

Polygonal Modeling: The Aestheticization of Identity

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ABSTRACT

Starting from the assumption that the skin is a complex organ that carries with it a depth and cultural history that cannot be easily understood, it follows that one must also come to reckon with the technologies that are used to represent skin in digital formats. By far, the dominant computational paradigm for representing 3D objects of any kind is “polygonal modeling”, a system which represents 3D objects as the combination of two things: a mesh and a texture, also known as a “skin”. This seemingly innocuous technological paradigm carries with it important ideological, political messages about identity and visual representation. I approach the analysis of these messages in three ways. First, I briefly examine the history of computer graphics, and polygonal modeling in particular, to show how the engineering values of efficiency and functionality ultimately drove and determined the development of polygonal modeling, and emphasize the cultural and critical reflection absent from that development. Next, I examine cultural practices surrounding 3D models in video games, specifically players skinning characters and the economy of skins, to show how the affordances of polygonal modeling as a paradigm lend themselves to the aestheticization and commodification of identity in digital spheres, advancing a neoliberal ideology that holds identity as an aesthetic commodity to be bought and sold. While it’s unlikely that this technology will radically transform in the near future, it’s important to identify, and reflect on, the assumptions that underlie it and the ideological effects it has. In doing so one can start to imagine new ways of interacting with it, or even start to imagine new technologies with new paradigms that govern them.

Keywords

Polygonal modeling, skins, computer graphics, identity, representation

INTRODUCTION

The fundamental paradigms and technologies that govern digital media often hide their political content behind assumptions that they are set in stone or “just the way that it works”. However, complex cultural issues like identity and representation are deeply tied to these technologies. As Jennifer Malkowski and TreaAndrea Russworm write, “...representation is not fully separate from the implicitly hard-core elements of games: it is achieved through and dependent on player and machine actions, on code, and on hardware, not just on surface-level images and sounds” (Malkowski & Russworm 2017, 3). This paper seeks to pursue this by focusing on one such infrastructural digital paradigm, ‘polygonal modeling’¹. Specifically, the paper is motivated by a deeply related paradigm called texture mapping, also known as ‘skinning’. Polygonal modeling is one of the fundamental technologies of 3D graphics: it is the process of creating a 3D object or character using the combination of a polygonal mesh and 2D texture. In most 3D video games and much CGI in movies, this system governs how 3D characters and objects are created and represented on screen. Following this, polygonal modeling therefore determines how

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characters' skins (as well as their clothes, facial expressions, and any other outwardly visible characteristics) are constructed and shown.

The skin is an extremely complex organ that reflects a combination of internal and external forces: it reflects the internal states of our bodies, and, through scars and other markings, bears traces of the movement of those bodies through the world. It is one, but not the only, prism through which some forces of oppression and privilege become assigned to individual bodies, and carries with it some the baggage of those historical assignments. Polygonal modeling, on the other hand, presents a very reductionist model of skins and bodies. This is not a neutral choice. What are the cultural and political implications of the current paradigm of polygonal modeling, and how do they affect creators of games and films and their audiences? With a critical reading of computer graphics history, as well as current practices surrounding video games and "skinning", one can begin to see some of the ways that the neoliberal ideology around identity, and the idea of the skin as a mere aesthetic, arise from an engineering culture of functionalism and efficiency, and are embedded into polygonal modeling as a technology. This paper hopes to serve as a reflection point for understanding what the values of polygonal modeling really are, and what effects they have on the world.

There has already been some writing on the intricacies of 3D modeling and specifically digital skinning. The 2006 essay collection *Re:skin*, edited by Mary Flanagan and Austin Booth, is one such work and it collects many essays on the subject of skinning. One commonality between the essays in that collection and this paper is that no paper on skinning can neglect a rumination on the complexity and depth of skin itself. In her essay for the collection, artist, architect, and scholar Alicia Imperiale writes,

"The skin is not a straightforward simple surface that covers our interiority. Rather, the skin is an organ, divided internally into differentiated and interpenetrating strata. The skin or the surface of the body is a surface of maximum interface and intensity, a space of flux, of oscillating conditions. The 'surface' is more slippery than it might first appear" (Imperiale 2006, 265).

The skin can't be taken at its face value; the skin can't simply be taken as an aesthetic condition of the body. It's porous, not flat. It's alive, not dead, not a coat of paint. As will be discussed later, polygonal modeling's treatment of the skin as a disjoint costume that is just "worn over" the body, and that can easily be exchanged with another, is one of its most problematic aspects. Artist, writer, and curator Melinda Rackham, in a separate essay, writes,

"Usually we think of ourselves as being like a peach—having a soft and squishy skin on the outside and a solid kernel-like core. There is something about ourselves that we see as intrinsically fixed, central, immovable. It's not our mushy and vulnerable brain, and it's not our intangible and ethereal soul. Perhaps this fixed point could be the pineal gland, a small lobe in the forebrain that, according to the Eastern perspective of the chakra system, governs the experience of self and reality, integrating the entire physical, emotional, mental,

and spiritual human experience. Or is this hardness more centrally located . . . lying beneath the rib cage in our heart, that strong muscle that pumps the animating fluid of blood through our vascular systems, bringing life and nourishment to the flesh?” (Rackham 2006, 51).

Our skin is also deeply related to our identity. One might stereotypically assume that their identity lies on the surface of their body, alongside their skin, but Rackham playfully complicates this. For her, taking the skin seriously means rejecting it as the sole source of identity, and refusing to let identity be reduced to a mere quality of the skin. If this reduction happens, and identity becomes aestheticized as a visual property of the skin, it facilitates a very superficial, dehumanizing dismissal and erasure of the important, and inconvenient, social and historical components of skin and identity.

It may be hard, at first, to see the digital technology of polygonal modeling as having anything to do with any metaphysical questions about identity and selfhood. Polygonal modeling may just seem like an anodyne tool with no particular values or ideology. As Mary Flanagan notes in her chapter of *Re:skin*, “Once we are faced with a paradigm, however, the underlying assumptions on which it is built become invisible” (Flanagan 2006, 307). We, the scholars of games and technology, have been faced with the paradigm of polygonal modeling, and these assumptions have become invisible. In order to make them more visible, we need to start questioning aspects of polygonal modeling that might seem obvious. To do that, I first want to explain in more detail what polygonal modeling is.

In the broadest sense, polygonal modeling is the paradigm that governs the representation of 3D characters or objects in films and video games. Any digital representation of a 3D thing uses polygonal modeling as a structuring system. This isn’t an authorial choice for the most part- while there are many kinds of software that aid in creating 3D models like Blender, Maya, ZBrush, and so on², all of them rely on polygonal modeling. At a basic level, there are two components to any 3D model made using this technology: the mesh, and the texture. The mesh is the shape of the character, composed of triangular planes called polygons. A mesh has no associated outward visual appearance, it is just a collection of triangles (which in turn are collections three points each in 3D space) that compose the shape of whatever thing the model represents. In many of the modeling programs I mentioned earlier, the mesh is represented with a default smooth, gray look similar to modeling clay to emphasize that it is incomplete and needs to be “painted on” (see Figure 1).

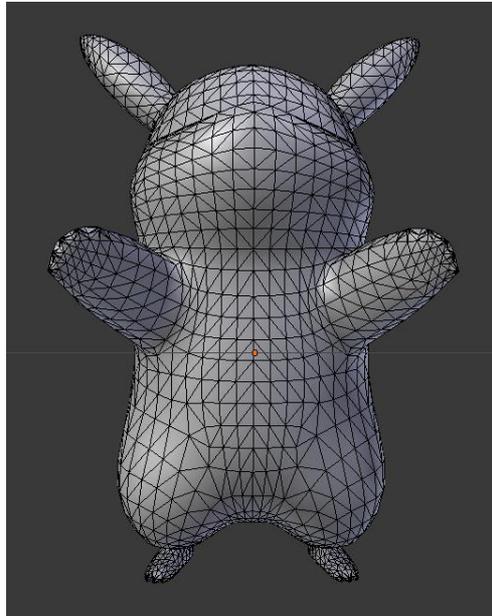
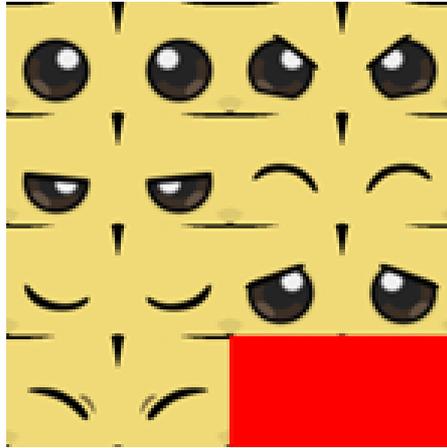


Figure 1: The mesh of Pikachu from *Pokémon X/Y* (Nintendo 2013)

This thing that meshes are “waiting for” is the texture. The texture is a 2D image, or multiple 2D images. They represent everything visual about the 3D character or object in question (see Figures 2 & 3). This is their skin, but also clothes, hair, etc. A texture determines the outward appearance of everything visual, except shape, which is determined by the mesh. In the key process of polygonal modeling, these textures become “mapped” to the mesh, essentially wrapping themselves around it so that the final product looks like a 3D character with skin and clothes. The result looks like a single cohesive character or object, but is really a mesh wrapped in textures. This process is called “texture mapping”, colloquially “skinning”. In contemporary polygonal modeling there are many other kinds of 2D images mapped onto the meshes (bump maps, UV maps, etc.) that determine other aspects of rendering, but for the purposes of this paper I will just focus on the visual textures³. Even in this simplified form, the whole process of polygonal modeling might seem baroque to those who aren’t familiar with computer graphics and 3D art. How did graphics technology get here? What were the values underpinning computer graphics that could lead to the rise of this particular paradigm?





Figures 2 & 3: Some of Pikachu's skins from *Pokémon X/Y* (2013)

HISTORY OF POLYGONAL MODELING

It's helpful to look back at the forces that shaped computer graphics, and specifically 3D modeling, to get a sense of the intellectual heritage that underpins it. This is a history not often told, and my retelling of it here is based off of my independent research of doctoral theses and other writing in the computer graphics field, as well as Jacob Gaboury's important interventions (Gaboury 2015) into the history of the computer image. Like many of the histories of computing technologies, the story of 3D computer graphics has been defined by institutional, corporate interests that privilege white, male voices while keeping others silent. A prime example of this is that most histories of computer graphics start at MIT, with Ivan Sutherland's "Sketchpad", one of the first examples of computer graphics. Then, Sutherland moves to the University of Utah, and much of the subsequent development of computer graphics takes place there. Soon, much of the cutting edge development in 3D graphics, on the modeling side, at least, would then move from the academy to the industry, to companies like Pixar and Industrial Light and Magic. During this time it became an essential tool in 3D arts and animation, including video games. Computer graphics was born as an engineering problem, to be used towards primarily engineering ends. As computer science developed as a discipline, even this justification fell away as technological iteration and development in that space became normalized. In other words, one of the main reasons for the current functionalist paradigm of polygonal modeling that exists today is as a result of the development and normalization of an engineering culture with little critical or cultural responsibilities. To see this in more detail, let's first examine Ivan Sutherland's "Sketchpad".

No matter how associated the usage of 3D graphics is with self-expression, creativity, and the arts today, it was conceived, developed, and understood from an engineering standpoint and thought of, and evaluated as, an engineering tool. Consider how Ivan Sutherland's 1963 "Sketchpad", a new program that could represent shapes and drawings on a computer screen programmatically, was justified. Sutherland writes of "Sketchpad" being primarily used for scientific diagrams, circuit simulation, and architectural drafting. All of these are rational, scientific uses, they are professionalized and industrial. It's only as an aside, in a 1963 conference paper on Sketchpad, that Sutherland mentions "Sketchpad need not be applied exclusively to engineering drawings" (Sutherland 1963, 343). As an example, he provides a drawing of a woman's head (who can be animated to wink) made in Sketchpad. He names it "Nefertite", which is a slight corruption of the name 'Nefertiti', the "Queen consort"

of Akhenaten, an Egyptian pharaoh (see Figure 4). White men creating the image of an Egyptian woman whose only ability is to flirtatiously wink has feminist and colonialist implications that underline an uncritical entitlement to the images and experiences of women and in this case people of color. It's a clear signal that gendered and racial oppression was not being taken into consideration in the creation of "Sketchpad".

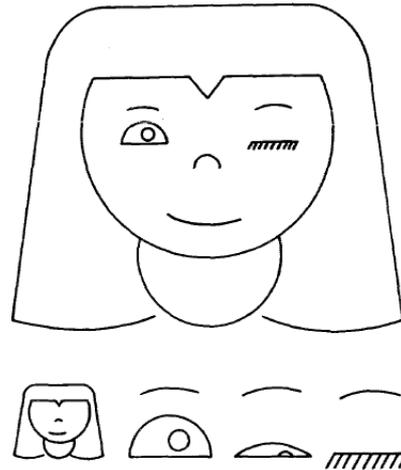


Figure 4: "Nefertite", from Sutherland 1963, 344

In addition, though, again notice the normalization of an engineering application in Sutherland's language: Sketchpad "need not be applied *exclusively to engineering drawings*" (Sutherland 1963, 343, emphasis my own). Even though contemporary computer graphics are used extensively for artmaking, this could not even be conceived of at the inception of computer graphics. This extends to other areas of computing as well, of course, as Mary Flanagan writes in *Re:skin*, "The object model [of programming design], for one, reinforces a rationalistic and deterministic view of problems and solutions, creating separations and hierarchies between and among discrete objects. This could be because of the way computer programming/system design disciplines have been institutionalized as an engineering or scientific field, rather than, for example, a creative arts field, which it most certainly can be" (Flanagan 2017, 318). When engineering as an institution imagines the uses of their labors to be for business or science, the most efficient and reproducible solutions will always be considered as the best. The most efficient and reproducible solutions also will be deployed in the service of optimizing mass production, and so also in the service of maximizing profit. This institutionalization into engineering, which in this sense is an institutionalization into capitalist rationalism, brings with it certain approaches to problem solving which have certain kinds of solutions and justifications. Without being reexamined or questioned, this solidifies into an orthodoxy of exploitative capitalist production that no longer needs justification.

Ten years later, under the supervision of Ivan Sutherland and others at the University of Utah, Ed Catmull, who would later go on to co-found Pixar, submitted his PhD dissertation on texture mapping. Texture mapping is the process in polygonal modeling where a skin is "wrapped" around the polygonal mesh. The most striking thing about reading this, especially in comparison with Ivan Sutherland's writing on Sketchpad, is how little justification is provided for the necessity of this new technique. Computing orthodoxy had solidified in the intervening years since "Sketchpad", and where Ivan Sutherland needed to provide reasons to want to

represent shapes, lines, and drawings on computers and argue for their importance, even if that importance was largely justified in the context of engineering, Ed Catmull was not under the same restrictions. His thesis doesn't explain why, just how. The extent of his justification is just one sentence from the first chapter of his thesis, "A motivation for the method is that we wish to produce high quality computer-generated images of surfaces and curved solid objects on a raster screen output device" (Catmull 1974, 1). It seems it was sufficient for the thesis that if the technique was possible to do, and achieved the nebulous criteria of 'high quality', then it was useful. In his thesis there was no ethical reflection, or critical analysis of his algorithms and formulae, they just were presented, because he had invented them and they worked. In a sense, functionality, efficiency, and accuracy *were* the highest ethics and values of engineering and so Catmull was appealing more to those than to other moral considerations. As such the potential ramifications of this technology along other ethical lines, like to that of representation, identity, commodification, and so on, were neglected.

Development in computing marches along this straight line, justified, if at all, through engineering, iterating and developing for a conservative idea of progress and future. Thought for alternatives is not provided. There's seemingly no space to image other futures in technological development. Polygonal modeling comes from this intellectual heritage, conspicuously lacking diverse creative force, locked into a dialogue with engineering values like efficiency and productivity, and relatively uncritically iterated on and advanced without reflection.

AFFORDANCES

Knowing more about the history of computer graphics and polygonal modeling puts us in a better position to ask: what kind of technology is polygonal modeling? One method of answering this question is to examine what are known as technological "affordances". For this essay, we can consider them as the things that a technology lends itself to, the things that using it makes easier to do. Importantly, as Adrienne Shaw notes in her 2017 essay "Encoding and Decoding Affordances", this is not to say that the technologies in question FORCE users to act out their affordances. Rather, they just represent what users are pushed towards, in what Shaw notes as an "imbrication of culture and technology" (Shaw 2017, 595). Using this concept to perform technological criticism, Shaw writes, "Technologies are not ideologically neutral in their design, in what types of interaction they allow or disallow. We can look at what uses (and users) are encoded into the design of interactive objects/texts" (Shaw 2017, 597). Following this provocation, we can ask these same questions of the affordances of polygonal modeling that she poses, "All interactive media technologies can be looked at in terms of what they allow users/audiences to do. What types of uses do they lend themselves to? What types of interaction do they encourage?" (Shaw 2017, 597).

The most obvious, and pertinent, affordance of polygonal modeling stems from the fact that the mesh and texture are separate. Their separation, reflecting the engineering principle of interchangeable parts, results in textures and meshes being easy to swap and change. For creators, and for users in situations where modeling files are accessible (like in many PC games), this affords a certain freedom to easily change and modify 3D characters on the level of their textures. This affordance only extends to textures, and not meshes, because textures are simpler to edit or create than meshes. Modifying textures requires no specialized software (any image editing program, like *Microsoft Paint*, will do), while meshes need specific knowledge and tools to modify.

This one affordance of one technology both enables and encourages a whole host of behaviors from consumers and users as well as companies and producers. By examining some of these behaviors, and examining what kinds of values and principles they rely on, I will illustrate how the technological or engineering principle of interchangeable parts, which is core to polygonal modeling, carries quite a bit of social and political values. But what are these values, and what kinds of behaviors do they afford? In order to see this, we'll look at two behaviors relating to polygonal modeling: player skinning and the economy of skins.

PLAYER SKINNING

In 3D video games, characters and objects are represented using polygonal modeling. This means that the meshes and textures used for those characters must exist somewhere in the code of the game, usually in files referred to as "assets". In so-called closed platforms, like a video game console (a *PlayStation*, *Xbox*, etc.), these assets are basically inaccessible to the user. They are obfuscated and hidden away. On a more open platform, like a PC, these assets are often accessible, living on a hard drive in just the same way as any other file on a computer. Because they are accessible, and because they are easy to modify, users often take these polygonal modeling assets and edit or fully remake the textures in the image of their choosing. For the purposes of this paper I will refer to this practice as "player skinning", to distinguish it from the skinning that the game artists of 3D assets do in the initial creation of those assets. That is to say, game creators skin characters the first time, and then "player skinning" is when players skin them again once they have the game.

Player skinning is a popular subset of the video game modding community- players will create skins and then upload them for others to download and install on their own computers. To see the popularity of this, one can look at the 2011 phenomenon *Minecraft* (Mojang 2011), which highly encourages and facilitates skinning. A quick survey of the fansite *Planet Minecraft* shows, at the time of writing, a total count of 1,205,751 skins available to download. For perspective, that's approximately 344 skins per day from *Minecraft's* release until today uploaded to just this one website. In addition, the ability for players to customize their own character, or other characters, is considered to be an extremely important feature of video games and is well studied in video game studies.

One reason for this is because it facilitates an identification with the characters, and as games scholar James Paul Gee writes, "[The play of real world, virtual, and imagined future identities] transcends identification with characters in novels or movies, for instance, because it is both active (the player actively does things) and reflexive, in the sense that once the player has made some choices about the virtual character, the virtual character is now developed in a way that sets certain parameters about what the player can do" (Gee 2004, 58). Because the player's character can both act in the game world, and be reacted to in the game world, Gee argues their identification with that character is that much deeper, or even "transcendent". Gee does not argue that a player needs to actually customize the character they are playing as for this identification to occur. However, player skinning, as an extension of character customization, allows for a deepening of this kind of "transcendent" identification, and accordingly has demanded a certain amount of serious attention from Gee and other games scholars⁴. In this literature, player skinning is usually portrayed in a positive light due to, as Gee later argues, its ability to facilitate learning and foster empathy through the connection between the creator/player and the creation/virtual avatar. While I don't dispute that there are definite positive cultural benefits to player skinning, reading the practice through the lens of polygonal modeling and its affordances can give a differing, less positive and less studied view.

I want to underline just how low the barrier is to installing a skin in a game. It is simple enough that players without a high level of technical sophistication can still install and use skins. Some games, like *Minecraft* or *Skyrim* (Bethesda 2011), have built in systems to install and manage skins automatically, but for other games the process is roughly as follows: first, you download a skin from a website, usually these come as compressed archives that need to be unzipped. These archives will contain a README file which explains what directory that skin needs to be placed in. After navigating to that directory, the skin files are copied over and replace whatever files were originally there. On loading the game next, the skins will be active. Installing a skin is usually simply a process of dragging files from one folder to another.

So, players are able to easily create skins because textures are separate from models, and textures are easy to edit and easy to install, but what are some of the qualities of skinning? What does it allow players to accomplish? One common positive interpretation is that player skinning opens up new forms of player-driven resistance to oppressive or otherwise harmful functioning of games and digital media. Hanna Wirman, in her 2011 PhD dissertation, explores this idea in the context of the game *The Sims 2* (Maxis 2004). She writes on this reading of skinning in game studies as a discipline, “In addition to feminist studies on game modifying, also in the broader context of Game Studies skinning is generally understood as the player’s way to subvert the game artifact and therefore as a way of being resistant” (Wirman 2011, 111). This can be seen as an almost physical (or digital) version of Stuart Hall’s oppositional reading⁵: if players don’t like the way a game is representing their character or any character, through player skinning they can literally change the way the game presents itself on screen. However, this positive outlook is a reading that is only somewhat corroborated by Wirman’s research. There are people who Wirman interviewed who do take pleasure in, and purposefully do, subvert the traditional functioning of *The Sims 2*: “One of the participants, for example, is very proud of an acne face she has created. She mentions that is it interesting to fight back the ‘perfect’ game characters with such skins” (Wirman 2011, 178). However, there are also many player skimmers who just seek to produce “quality” skins, without an attempt to subvert the game itself, “Most of the players I researched do not create skins that would break the consumerist, suburban settings and ideology of the game, but clothes with different patterns and items with everyday looks instead” (Wirman 2011, 176). There exists a kind of potential for resistance, but the reality is that through player skinning games are often reified and their ideology strengthened, rather than resisted. Players make skins for games by trying to make ones that integrate seamlessly into the machine of the game, giving it strength as an organizational system. When identity is reduced to a texture, it becomes aestheticized. It makes sense that the consumerist and neoliberal ideologies that underline AAA games would benefit and support an aestheticization of identity. It’s not impossible to perform resistant action using these games, but it requires more than the ability to skin them alone.

The ease of skinning games enables not just potentially resistant or reifying behavior, but also the regressive. One of the more understudied aspects of player skinning are the skins that undo racial, gender, or body diversity in games by replacing those diverse skins with homogenous, thin, white, “sexy” ones. There are people who have inserted neo-Nazi skins in *Counter Strike* (Valve 2000), letting you play as white supremacist figures or change your enemies to ethnic minorities (Khosravi 2017). There are also mods that involve, in the mods’ own words, “cleaning” women’s faces in games like *Skyrim* or *Fallout 4* (Bethesda 2015) which usually involve whitening and modifying characters to fit traditional Western ideals of beauty (Feldman 2015). A simple search on a popular mods site for the keyword “sexy” will turn up hundreds of mods designed to make female characters more stereotypically sexually desirable to a presumed straight, white, man (see Figure 5). The fact that skins are easy to

replace enables, and to an extent, encourages, this kind of far right, sexist, behavior. When a skin is easy to change, when identity and visual representation are seen just as an aesthetic, it's not surprising that players would feel entitled to change them in accordance with their own beliefs about how people should look. As the writers in the introduction to this paper make clear, there's extreme depth and complexity located in the skin, and these regressive skinning practices use polygonal modeling's elision of that to enact their racist, sexist, agenda.

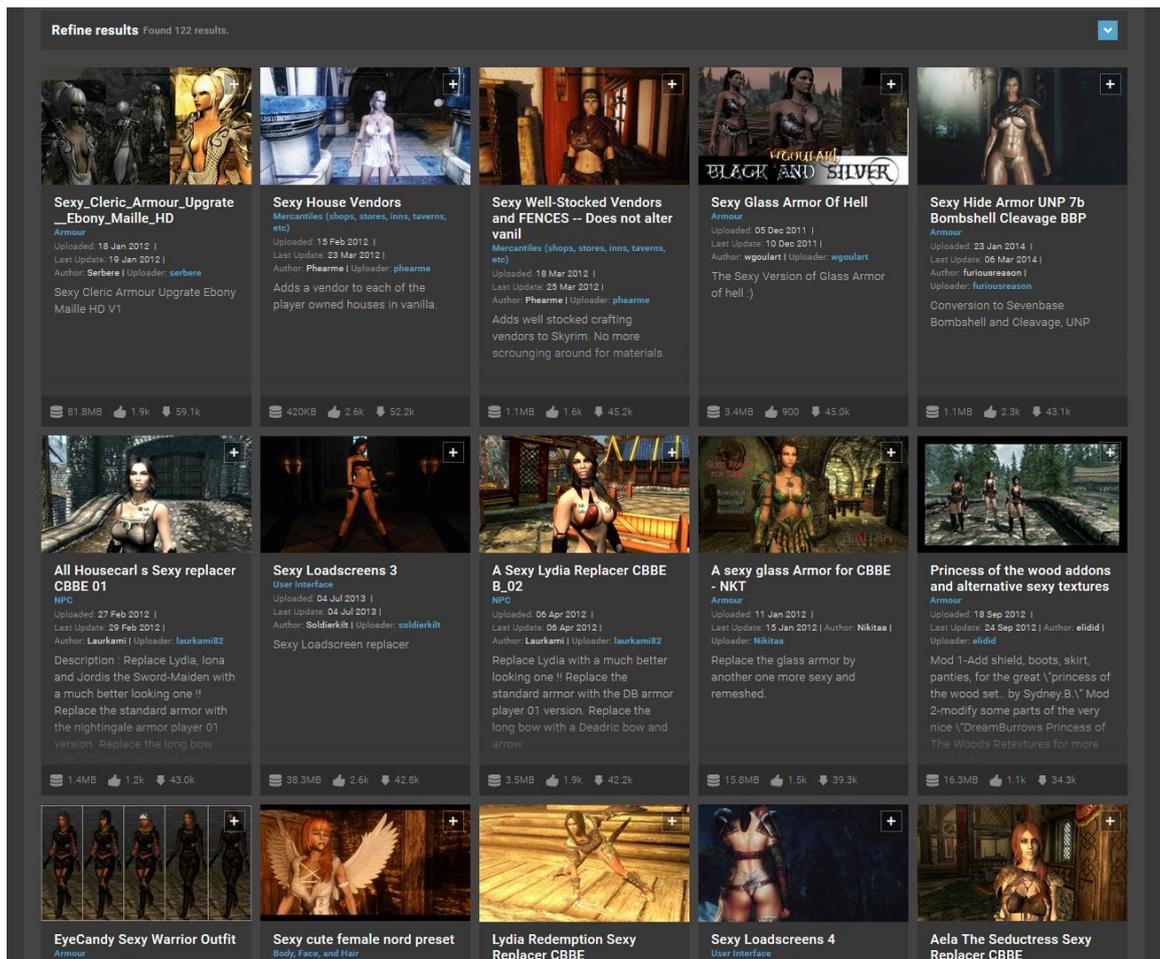


Figure 5: A selection of “sexy” mods for *Skyrim* from *Nexus Mods*

In their chapter of *Understanding Digital Games*, Seth Giddings and Helen Kennedy are optimistic about the possibilities of player skinning allowing a sort of upwards consumer mobility for those who participate in the practice. They write, “A particularly adept skinner may eventually see their skins being included in the range of characters on offer to other players through online communities and may receive prizes and acclaim for their art” (Giddings & Kennedy 2006, 134). They also chronicle the story of Camilla Bennett, a former player skinner who later found a job as a texture artist in the games industry. *Understanding Digital Games* was released in 2006, and now such an analysis of skinning seems quaint- the distinction between consumer and producer has indeed become blurred, but the economy of skinning has instead devalued the producer, creating a class of ‘producers’, and locked others into precarious per-skin based funding models⁶. Game companies benefit from this, and other, aspects of the new skin economy.

THE SKIN ECONOMY

While players can often change the assets in PC games, these assets are restricted to the computer that the game is installed on. In an age of multiplayer games, these are called “local assets”. For a game with a multiplayer component, where one player is interacting with many online, changing skins locally will not have any effect on what all those other players see. You might change your assets, your own skins, but in a multiplayer setting, nobody else will see those changes. Their own local assets would take precedence. In fact, they can much more easily change how other people appear to them than change how they appear to others! To get around this, players of some games like *Quake* (id Software 1996) would send around packs of skins⁷, so that everyone would have the same local assets and could see each other’s skins online. This model was obviously very cumbersome, and has since fallen out of favor with the rise of the commodification of skins.

Because multiplayer games function as intermediaries for the different players using them, and because textures are very interchangeable, companies slowly began experimenting with different profit-driven models for deploying skins. In games like Valve’s *Team Fortress 2* (Valve 2007), skins began to be associated with rarity, and would “drop” for a player as they played a game. It was possible to buy skins directly from Valve, but some things were only obtainable through random chance. Because of the rarity of skins, and the Valve establishing the ability to trade them, a trading market emerged around trading skins and other digital commodities, which then would sometimes be converted into straight money. Valve then implemented a “community market”, to profit from the transactions that were happening anyway, and so the digital skin economy around *Team Fortress 2*, and some other Valve games like *Counter Strike: Global Offensive* (Valve 2012) and *Dota 2* (Valve 2013), found an institutional backing. Other games, like Epic Game’s *Fortnite* (Epic Games 2017), allow people to subscribe to a “battle pass”, which periodically releases skins, and in addition allows them to be purchased directly from the company itself. Because an economy has formed with a marketplace, exploitative practices, like scams and hustling, have proliferated. For example, in Valve’s skin economy, it is speculated that money from credit card fraud has been laundered through the service through the buying and selling of digital goods. In just one day in 2012, almost 12,500 dollars of suspicious money was moved through the service (Bowman 2014). In addition, there has been the development of skin gambling, where people will wager in-game skins on poker games or on the results of an esports match. Because this gambling exists outside of mainstream economic practices it has largely been unregulated, and has been under fire for the participation of players who would otherwise be too young to gamble. However, this state of affairs will most likely not last for too much longer, as the legal status of skin gambling has been the subject of recent scholarly debate (Hardenstein 2017, McLeod 2017). These markets are sustained by the aestheticizing of texture and skin that comes from the structure of polygonal modeling. Because they’re aestheticized, they can be easily commodified like any other aesthetic good, and their commodification has led to the rise of these unregulated markets.

The market imperatives underlying the contemporary form and function of the internet may seem to make such markets of identity inevitable. As Mendi and Keith Obadike explore in their 2001 net art piece “Blackness for Sale”, where they attempted to sell Keith Obadike’s blackness in an *eBay* auction, the internet has created spaces for the buying and selling of anything, agnostic of content, and has rendered identity as a particularly lucrative commodity. I would argue that the economy of skins did not have to be this way if the underlying paradigm that it relies on, polygonal modeling, was structured differently. If textures were not so easy to replace, and therefore easy to control and commodify, these kinds of markets would

not have been able to form in the first place. It's worth now taking a step back and considering, with these two practices in mind, what kinds of values can be associated with polygonal modeling as a technological paradigm.

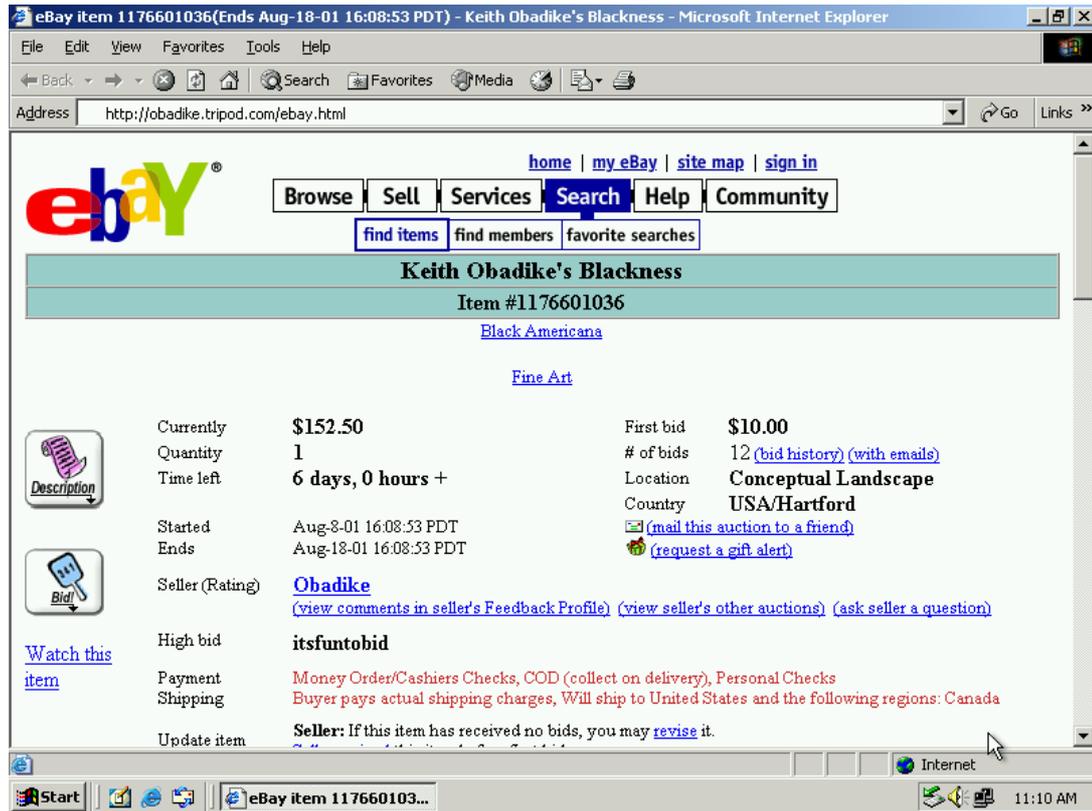


Figure 7: “Blackness for Sale” by Mendi & Keith Obadike, image from *Rhizome.org*

One thing referenced multiple times in the previous two sections is the way that polygonal modeling aids in the aestheticizing of identity. How one looks is just a costume (just a texture) in the structure of polygonal modeling, and that costume can be easily replaced. This is the foundation of how player skinning functions. The established depth and complexity of skin is eradicated in this conceptualization. Again, there is a neoliberal identity politic at play here- the idea that a skin is not reflective of a material, cultural, or historical situation but just an incidental visual trait that is free to be replaced, bought, and sold. This orientation is reliant on the erasure of those historical, cultural circumstances and is problematic for that reason. By the exact same mechanism, though, the aestheticization of identity also allows for a greater latitude in expression in the digital world. People who might feel trapped by their social or historical situation can find themselves open to trying different kinds of identities or building hybrid identities both for themselves and for the other characters they might engage with in digital games. A certain kind of posthuman worldbuilding is unlocked when players have the ability to “repaint” the world in the way that they see fit, something obviously not (easily) possible in the world at large. This is the dream of the early internet: you can, at least theoretically, be whoever, or whatever, you want to be digitally. It's important to also emphasize, though, that the ability to reshape the digital world is still limited in the realm of polygonal modeling. While textures are easy to change, meshes are not. It's easy to change a characters skin tone, or clothing color, but to change the way they walk, or the shape of their body, or so that they use a wheelchair would be much more difficult.

Another very important thing to examine is how this aestheticization lends itself to a system of controlled commodification by big game companies and distributors. The way that Helen Kennedy and Seth Giddings hoped to see skimmers being supported and pulled up into the games industry has backfired. Now, game companies buy skins from individual creators on a skin-to-skin basis, leaving their finances precarious and unsustainable, and go on to resell those skins as part of their big multiplayer games, which function more and more like platforms. The current paradigm of polygonal modeling has thus become concretized in industry not just because its current functioning is an unquestioned norm, though that surely contributes, but also because to change polygonal modeling in a fundamental way would involve the loss of hundreds of thousands of dollars in potential revenue to the companies that use it the most. In fact, whole funding models for certain games, like *Fortnite*'s item shop and battle pass, would be completely eradicated. What was once an unquestioned engineering decision now has the weight of huge corporate industries pushing down on top of it, further entrenching the system and preventing it from changing.

CONCLUSION

The skin is a complex, dynamic organ that constantly shifts, scars, and otherwise bears traces of the lives we lead in the world. We have, without much reflection, developed and then normalized a digital paradigm for representing bodies and skins that has tremendous information loss between the thing it represents and the thing that it is. Of course, this is true of so many artistic mediums, a painting of a human subject is still just paint, just like a polygonal model of a human subject is just texture and mesh. What makes polygonal modeling different, as I hope I've shown, is its mutability- everything about a polygonal model can be swapped out, changed, and in many cases, bought and sold. Polygonal modeling directly encodes a very political and ideological neoliberal orientation towards identity, specifically visual identity, but it's so normalized and operationalized that it's hard to actually see that it's there.

The primary thing I hope to accomplish with this essay is to show that polygonal modeling has embedded ideology and values, and that the embedded ideology and values have ramifications on the world due to the affordances they create. This is hopefully shown through the sections on interchangeable parts, the efficiency of engineering, and the aestheticization of identity, as well as the examples of skinning-related practices in the world including player skinning and the skin economy. It would have been, and still is, possible to have a different kind of 3D modeling system, with different values, ideology, and affordances. It's my hope that by having more of an awareness of where polygonal modeling comes from and what polygonal modeling affords more care and thought can be taken in order to build digital artifacts that are responsive to these traits, instead of mostly taking them for granted as we have for years.

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ENDNOTES

¹ In some cases, "polygonal modeling" just refers to the construction of the polygonal mesh, but in this paper I will use it to refer to the process of creating both mesh and texture.

² An expanded but incomplete list: 3D Crafter, 3D Slash, 3ds Max, Blender, Fusion360, MagicaVoxel, Maya, Meshmixer, Onshape, Sculptris, SketchUp, Solidworks, Tinkercad, VoxelBuilder, ZBrush.

³ Bump mapping can draw bumps and wrinkles, displacement mapping can create ridges or indentations, reflection mapping approximates a reflective surface, mipmapping aids in drawing objects at a distance, and so on.

⁴ For examples of this, see the work of scholars Mary Flanagan, Fox Harrell, or Adrienne Shaw on identification and avatars.

⁵ For more on oppositional reading, and encoding/decoding in general, see "Encoding/Decoding" in Hall, Stuart, Dorothy Hobson, Andrew Lowe, and Paul Willis, eds. *Culture, Media, Language: Working Papers in Cultural Studies, 1972 - 79*. London: Routledge, 2006.

⁶ Nowhere is this more apparent than the video game company Valve and its deteriorating relationship with its cosmetics creators, detailed here: <https://www.polygon.com/2017/4/1/15129600/valve-has-cut-dota-2-royalties-and-workshop-creators-are-crying-foul> and here: <https://compete.kotaku.com/dota-2-skin-creators-say-valve-is-ripping-them-off-1793889486>.

⁷ See *The Skin Factory* website for more info: <https://www.quakewiki.net/archives/factory/usingqw.html>.