open source afro hair library

A.M. Darke

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Founder, Open Source Afro Hair Library

open source afro hair library

More Than Killmonger Locs

a style guide to Black Hair (in computer graphics)

SIGGRAPH Courses 2024

Fighting-Games Daily
@FGC_Daily

IT'S JOEVER, TEKKEN HAS FALLEN
Eddy Gordo has that overused braided haircut😭

2:44 PM · Jan 14, 2024

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Eddy Gordo has that overused braided haircut😭

2:44 PM · Jan 14, 2024

BLACK PANTHER PRINCE OF PERSIA: THE LOST CROWN SPIDER-MAN 2 TALES OF KENZERA: ZAU TEKKEN 8

The 'Killmonger Cut' Is Everywhere In Games, Here's Why the Industry Needs to Fix This

Black video game characters are being reduced to a single template.

BY TRONE DOWD | POSTED: FEB 28, 2024 9:00 AM

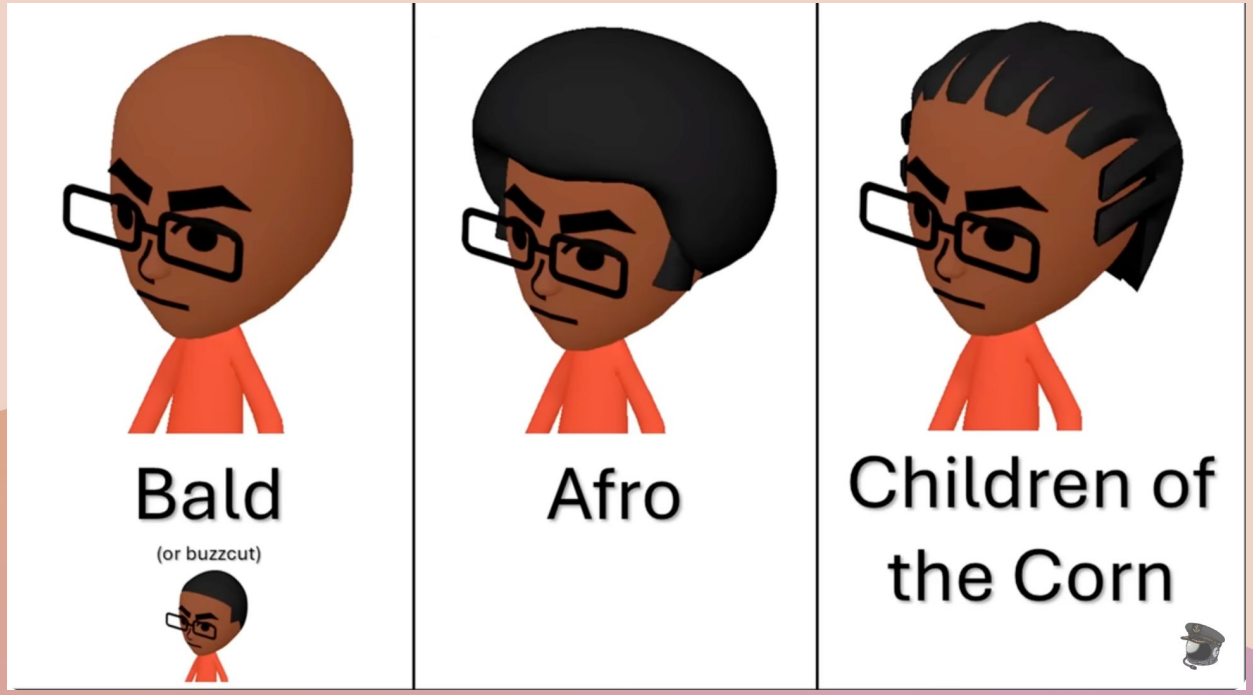
The 'Killmonger Cut' Is Everywhere In Games, Here's Why the Industry Needs to Fix This - IGN

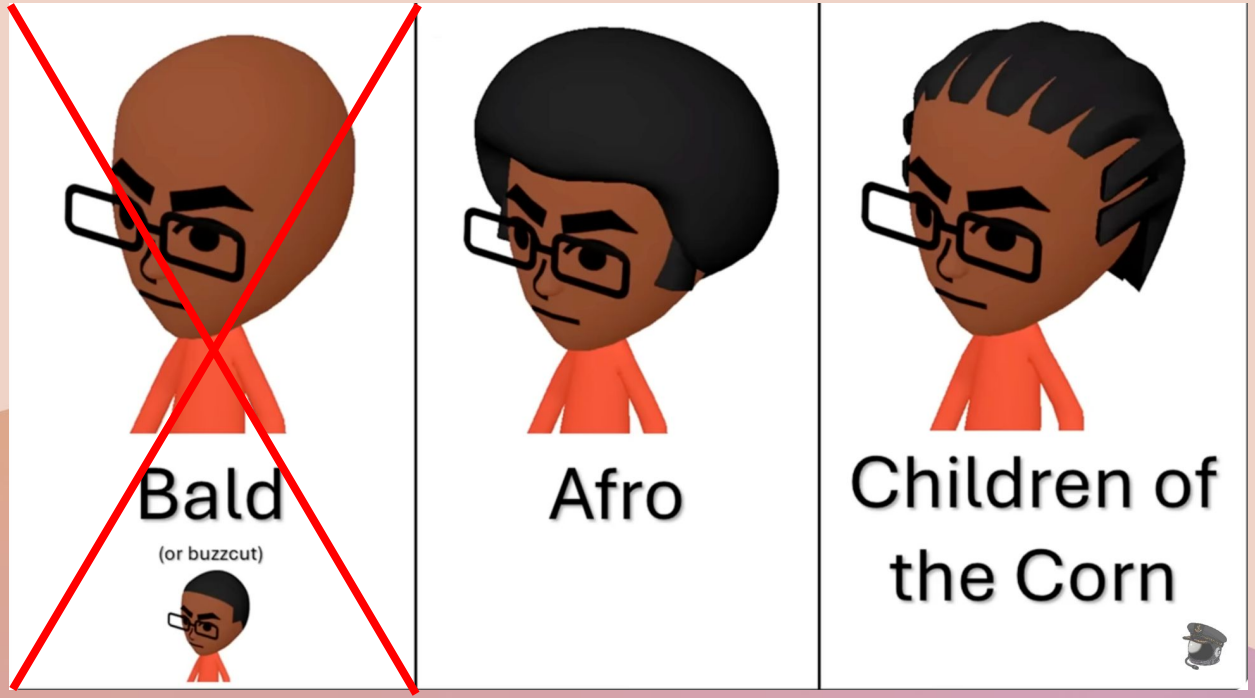
What was the state of Black Hair in games *before* the Killmonger Cut?

Black Hair in Video Games is Terrible.

–VICE News (2022)

https://www.vice.com/en/article/5dgdwz/black-hair-in-video-games


Bald
(or buzzcut)
Afro
Children of the Corn

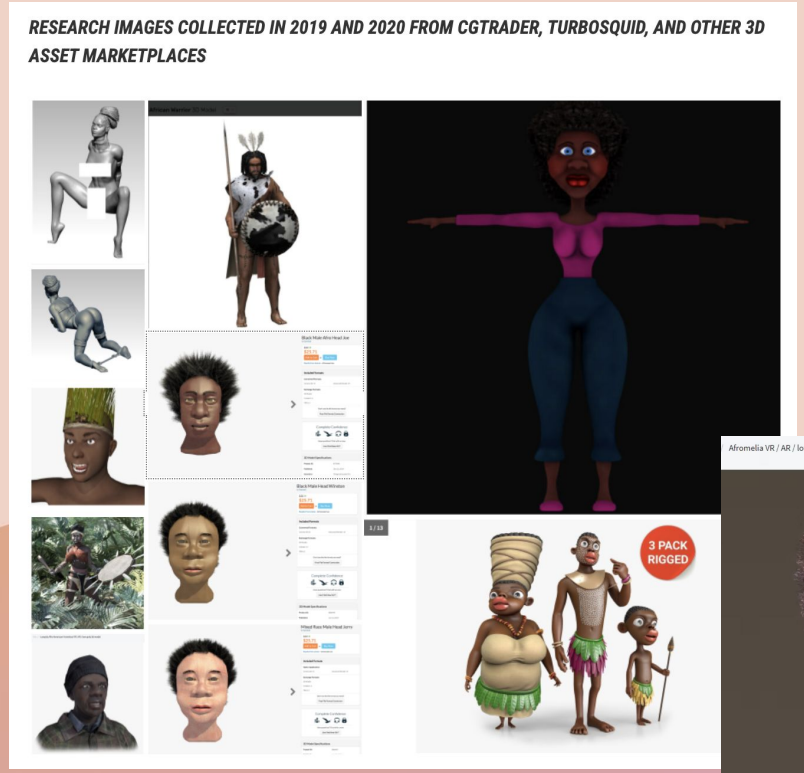


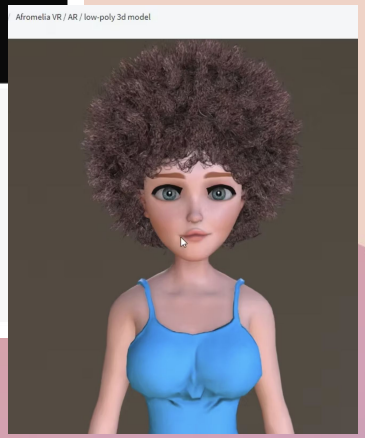
are we really counting ‘bald’ as a style?


Bald
(or buzzcut)
Afro
Children of the Corn
Dreadful Locks

The Black Hair in Games Trifecta

Afros | Cornrows | Dreadlocks





Popular marketplaces weren't any better.

Black Hair in Popular 3D Marketplaces – A.M. Darke (2020)

It makes sense that games would look to film for inspiration.

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Story from BEAUTY >

Black Actors Are Getting Huge Roles In Hollywood, But Still Doing Their Own Hair

In film and TV, hair and makeup comes with the gig. So why must Black actors provide their own?

AIMEE SIMEON

JULY 26, 2019, 2:20 PM

Or does it? 🤷

teenVOGUE

STYLE POLITICS CULTURE IDENTITY VIDEO SUMMIT SHOPPING

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The Washington Post
Democracy Dies in Darkness

Hollywood actors hope to curtail hair horror stories

SAG-AFTRA's new hair equity rules are long overdue, say Black actors who've struggled to find qualified beauty professionals on set. "I actually convinced them to let me shave my head," one said.

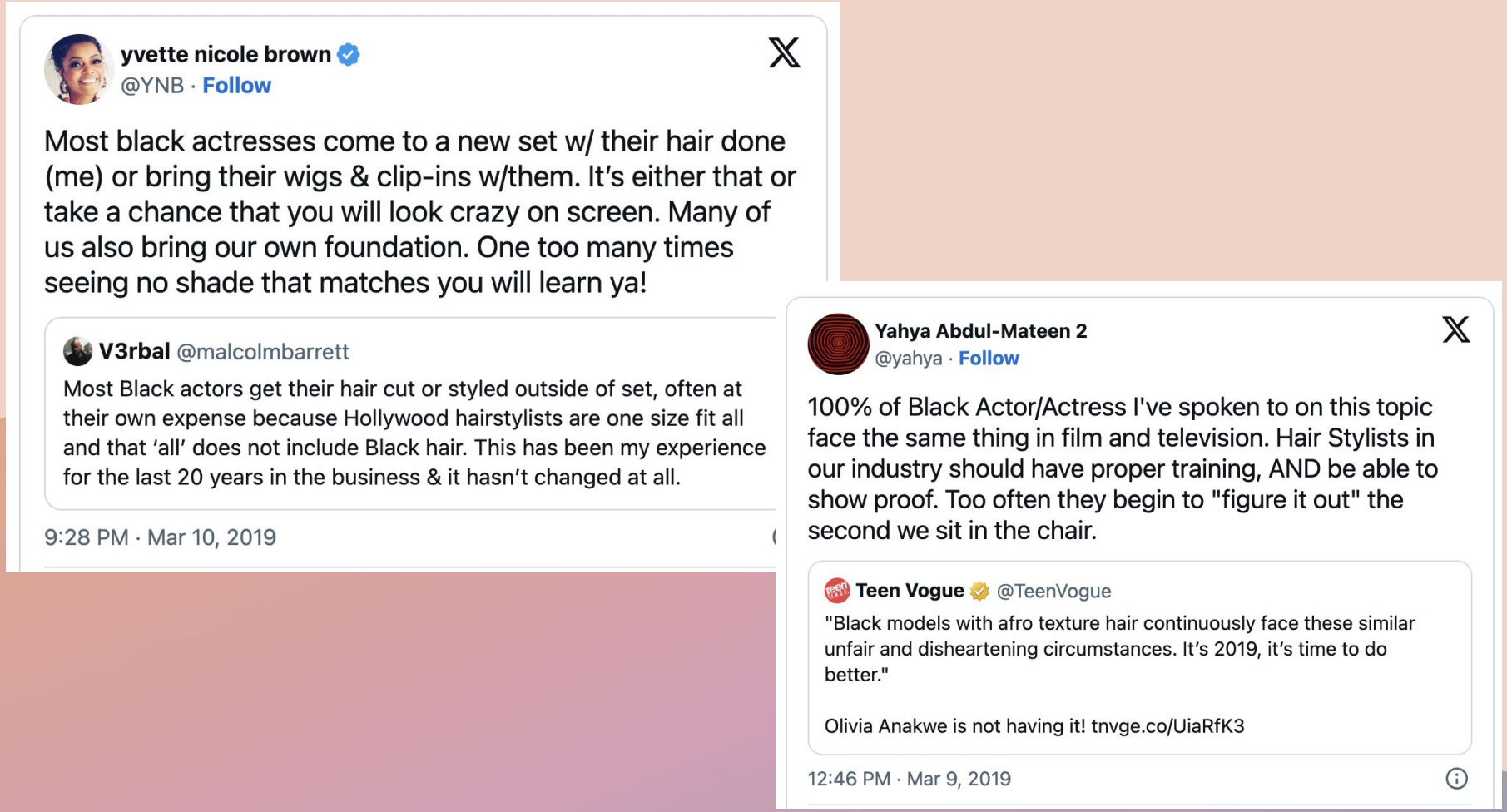
Hair

Why Is Black Hair Still an Afterthought in Hollywood?

Arriving on set hair-ready shouldn't be a typical experience.

BY SHAMA NASINDE

FEBRUARY 24, 2021


yvette nicole brown
@YNB · Follow
Most black actresses come to a new set w/ their hair done (me) or bring their wigs & clip-ins w/them. It's either that or take a chance that you will look crazy on screen. Many of us also bring our own foundation. One too many times seeing no shade that matches you will learn ya!
V3rbal @malcolmbarrett
Most Black actors get their hair cut or styled outside of set, often at their own expense because Hollywood hairstylists are one size fit all and that 'all' does not include Black hair. This has been my experience for the last 20 years in the business & it hasn't changed at all.
9:28 PM · Mar 10, 2019
Yahya Abdul-Mateen 2
@yahya · Follow
100% of Black Actor/Actress I've spoken to on this topic face the same thing in film and television. Hair Stylists in our industry should have proper training, AND be able to show proof. Too often they begin to "figure it out" the second we sit in the chair.
Teen Vogue @TeenVogue
"Black models with afro texture hair continuously face these similar unfair and disheartening circumstances. It's 2019, it's time to do better."
Olivia Anakwe is not having it! tnvge.co/UiaRfK3
12:46 PM · Mar 9, 2019

Gabrielle Union
@itsgabrielleu · **Follow**

The pressure to "just be happy they picked you & you got a job, don't ask for the SAME things every other actor/model gets on GP..." Listen, if u stay quiet, u WILL have bald spots, hair damage, look NUTS (tho they will tell u its cuuuuuuuuute 🥲)

> **Natasha Rothwell** @natasharothwell
>
> PSA: If you cast a POC— And thank you for doing so!—you also have to hire someone who knows how to do ethnic hair. Not someone who's "comfortable with it" but someone who actually knows how to style ethnic hair types.
>
> Congratulations on advancing to the next level of inclusion!

11:48 AM · Mar 11, 2019

Gabby Sidibe
@GabbySidibe · **Follow**

Replying to @YNB

If they don't have the budget to hire a black hairstylist for me, or won't, I just get the director to agree that my character should have box braids or senegalese twist.

3:44 PM · Mar 11, 2019

The same issues around Black Hair in games exists in film.

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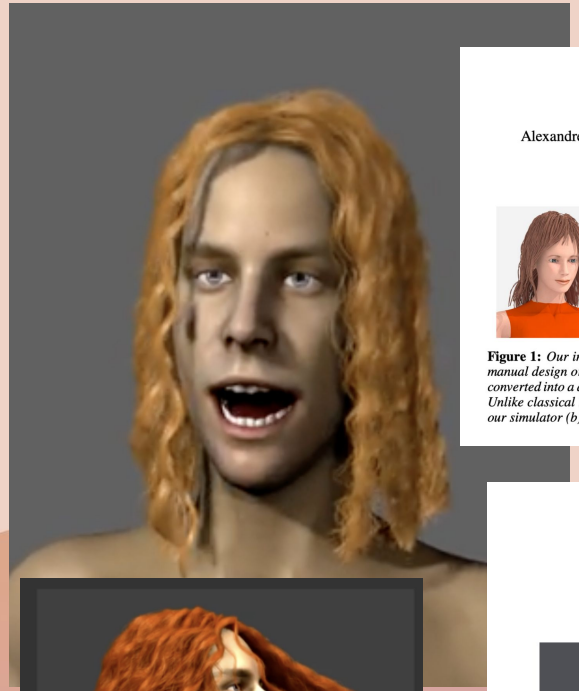
Black Hair in CG

How does it show up in the research?

1. There have been no papers on afro-textured hair at SIGGRAPH ever.



Inverse Dynamic Hair Modeling with Frictional Contact

Alexandre Derouet-Jourdan Florence Bertails-Descoubes Gilles Daviet Joëlle Thol

INRIA and Laboratoire Jean Kuntzmann (Grenoble University, CNRS), France*

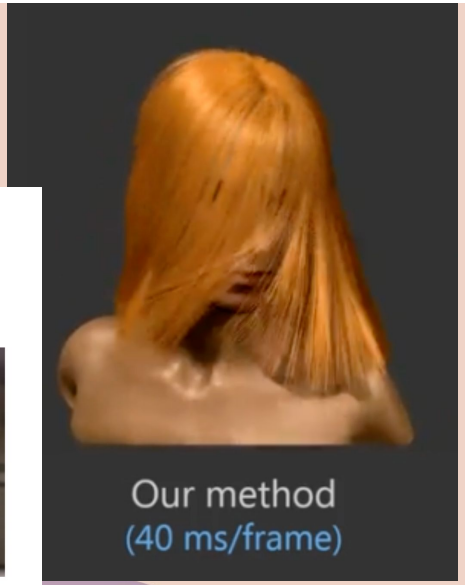
Figure 1: *Our inversion method makes the hair synthesis pipeline consistent: (a) Raw hair geometry (a set of polylines) resulting from the manual design or the automatic capture of a static hairstyle (here, a capture from [Herrera et al. 2012]); (b) Input geometry is automatically converted into a dynamic hair model (a set of super-helices) at equilibrium under gravity and frictional hair-body and hair-hair contact forces; Unlike classical hair simulators (c) which ignore surrounding forces when initializing the hairstyle and are thus prone to undesired sagging, our simulator (b) exactly matches the original hair geometry at initial state and (d) yields a realistic, character-specific hair animation.*

Efficient Implementation of the Dual Scattering Model in RenderMan

Iman Sadeghi*
Walt Disney Animation Studios
University of California, San Diego

Rasmus Tamstorf†
Walt Disney Animation Studios

Figure 1: *Some early rendering results based on the dual scattering implementation presented in this report.*



Importance Sampling for Physically-Based Hair Fiber Models

Eugene d'Eon[1] Steve Marschner[2] Johannes Hanika[1]
[1]Weta Digital [2]Cornell University

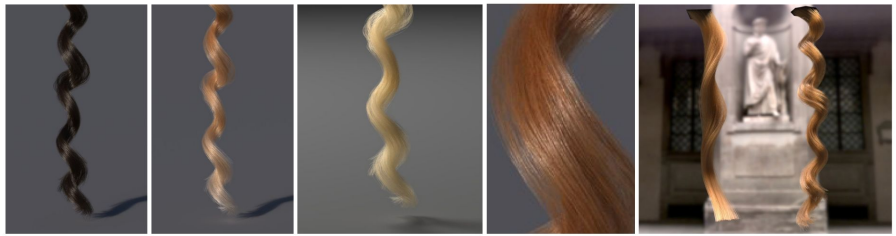


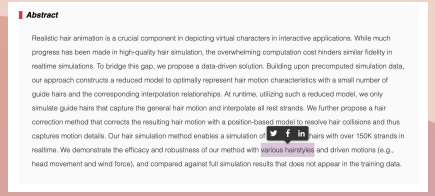
Figure 1: *Our new importance sampling strategy allows easy inclusion of Marschner and related hair reflectance functions in physically-based Monte Carlo renderers. Here we show hair volumes illuminated by environment maps and area lights with unbiased global illumination (computed using a forward path-tracer with multiple importance sampling). Our sampling strategy requires no precomputation, so it is easy to vary the absorption along the fiber (second image), and to add noise to the index of refraction, roughness, and scale tilt to create subtle heterogeneity along each fiber. Each image is 1024 samples/pixel.*

2. European hair is considered diverse despite little differentiation in style.

mesh shaders to carefully distribute the computation and a custom texture layout for offloading a part of the computation to the hardware texture units. We also present a set of procedural styling operations to achieve hair strand variations for a wide range of hairstyles and a consistent coordinate-frame generation approach to attach these variations to an animating/deforming hair mesh.

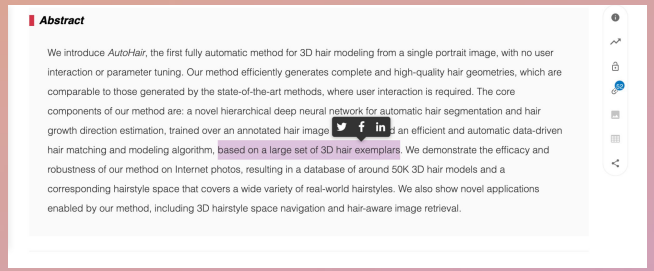
It’s also considered representative.

To confirm the model’s predictions, new scattering measurements of fibers from a wide range of hair types were made, using a new measurement device that provides a more complete and detailed picture of the light scattered by fibers than was previously possible. The measurements show features that conclusively match the model’s predictions, but they also contain an ideal-specular forward-scattering behavior that is not predicted and has not been fully described before.



Abstract

Realistic hair animation is a crucial component in depicting virtual characters in interactive applications. While much progress has been made in high-quality hair simulation, the overwhelming computation cost hinders similar fidelity in realtime simulations. To bridge this gap, we propose a data-driven solution. Building upon precomputed simulation data, our approach constructs a reduced model to optimally represent hair motion characteristics with a small number of guide hairs and the corresponding interpolation relationships. At runtime, utilizing such a reduced model, we only simulate guide hairs that capture the general hair motion and interpolate all rest strands. We further propose a hair correction method that corrects the resulting hair motion with a position-based model to resolve hair collisions and thus captures motion details. Our hair simulation method enables a simulation of [illegible] hairs with over 150K strands in realtime. We demonstrate the efficacy and robustness of our method with various hairstyles and driven motions (e.g., head movement and wind force), and compared against full simulation results that does not appear in the training data.



Abstract

We introduce *AutoHair*, the first fully automatic method for 3D hair modeling from a single portrait image, with no user interaction or parameter tuning. Our method efficiently generates complete and high-quality hair geometries, which are comparable to those generated by the state-of-the-art methods, where user interaction is required. The core components of our method are: a novel hierarchical deep neural network for automatic hair segmentation and hair growth direction estimation, trained over an annotated hair image database; and an efficient and automatic data-driven hair matching and modeling algorithm, based on a large set of 3D hair exemplars. We demonstrate the efficacy and robustness of our method on Internet photos, resulting in a database of around 50K 3D hair models and a corresponding hairstyle space that covers a wide variety of real-world hairstyles. We also show novel applications enabled by our method, including 3D hairstyle space navigation and hair-aware image retrieval.

2. From individual strands to a full head of hair: elements of methodology

Most hair models proposed up to now use a specific methodology to cope with the complexity of hair, in terms of the number of strands: they simulate, at each time step, the motion of a relatively small number of **guide strands** (typically, a few hundreds), and use either interpolation or approximation to add more strands at the rendering stage. See Figure 1. More precisely, three strategies car be used for generalizing a set of guide strands to a full head of hair :

1. Using the hypothesis that hair is a continuous set of strands, one can interpolate between three guide strands which are neighbours of the scalp; this works well for straight, regular hair styles;

2. One can on the opposite add extra stands around each guide strand to form a set of independent wisps; This has proved successful for curly hair for which hair clustering is more relevant;

3. A hybrid strategy, which consists in interpolating between guide strands near the scalp while extrapolating to generate wisps at the bottom of hair, was introduced recently [BAC+06]. This has the advantage of capturing the aspect of any type of hair.

Using this methodology, the main challenges in terms of animation are to find good models for animating individual strands, and then modify their dynamics to take into account the interactions that would take place in the corresponding full head of hair.

Figure 10: *Different hair meshes and hairstyles generated from them, rendered using our method without LOD and with 8× MSAA. All hair models have 100 thousand hair strands and take 1 ms to rasterize, except for (e), which takes 1.8 ms. The hair mesh resolutions and the storage costs of the 5 textures we use for representing each of them are (a-b) 185 vertices/13 KB, (c) 477 vertices/34 KB, (d) 7892 vertices/563 KB, (e) 1316 vertices/94 KB, and (f) 3236 vertices/231 KB.*

This is not a wide range of styles.

3. Curly hair in graphics research is limited to “classical European locks”

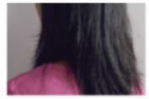
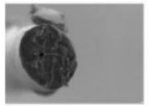
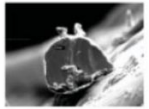
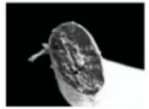
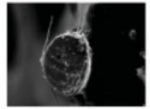
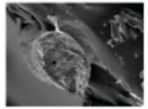
1. Nature of hair and challenges

The great difficulty in modelling and animating realistic hair comes from the complexity of this specific mater: human hair is made of typically 100 000 to 200 000 strands, whose multiple interactions produce the volume and the highly damped and locally coherent motion we observe. Each hair strand is itself an inextensible, elastic fibre. As such, it tends to recover its rest shape in terms of curvature and twist when no external force is applied. Hair strands are covers by scales, making their frictional behaviour, as well as the way they interact with light, highly anisotropic. Lastly, the ellipticity of their cross-section – which varies from an elongated ellipse for African hair to a circular shape for Asian hair – is responsible for the different kinds of curls, from quasi-uniform curliness to the classical European locks, quite straight at the top but helicoidal at the bottom.

Reproducing these features in virtual is clearly a challenge. A typical example is the number of interactions that one would have to process at each time step, if

4. No one knows what natural Black hair looks like.

(*Azimuthal Scattering from Elliptical Hair Fibers*) and I still think we can get a bump in quality from a good model of noisy/glinty highlights in hair".

	A	B	C	D	E	F	G
Source	Caucasian	Caucasian	Caucasian	artificial wig	African	Chinese	Indian
Photographs							
SEM images Measured aspect ratios (Fiber 1)	 ($\bar{x} = 1.273$)	 ($\bar{x} = 1.473$)	 ($\bar{x} = 1.660$)	 ($\bar{x} = 1.256$)	 ($\bar{x} = 1.897$)	 ($\bar{x} = 1.334$)	 ($\bar{x} = 1.396$)

From the 2017 TOG paper: Actual real hair cross sections. Note that the most round is the D. The Artificial Wig. All other hairs have cross sections that are elliptical. (click for larger)

5. The way that we talk about different hair textures is troubling.

1.4.4 Parameter values for natural hair

	Asian (smooth)	Caucasian 1 (wavy)	Caucasian 2 (curly)	African (fuzzy)
Radius (μm)	50	35	50	50
Ellipticity	1	1.1	1.1	1.2
Helix radius (cm)	0	1	0.6	0.1
Helix step (cm)	0	0.5	0.5	1
Young's mod. (GPa)	1	2	1.5	0.5
Poisson's ratio	0.48	0.48	0.48	0.48

Africans have follicles with a helical form and an oval cross section, whereas Asians have follicles that are completely straight with a larger and circular cross section. As a result, Asian hair is thicker, with no natural curliness. It makes it look smooth and regular. In contrast, African hair looks frizzy and irregular. Caucasian hair stands between these two extremes.

Modeling hair dynamics raises a number of difficulties. The very first one is due to the fact that each individual strand has a complex nonlinear mechanical behavior, strongly related to the thinness of its cross section as well as its natural shape: smooth, wavy, curly or fuzzy. In this chapter, after a brief report about the mechanical structure and properties of hair strands, we present two innova-

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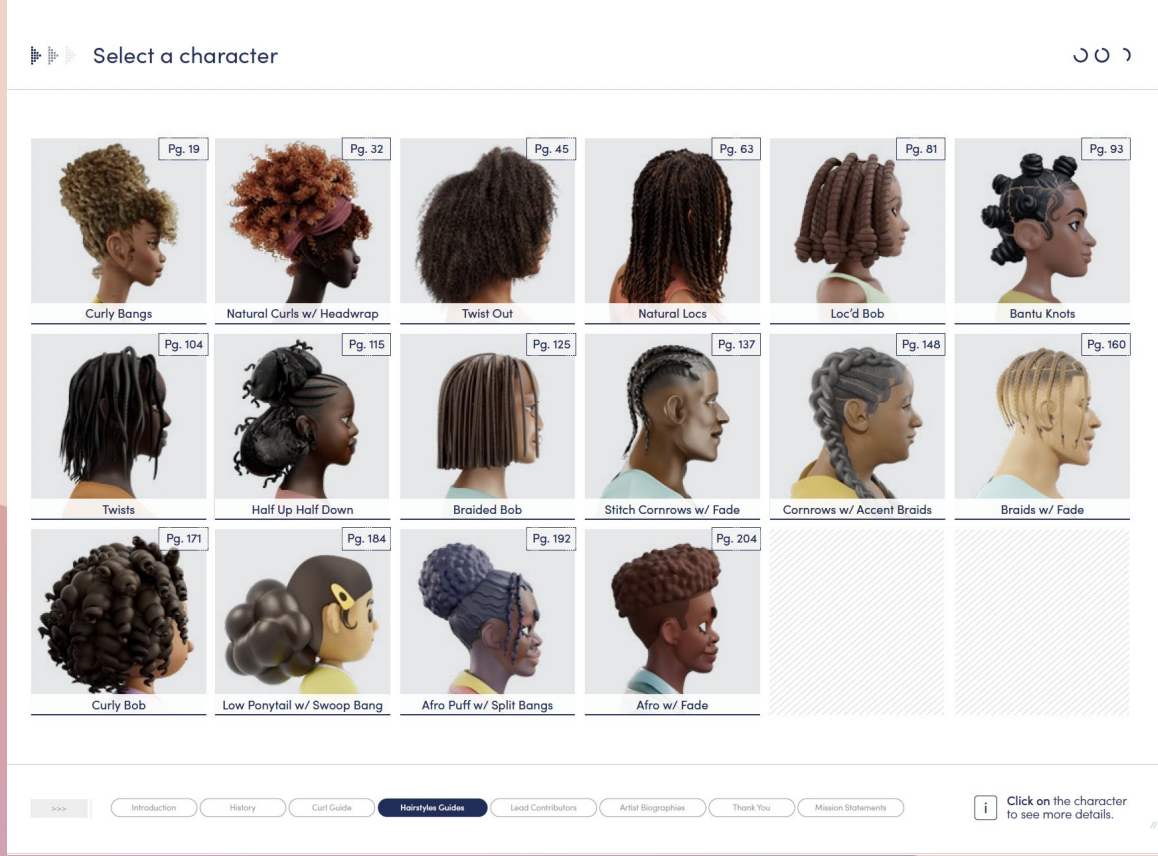
This is a cultural issue more than a technical issue.

Figure 10: *Different hair meshes and hairstyles generated from them, rendered using our method without LOD and with 8× MSAA. All hair models have 100 thousand hair strands and take 1 ms to rasterize, except for (e), which takes 1.8 ms. The hair mesh resolutions and the storage costs of the 5 textures we use for representing each of them are (a-b) 185 vertices/13 KB, (c) 477 vertices/34 KB, (d) 7892 vertices/563 KB, (e) 1316 vertices/94 KB, and (f) 3236 vertices/231 KB.*

Wide variety.

Wide variety.



Dove.com/CodeMyCrown - Download the guide for free and get the 3D models on Github.

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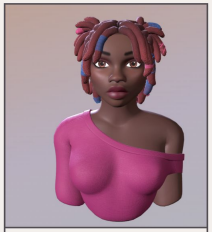
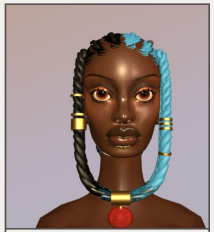
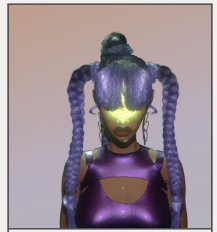
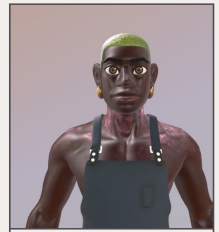

Sarita


Monáe

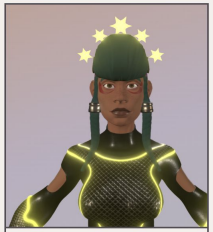

Khadijah

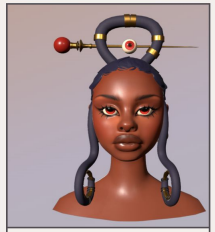

Zawadi


Lisa


Bread


Marshall


Yvette


Naomi


Tahj


Ramonda


Tavis

HAIR TEXTURES

- Coily
- Curly
- Locs
- Straight
- Wavy

HAIR STYLES

- Protective
- Natural
- Braids
- Heat-Styled
- Twists
- Fades
- Headwraps

Even more to explore.

afrohairlibrary.org

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Do we want to copy or do we want to innovate?

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Innovation requires informed experimentation. When we thoroughly understand a problem, we come up with better, more creative solutions.

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This course is about sharing what we know about Black Hair, so that together we can solve these problems 🖤

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Resources

Connect: am@darke.digital @prettydarke / @afrohairlibrary

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How Character Customization be for Black People on Video Games (2021)
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Black Hair in Popular 3D Marketplaces– prettydarke
I Am My Hair: Racial Diversity in Video Games (2016)