensure realism' (Epic Games 2024a). This decision makes sense given the Unreal Engine's market leadership in RT3D content with graphical fidelity to real environments and humans, achieved through dedicated libraries and toolsets for photorealistic textures, dynamic lighting, and more. Instead of attributing the MetaHuman Creator's constraints to brand consistency with its parent engine, Epic's representatives framed their limitations on racial blending as mathematical and biometric rather than social or political (Figure 11.3).

Race 'is not a biological category that is politically charged. It is a political category that has been disguised as a biological one' (Roberts 2011, 4). In other words, race is a framework for governing people by classifying them into a social hierarchy based on constructed biological distinctions. Race as a classification scheme does not precede, but is a consequence of racism and racialisation. However, this understanding of race is lost on proponents of the MetaHuman Creator, who cast race and its computational blending not in political, but datalogical terms. For example, digital human researcher Mike Seymour explained during an online panel that the MetaHuman Creator worked by:

> learning from studying real people or learning from sort of datasets that have real people. And it's not programmatically, somebody inventing a super intelligent being that does stuff. It's a sort of statistical thing, but that means that you are getting a sort of a genesis of an authenticity from what it learned from real people.
>
> (Epic Games 2021b)

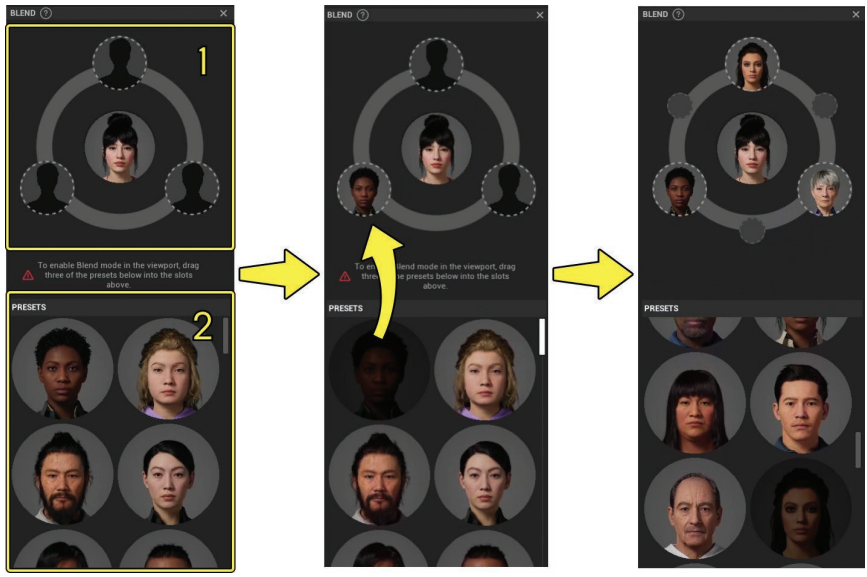

Figure 11.3 The MetaHuman Creator's blending of presets (Epic Games 2024b).

Seymour encapsulates Epic's 'data-based' approach to the political minefield of racial classification and social pressures for diversity in digital human representations: a conflation of the graphical fidelity of photorealism with the anatomical fidelity of photogrammetry (i.e. human scanning). This conflation shifts the responsibility for racial classification and representation from the programmatic to the statistical, from constraints imposed by corporations to datasets derived from reality and customised by creators. Within this logic, the challenge of diverse representations of digital humans is always-already responsibilised to content creators. This conflation of (photo- and anatomical) realisms in the photogrammetric database is used to legitimate MetaHuman's racial configurations as technical rather than aesthetic and political.

This conflation is rooted in the ideology of 'optical empiricism' where truth claims are made through beliefs about photography's objective capture of reality (Sekula 1986). MetaHuman's legitimation of racial blending (and classification) through photogrammetry continues this tradition of seeing the camera as a truth apparatus that 'promised to reduce nature to its geometrical essence' (1986, 17). In the case of the MetaHuman Creator, photogrammetry promises to reduce the nature of race to its statistical essence. Photography operates through a bureaucratic clerical-statistical system of 'intelligence' that standardises, measures, and classifies, in order to govern human bodies, most saliently according to constructed categories of race (Sekula 1986). The racial classification systems enabled by the camera and its archive are also the precursor to modern facial recognition technology (see Stevens and Keyes 2021). In this sense, photography (and photogrammetry)

falls into a long line of imaging and computational technologies that were created in part to monitor, control, and exert power over Black people and people of colour (Allison 2021).

This section contextualised the MetaHuman Creator's conflation of graphical and physiological fidelity in its framing of photogrammetry through ideologies of optical empiricism. These contexts for truth claims lay the groundwork for MetaHuman's significance as an analytical case – its blending of racialised presets as 'a statistical thing', to quote digital humans researcher Mike Seymour. MetaHuman's blending capacity goes beyond the diversity surfing of virtual influencers or atavism of digital human presets. The MetaHuman blend performs a kind of racial transcendence that is characteristically post-racial. Post-racial politics framed racial relations – especially in the post–Obama era – as transcending racial divisions of past generations (Cho 2009). In a similar vein, post-racial aesthetics in the MetaHuman blend frame the problem of underrepresentation of minorities in entertainment media as transcended by (Epic's) digital human technology. In the 1990s, Benetton's United Colors campaign (Figure 11.4) visually orchestrated opposing racial archetypes to be united by its brand image in a 'saccharin message of multi-racial transcendence' (Back and Quaade 1993, 68). Three decades later, MetaHuman now orchestrates its photogrammetric database into racially representative presets in order to stage their blending into unique and 'diverse' digital humans. In contrast to Benetton's iconic advertisement, this transcendence is not symbolic, but statistical. The MetaHuman blend is a technology of race-making

Figure 11.4 1990 United Colors of Benetton advertisement (Benetton Group 2024).

(Gray 2016): race is re-made through techniques not of categorisation but of statistical compression. At the heart of Epic's data-based strategy is a recasting of diversity not as measurable outcomes but as latent probability.

Engines of Race-Making

'Diversity' is often framed as a target or quota, for example, of representations of characters or inclusion of creators from minority or underrepresented backgrounds. This numbers approach to diversity as representational and demographic parity obscures larger questions about who has the power to define the targets and quotas that link measurements of parity to principles of equity (Saha and Van Lente 2022). Indeed, diversity is often defined by the dominant culture, which uses targets and quotas as a means to govern the participation of minorities. Rather than a target to be met, diversity should be considered in terms of the power to define those targets, its marked and unmarked categories, and the meanings of race itself (Gray 2016). This politicisation shifts the focus from criteria for diversity to infrastructures of race-making. In the case of the MetaHuman Creator, race and its 'diversity' are defined through infrastructures that are data based and asset driven. Just the camera functioned as part of a broader clerical-statistical system, the MetaHuman Creator functions as part of its game engine as a software framework. The previous section discussed how photogrammetric truth claims animate Epic's data-based strategy. This section argues that MetaHuman's encompassing game engine defines diversity not as an outcome to be manifested but as an asset whose value lies in its latency.

This infrastructure of race making processes and packages data into assets through photogrammetry. Critical geographers note that photogrammetry operates according to a logic of extractivism. Photogrammetry is a longstanding technique developed through government-supported geomedia infrastructure for spatial information capture that systematises the material world into extractible data for material and immaterial accumulation (Wilken and Thomas 2022). These techniques have been honed through historical military applications, RT3D environments for architectural and entertainment media (Statham 2018), and are now used for close-range deployment in body and facial scanning. Across these applications, the photogrammetric impulse is datalogical – to extract and repurpose geography, geometry, and physiology as data. Photogrammetric scans are 'operational images' (Parikka 2023), where a high-quality dataset compiled from overlapping photographs (and laser scans) supposedly 'lacks any sense of aesthetics and does not perceive the image as image, but rather the image as data' (Loder 2021, 296). Beyond the truth claims invoked by MetaHuman developers in the previous section, this framing of photogrammetric reproductions as objective data reinforces the popular assumption that realistic representations of 3D worlds and characters are exempt from stylisation. Contrary to this claim, scholars of computational images have noted that realistic DCC ascribes equally to aesthetic conventions as stylised aesthetics

such as pixel art or cell shading. For example, modelling realistic-looking natural environments in RT3D requires meticulous attention to textures, lighting, shadows, and animations using specialised toolsets. Computational images do not reproduce reality; they embed conventions, ideologies, and techniques of the contexts in which they are produced (Gaboury 2021).

Photogrammetry scans captured and processed as data are packaged (and re-packaged) as assets. The most obvious asset class is digital humans created using the MetaHuman app, which are subsequently assembled as part of digital content such as animations, videogames, and social media. In videogame production and DCC more generally, an asset refers to 'a specific element, such as a 3D model, a sound file, or a particle system' (Barr 2024, 130). RT3D production is a modular process involving a variety of assets. Such assets are packaged thematically and sold in marketplaces that are often brokered by game engine companies such as Unreal and Unity. Using pre-made assets may make 3D content creation more accessible, but it may also have a homogenising effect on digital content, where the aesthetic signature (Livingstone 2024) of specific game engines stands in for the distinctive look and feel many creators aspire towards. The bricolage of marketplace assets constitutes 'design by marketplace' that frames games as collections of parts rather than an integral whole (Werning 2021). Digital human assets are similarly described as parts of a whole.

This nesting of assets becomes clearer in a promotional interview with creators reinventing Universal Pictures' *Bride of Frankenstein* for an animated mini-series themed around Epic's videogame *Fortnite*. The project's concept artist stated that the character's brown complexion and box braids were created in the MetaHuman Creator by 'generating different skin patches, scars, and imperfections by *combining* six different Bride variants into one' (Epic Games 2021e, emphasis added). The MetaHuman system was praised for helping create Black and Indian characters as more inclusive of minority ethnic representations than the classic *Universal Monsters.* On the level of content, *Bride of Frankenstein* is considered a 'high-quality asset' that is rigged and screen-ready 'straight out of the box that we could then reuse for our other episodes' (Epic Games 2021e). Individual MetaHuman characters are described as assets that are fully rigged for 'animation and motion capture in Unreal Engine' (Epic Games 2021a). This is the most common usage of the term asset in DCC – as a distinctive element that can be reused across contexts. This usage corresponds to financial contexts where an asset is created through a capitalisation process that transforms a tradable commodity into a resource that creates future benefits (Birch 2017). Assetization is a mode of ownership and control that designates a thing as both capital and property (Birch and Muniesa 2020). In this case, the Bride digital human, once crafted from other variants (that are themselves assets)[7], becomes a means for generating future value as a form of capital for Universal Pictures' within the *Bride of Frankenstein* production pipeline, its *Universal Monsters* franchise, and beyond.[8]

The asset is not a thing but a *form* (Birch and Muniesa 2020): it is a technoeconomic configuration between data, content, and system. Beyond specific

digital human assets, on the system level, the MetaHuman Creator is itself described in terms of its value in developing 'a full human asset' through the application of machine learning techniques to the simulation of human muscles in a robust kinesiological system (Epic Games 2021b). These proprietary systems for facial muscles and movement automate the rigging process, thereby eliminating the 'most resource intensive and time-consuming thing we [animators] do' (Epic Games 2022d). The full human asset is the infrastructure that enables each digital human asset such as the Bride to be rigged and ready straight out of the box. This full human rig and blendable presets are infrastructural assets (Birch and Muniesa 2020) that, according to Epic, have been developed through substantial investment. This investment and its relative value to other asset classes (e.g. pipeline assets) were clear to a YouTube content creator who stated in a promotional video:

> [The] *real* magic of what Epic has done with handing over the MetaHumans for someone like me is it's really like an army of the highest-level artists creating your character, and then your being able to have access to that. It's not just some cool thing that you can sort of do. It's literally decades' worth of experience that's gone into creating these assets.
>
> (Epic Games 2022b, original emphasis)

These infrastructural assets are designed from databases processed through highly secretive photogrammetry pipelines and custom-built scanners (Statham 2018) that give MetaHumans their life-likeness and physical plausibility (Giuliana 2022, 824) that is characteristic of Epic's brand of graphical fidelity (Figure 11.5).

Figure 11.5 The MetaHuman Creator's facial rig (Epic Games 2021f).

Assets are not created or valued equally. The value of specific digital humans such as the Black Bride of Frankenstein with box braids and the touted diversity of MetaHumans is always-already secondary to the universality of the full human asset. This core–periphery configuration of different asset classes is characteristic of Epic's overall platform strategy. Game engines are software applications that provide building blocks for making and distributing virtual environments across formats and devices (Foxman 2019), expanding from entertainment contexts to architecture, manufacturing, logistics, and more (Chia 2022). Game engines play a pivotal role in coordinating different aspects of the development process, including design, art, programming, and management (Banks 2013). Game engines do not just constrain development through design methodologies, production workflows (Chia et al. 2020), or 'design by marketplace' (Werning 2021), they also lock in developers and gain market dominance through asymmetrical forms of interoperability (Foxman 2019). Infrastructural assets are core to the MetaHuman production framework and mediating workflows and transactions.

Within this platform ecosystem, the value of the full human asset lies in the Unreal Engine and MetaHuman's core technology – a stable system that can express near-infinite variations of plausible human diversity. The differential assetization of MetaHuman's universal system and diverse instantiations configures representations of race as discretionary, fragmentary, and peripheral to techno-physiological functioning. On the one hand, this core–periphery configuration of MetaHuman assets has continuities with other imaging technologies' approach to racialised characters. For example, analysing Will Smith's digital human in the film *Gemini Man*, Tanine Allison (2021) states that visual effects techniques often treat racialised features such as melanated skin as an add-on to the default texture, model, and rig. The white masculine human is consistently positioned as the unmarked default, with all other bodies treated as adjustments from this standard (see Phillips 2020 for a discussion of this default in video game character customisation). Another example of this durability of whiteness as a default can be seen in prompt-based AI-generated image synthesis systems such as DALL·E 2, which consistently reproduced images with racist stereotypes. Whiteness is so durable in these computational systems as a latent feature that it could only be interrupted with hidden prompts *added on* to user prompts by developers in an attempt to de-bias generated images (Offert and Phan 2022).

On the other hand, MetaHuman's asset-driven system has novel and pernicious implications for understandings of race and diversity. Within the MetaHuman imaginary, 'diversity' is always-already latent to the tool's infrastructure assets that enable its photogrammetric blend. This marks a crucial development of post-racial aesthetics from racial transcendence of MetaHuman presets analysed semiotically in the first section. Post-racial narratives purported that widespread racial mixing in modern societies meant that race was waning as an identity category and that racial categories would be obsolete in the future Washington (2017). At first glance, the MetaHuman blend

replicates this post-racial future's valuations of mixed-race people as more attractive and more robust because they embody the best of all worlds. Upon further inspection, the MetaHuman goes beyond post-racial logics of mixing or transcendence.

The MetaHuman creator does something more radical, or rather, more conservative: it dissolves race in the latent space – the statistical compression – of the photogrammetric blend. Even though the algorithms used to blend presets are not publicised by Epic, references to a data-based and statistical approach suggest similarities with machine learning techniques used in AI image generators. Latent space is a key aspect of generative models' learning mechanism: it refers to their ability to compress input data into more compact, lower-dimensional forms (Amoore et al. 2024). Drawing from their analysis of racist stereotypes in DALL·E 2-generated images, Fabian Offert and Thao Phan (2022) explain that within this latent space where data from massive image datasets are compressed, concepts like 'race' are dissolved and reconstituted. DALL·E 2 reconstitutes race in ahistorical, apolitical, and apparently non-ideological ways (Offert and Phan 2022). Correspondingly, the blending of presets into diverse MetaHumans produces race as an abstraction and diversity as a given. Instead of racial classification as the *basis* for the numbers approach to diversity, MetaHuman's data-based and asset-driven approach enacts a critical reversal where diversity *precedes* any need to classify, or even acknowledge race. In a computational twist to colourblind racism, MetaHuman frames diversity as a priori to conceptions of race. This subtle yet significant reversal shifts the meanings and politics of diversity, enacting the post-racial vision of racial mixing and transcendence – not as the obsolescence but the nullification of racial categories.

Conclusion

Since demonstrating the first proof of concept of a LED-based virtual production studio at SIGGRAPH 2019,[9] Unreal has become the dominant game engine in filmmaking by proactively partnering with visual effects and film production studios and supporting filmmakers and practitioners (Cremona and Kavakli 2023). Game engines are crucial to the simulation of 3D environments that can be adjusted and visualised on virtual cameras and LED volume walls in real time. According to creator testimonials in Epic's promotional videos, 'the instant response of the engine is amazing because you're really looking at something that looks like a shot' (Epic Games 2023c), yet are able 'to make changes right up to the last minute' (Epic Games 2022b). Virtual production practices using game engines articulate epistemological claims to the real by seemingly penetrating beyond the 'digital image as a representational surface' to simulate three-dimensional space (Ilmaranta 2020). In a discussion about virtual production, Cinzia Cremona and Manolya Kavakli (2023, 423)

articulate these claims about the reproduction of 'reality' in terms of physics systems in a passage that is worth quoting at length:

> Effectively, game engines are increasingly behaving like physics engines. Once the parameters of the laws of physics have been input, all representations of materials and lighting perform to a set of instructions determined by shifting conditions. The distinction becomes important when we think in terms of performance – Unreal and Unity don't 'design' a three-dimensional world, but set coordinates and parameters for materials and conditions with known and coded behaviours to perform their roles.

According to this epistemological claim, the MetaHuman Creator does not *design* racial blending or diversity; it merely inputs the parameters of the laws of physiology and kinesiology and sets the statistical constraints of graphical fidelity and anatomical plausibility. This is, of course, a fallacy. As a key component of Unreal's photogrammetry infrastructure, MetaHuman follows Epic's 'tendency of digitizing and transducing the real through AI rather than representing it from scratch' (Giuliana 2022, 825). Tracing the history of computational images, Jacob Gaboury (2021, 9) states that they 'are not pictures of the things they represent; they are pictures of the world that produced them, and they execute a theory of that world in the world'. The MetaHuman Creator is not a tool but a framework. The MetaHuman framework enacts a data-based and asset-driven form of race-making. Like other imaging technologies, MetaHuman relegates minority representations as discretionary, fragmentary, and peripheral to techno-physiological functioning. Like other statistical approaches to rendering race, MetaHuman dissolves concepts of race in the latent space of its photogrammetric blend. In addition to the post-racial logics of these imaging and statistical techniques, the MetaHuman Creator destabilises the grounds for the politics of diversity, by framing diversity as a priori to conceptions and classifications of race.

This chapter analysed how the MetaHuman Creator's brand of photogrammetric race-making adapts post-racial aesthetics for RT3D content creation. Digital humans, such as those produced using MetaHuman, embody calibrated forms of imperfection and calculated forms of diversity that are imagined as a source of humanisation. At the same time, digital humans embody a semiotic vacancy designed to be filled by the affects and intentions of their audiences (Miyake 2023). Race-making is a chaotic process, alchemised from the calculated and accidental, rupturing from the cracks between 'the relations of power and the power of social and cultural relations' (Robinson 2017, xii). The vacancy at the heart of MetaHuman presents a technoaesthetic opportunity for reframing diversity as a political imperative rather than a statistical abstraction.

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Notes

1 This analysis is contextualised by an event ethnography at the 2024 Game Developers Conference in San Francisco, which included roundtables, talks, and exhibits on digital human tools.
2 Although Aww has not publicised the software used to create its digital humans, the firm has declared that its work is supported by Epic's MegaGrant, a competitive grant awarded to smaller teams, solo developers, and innovators using Epic Games' technology.
3 The recorded panel was moderated by Seymour and featured Jerome Chen of Sony Pictures Imageworks, Amy Hennig of Skydance Media, Isaac Bratzel of Brud, and Vladimir Mastilović of Epic Games.
4 3Lateral has been noted as being highly secretive of their pipeline and capture rig (Statham 2018).
5 Epic Games' photogrammetry software application for users to create ultra-realistic 3D models from a set of images and/or laser scans is in fact called 'RealityCapture'.
6 A new release at the end of 2022 enabled MetaHuman Creator users to customise their digital humans in ways that go beyond their original constraints using a tool called the MetaHuman DNA Calibration Library (Unreal Engine 2022c).
7 The nesting of assets operates on multiple levels. Depending on how they are (re)packaged and (re)purposed, photogrammetry datasets are also understood as assets.
8 Future gains are subjected to licensing terms for MetaHuman Creator for projects using Unreal Engine. The details of partnerships between Universal Pictures and Epic Games for this project are beyond the scope of this chapter.
9 The Special Interest Group on Computer Graphics and Interactive Techniques (SIGGRAPH) conference is part of the Association for Computing Machinery.

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