

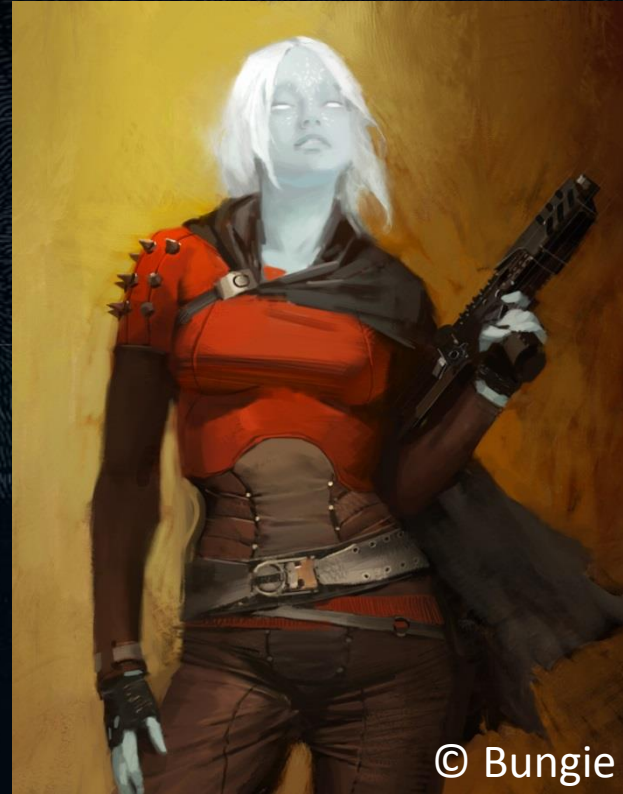
The background is a dark, almost black, textured surface. It features a faint grid of thin, light-colored lines. In the center, there is a large, circular, textured pattern that resembles a fingerprint or a complex, organic structure. The overall aesthetic is mysterious and scientific.

HAIR IN DESTINY

Natalie Burke

How is Destiny Unique?

- 10 year project
- PS4, PS3, Xbox One, Xbox 360
- Cinematic and gameplay constraints



© Bungie

Art Direction

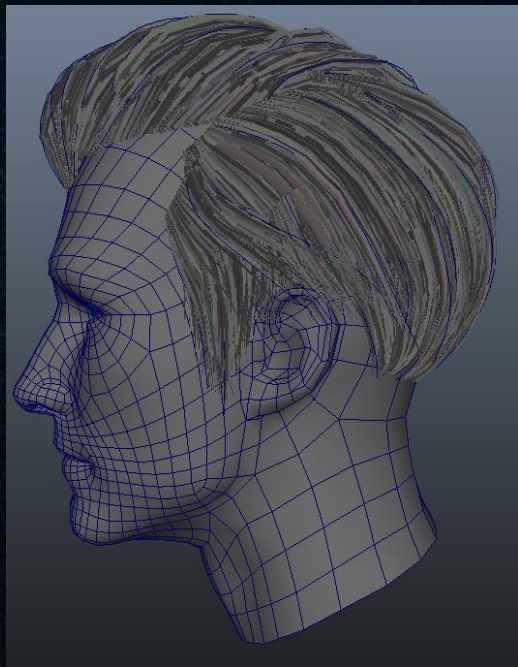
- Stylized Realism
- Distinct hair styles
- Fantasy Vibe



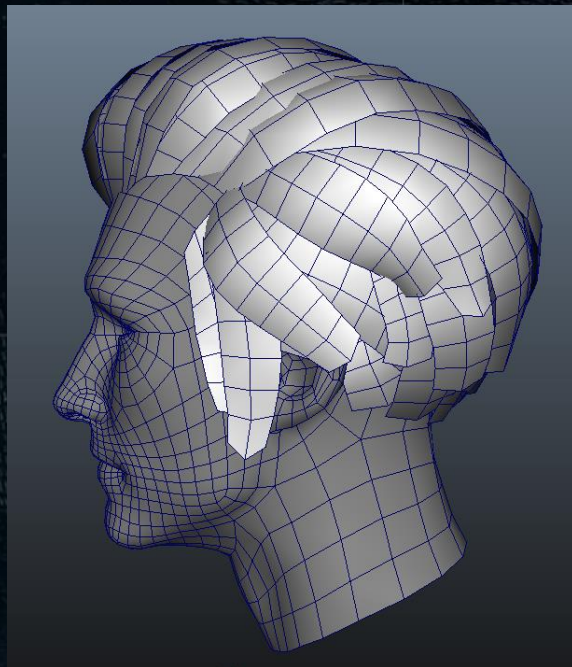


Creating Believable Hair

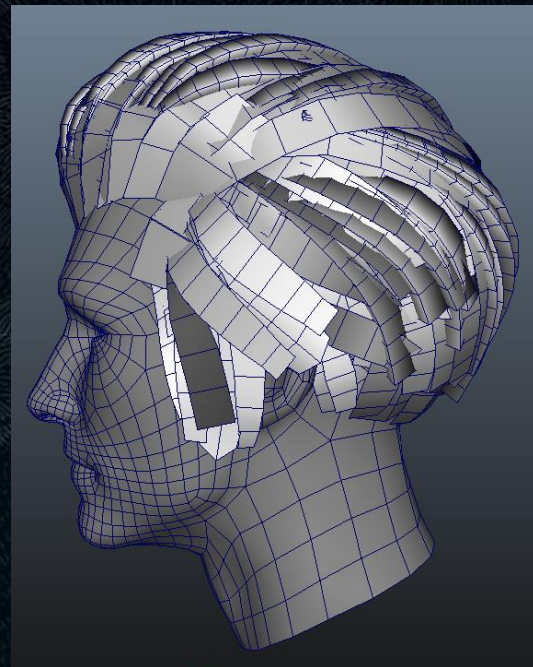
Geometry Creation



Future proof



Easy to create



Automated Aspects

Should hair be brushed or sculpted?





Hair Salon

PolyCount
Update
V1Social: 1671
V1Cinematic: 3957
V2Cinematic: 3957

Isolate V1SS V1Cin V2Cin
Apply Shader Dense Sparse
UV UV Wavy UV Straight Set UV
Options Save Finalize Close
 Facial Hair
 Eyebrows

All Objects
 All
 HeadGeo
 ShaveNodes
 HairCards
 HairScalps

SquareHairline	V	C	I	X
human_female_hot	V	C	I	X
toleft_hair	V	C	I	X
topback_hair	V	C	I	X
bottomleft_hair	V	C	I	X
topright_hair	V	C	I	X
bottomback_hair	V	C	I	X
bottomback_cards	V	C	I	X
toleft_cards	V	C	I	X
bottomleft_cards	V	C	I	X
topback_cards	V	C	I	X

Create Hair Surfaces Create Hair Layer

Scalps in Scene:
SquareHairline
Name your hair Layer: newHairLayer
Create New

Curve Styling Tools:
 Display Curve Preview Display Hair 100
Brush Cut Recomb Undo
Selection Comb To Curve Mirror

Select Hair Type
Build Replace

Card Editing Tools
Divisions 6
Revolve -18
Twist End 0
Taper 4
Width 10
Bulge
Amount 13
Position 5
Fold Selected
CV Edit Mode
Update To User Curves
Update To Shave Curves Stop Live Mode

Full Hair Layers
 Force Single Display

toleft	V	C	I	X	V1SS
topback	V	C	I	X	V1SS
bottomleft	V	C	I	X	V1SS
topright	V	C	I	X	V1SS
bottomback	V	C	I	X	V1SS
toleft_overlayer	V	C	I	X	V1Cn
topback_overlayer	V	C	I	X	V1Cn
bottomleft_overlayer	V	C	I	X	V1Cn
topright_overlayer	V	C	I	X	V1Cn
bottomback_overlayer	V	C	I	X	V1Cn

Create Over Layer
count Create V2Cn Flyaways

Bungie's Hair Salon



Hair Salon

PolyCount
Update
V1Social: 1671
V1Cinematic: 3957
V2Cinematic: 3957

Isolate V1SS V1Cin V2Cin
Apply Shader Dense Sparse
UV UV Wavy UV Straight Set UV
Options Save Finalize Close
 Facial Hair
 Eyebrows

All Objects
 All
 HeadGeo
 ShaveNodes
 HairCards
 HairScalps

SquareHairline V C I X
human_female_hot V C I X
topleft_hair V C I X
topback_hair V C I X
bottomleft_hair V C I X
topright_hair V C I X
bottomback_hair V C I X
bottomback_cards V C I X
topleft_cards V C I X
bottomleft_cards V C I X
topback_cards V C I X

Full Hair Layers
Force: Single Display
topleft V C I X V1SS
topback V C I X V1SS
bottomleft V C I X V1SS
topright V C I X V1SS
bottomback V C I X V1SS
topleft_overlayer V C I X V1Cn
topback_overlayer V C I X V1Cn
bottomleft_overlayer V C I X V1Cn
topright_overlayer V C I X V1Cn
bottomback_overlayer V C I X V1Cn

Count: _____ Create V2Cn Flyaways

Create Hair Surfaces **Create Hair Layer**

Scalps in Scene:
SquareHairline
Name your hair Layer: newHairLayer
Create New

Curve Styling Tools:
 Display Curve Preview Display Hair 100
Brush Cut Recomb Undo
Selection Comb To Curve Mirror
Select Hair Type Build Replace

Card Editing Tools
Divisions 6
Revolve -18
Twist End 0
Taper 4
Width 10
Bulge
Amount 13
Position 5
Fold Selected
CV Edit Mode
Update To User Curves
 Live Mode Update To Shave Curves Stop Live Mode
Previous Tab



Hair Salon

PolyCount: Update
V1Social: 1671
V1Cinematic: 3957
V2Cinematic: 3957

Isolate: V1SS, V1Cin, V2Cin
Apply Shader: Dense, Sparse
UV: UV Wavy, UV Straight, Set UV
Options: Save, Finalize, Close
Facial Hair
Eyebrows

All Objects: All, HeadGeo, HairScalps, ShaveNodes, HairCards
SquareHairline, human_female_hot, topleft_hair, topback_hair, bottomleft_hair, topright_hair, bottomback_hair, bottomback_cards, topleft_cards, bottomleft_cards, topback_cards

Create Hair Surfaces | Create Hair Layer

Scalps in Scene: SquareHairline
Name your hair Layer: newHairLayer
Create New

Curve Styling Tools:
Display Curve Preview | Display Hair: 100
Brush | Cut | Recomb | Undo
Selection | Comb To Curve | Mirror

Select Hair Type: Build | Replace

Card Editing Tools (highlighted in yellow):
Divisions: 6
Revolve: -18
Twist End: 0
Taper: 4
Width: 10
Bulge
Amount: 13
Position: 5
Fold Selected
CV Edit Mode
Update To User Curves
Update To Shave Curves | Stop Live Mode

Full Hair Layers: Force Single Display
topleft, topback, bottomleft, topright, bottomback, topleft_overlayer, topback_overlayer, bottomleft_overlayer, topright_overlayer, bottomback_overlayer

count | Create V2Cin Flyaways

Bungie's Hair Salon



Hair Salon

PolyCount
Update
V1Social: 1671
V1Cinematic: 3957
V2Cinematic: 3957

Isolate V1SS Dense UV Wavy Save Facial Hair
V1Cin UV Straight Eyebrow
V2Cin Sparse Set UV Finalize Close

Create Hair Surfaces Create Hair Layer

Scalps in Scene:
SquareHairline

Name your hair Layer : newHairLayer
Create New

Curve Styling Tools:
Display Curve Preview Display Hair 100
Brush Cut Recomb Undo
Selection Comb To Curve Mirror

Select Hair Type
Build Replace

Card Editing Tools
Divisions 6
Revolve -18
Twist End 0
Taper 4
Width 10
Bulge
Amount 13
Position 5
Fold Selected
CV Edit Mode
Update To User Curves
Update To Shave Curves Stop Live Mode

Objects
All ShaveNodes HairCards
HeadGeo HairScalps

SquareHairline	V	C	I	X
human_female_hot	V	C	I	X
topleft_hair	V	C	I	X
topback_hair	V	C	I	X
bottomleft_hair	V	C	I	X
topright_hair	V	C	I	X
bottomback_hair	V	C	I	X
bottomback_cards	V	C	I	X
topleft_cards	V	C	I	X
bottomleft_cards	V	C	I	X
topback_cards	V	C	I	X

Full Hair Layers
Force Single Display

topleft	V	C	I	X	V1SS
topback	V	C	I	X	V1SS
bottomleft	V	C	I	X	V1SS
topright	V	C	I	X	V1SS
bottomback	V	C	I	X	V1SS
topleft_overlayer	V	C	I	X	V1Cn
topback_overlayer	V	C	I	X	V1Cn
bottomleft_overlayer	V	C	I	X	V1Cn
topright_overlayer	V	C	I	X	V1Cn
bottomback_overlayer	V	C	I	X	V1Cn

Create Over Layer
count Create V2Cn Flyaways

Bungie's Hair Salon

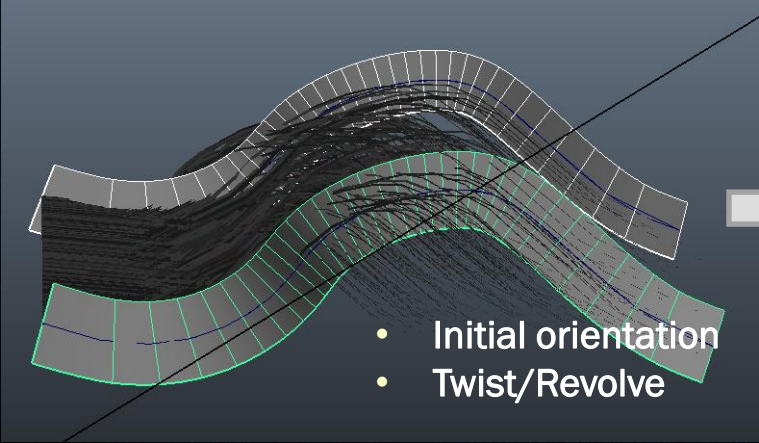
- Able to adjust curve cv positions



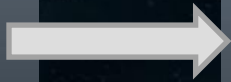
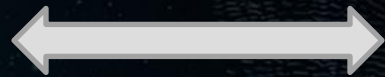
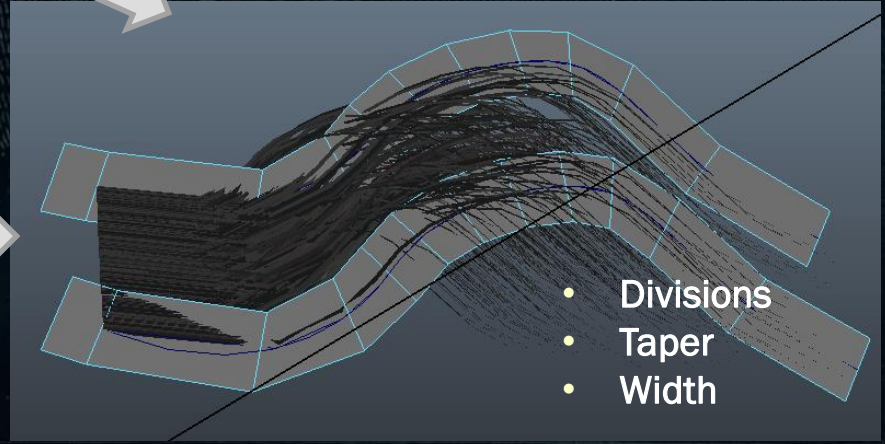
- Brush tools – push and pulling overall hair style
- Scale and cut
- Relaxing

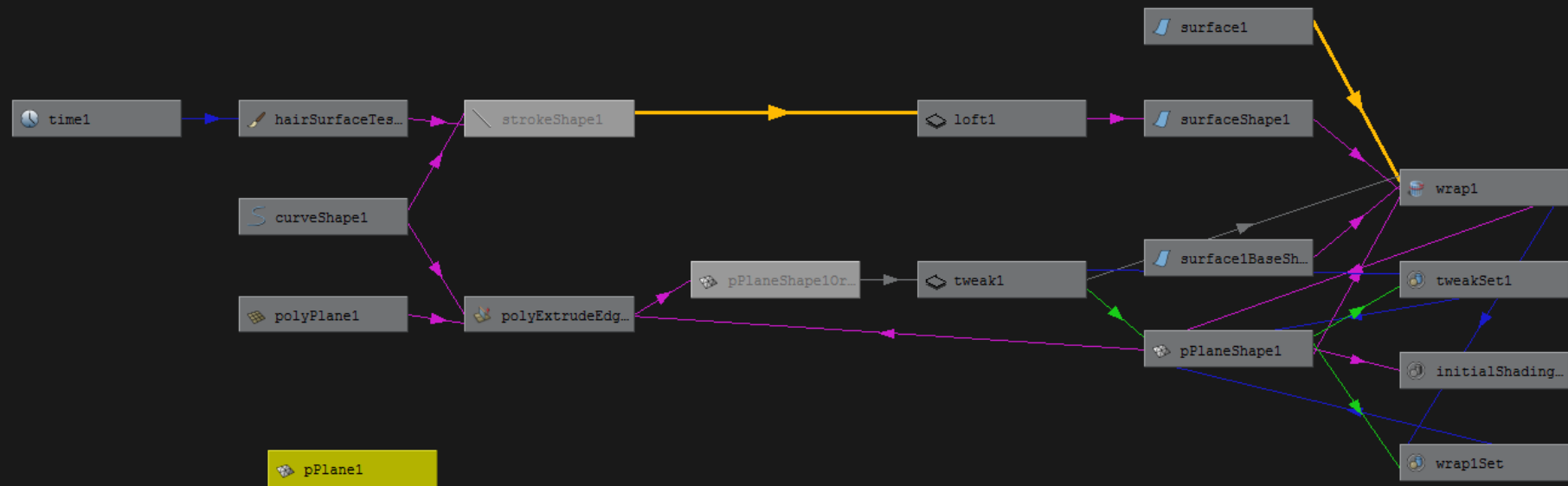


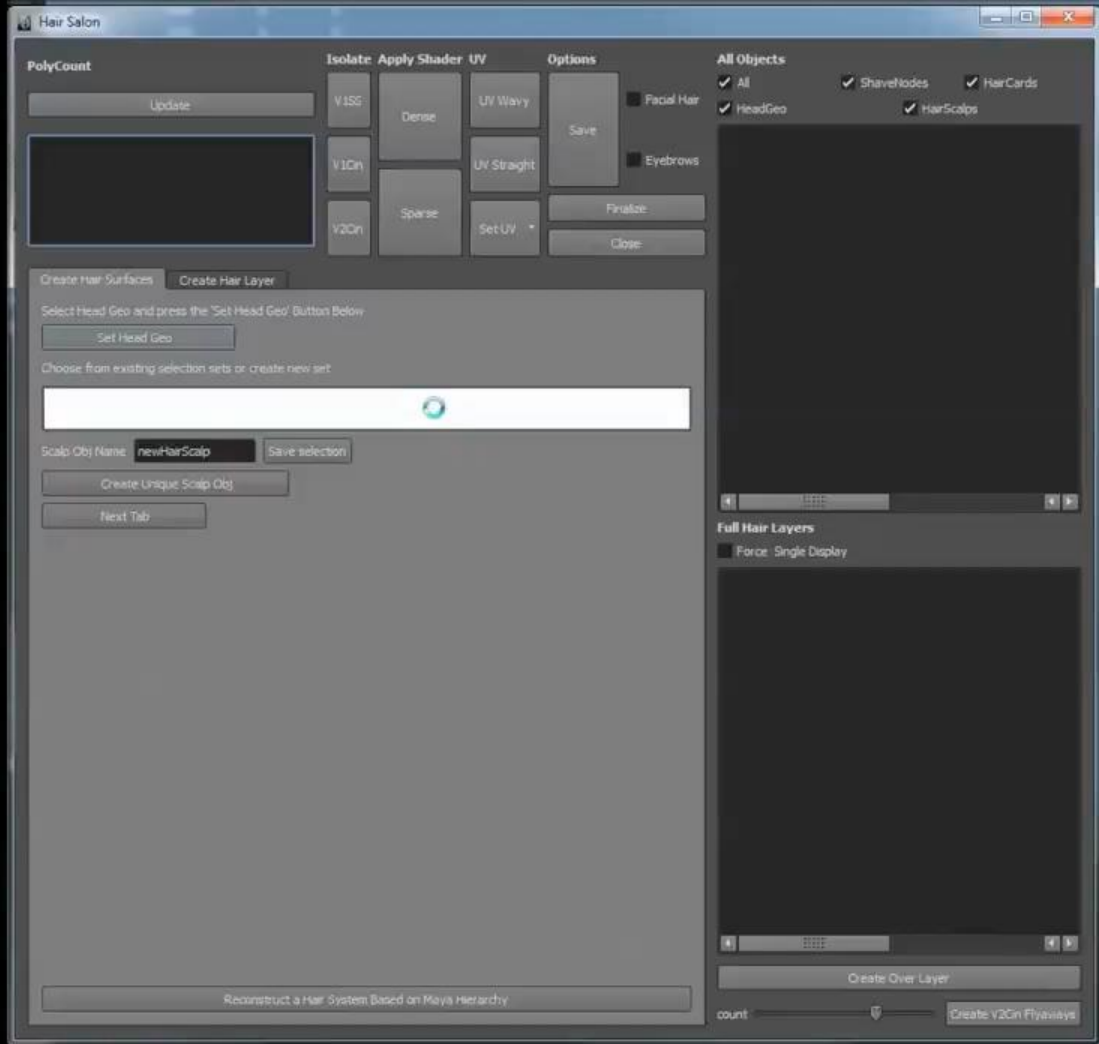
- Initial orientation
- Twist/Revolve



- Divisions
- Taper
- Width







Vertic: 2199 Edges: 4778 Faces: 2089
 Vertic: 2199 Edges: 4778 Faces: 2089

Hair Salon
 PolyCount: 579
 V1Social: 579
 V1Cinematic: 1315
 V2Cinematic: 1315

Isolate Apply Shader UV Options
 Y35S Dense UV Wavy Save Facial Hair
 Y10m UV Straight Eyebrows
 Y30m Sparse Set UV Finish
 Close

All Objects
 All ShaveNodes HairCards
 HeadGeo HairScalps

SquareHairline
 awoken_female_vixen
 filerHairLayer_har
 bunBaseHairLayer_har
 baseHairLayer_cards
 filerHairLayer_cards
 bunBaseHairLayer_cards

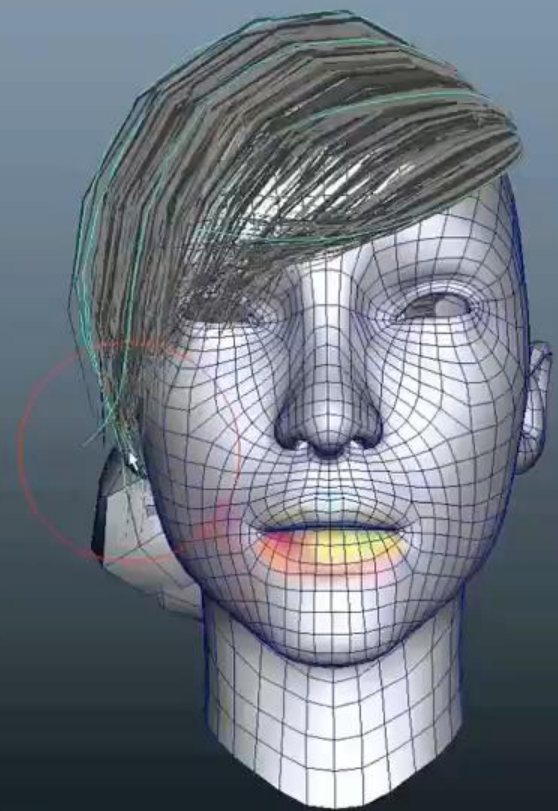
Full Hair Layers
 Force Single Display
 filerHairLayer
 bunBaseHairLayer
 baseHairLayer_overlayer
 bunBaseHairLayer_overlayer

Create Hair Surfaces Create Hair Layer
 Scalps in Scenes
 SquareHairline
 Name your hair Layer: newHairLayer
 Create new

Curve Styling Tools
 Display Curve Preview Display size: 100
 Brush Cut Records Undo
 Selection Comb To Curve Mirror

Select Hair Type: Build Replace

Card Editing Tools
 Divisor: 0
 Revolve: 0
 Twist End: 0
 Taper: 0
 Width: 1
 Ridge Amount: 0
 Position: 5
 Fold Selected
 CV Edit Mode
 Update To Live Curves
 Live Mode
 Update To Shave Curves Flip Live Mode
 Previous Tab Create V2Cin P1jama.js



Vertices: 157/32

Hair Salon

PolyCount

Locate

V1SS Dense UV Wavy Save Facial Hair

V1Cin UV Straight Eyebrows

V2Cin Sparse Set UV Finish Close

V1Social: 780
 V1Cinematic: 780
 V2Cinematic: 780

Create Hair Surfaces Create Hair Layer

Select head Geo and press the 'Set Head Geo' button below.

Set Head Geo

Choose from existing selection sets or create new set.

SideburnFaces Squarehairline EyebrowFaces Trianglehairlinefac

Scalp Obj Name: newHairScalp Save selection

Create Unique Scalp Obj

First Tab

Reconstruct a Hair System Based on Maya Hierarchy

All Objects

All
 HeadGeo
 ShaveNodes
 HairCards
 HairScalps

Squarehairline	V	C	I	X
awoken_male_prince_Straighten	V	C	I	X
newHairLayer_02_hair	V	C	I	X
newHairLayer_01_hair	V	C	I	X
filler01_hair	V	C	I	X
newHairLayer_02_cards	V	C	I	X
filler01_cards	V	C	I	X
newHairLayer_01_cards	V	C	I	X

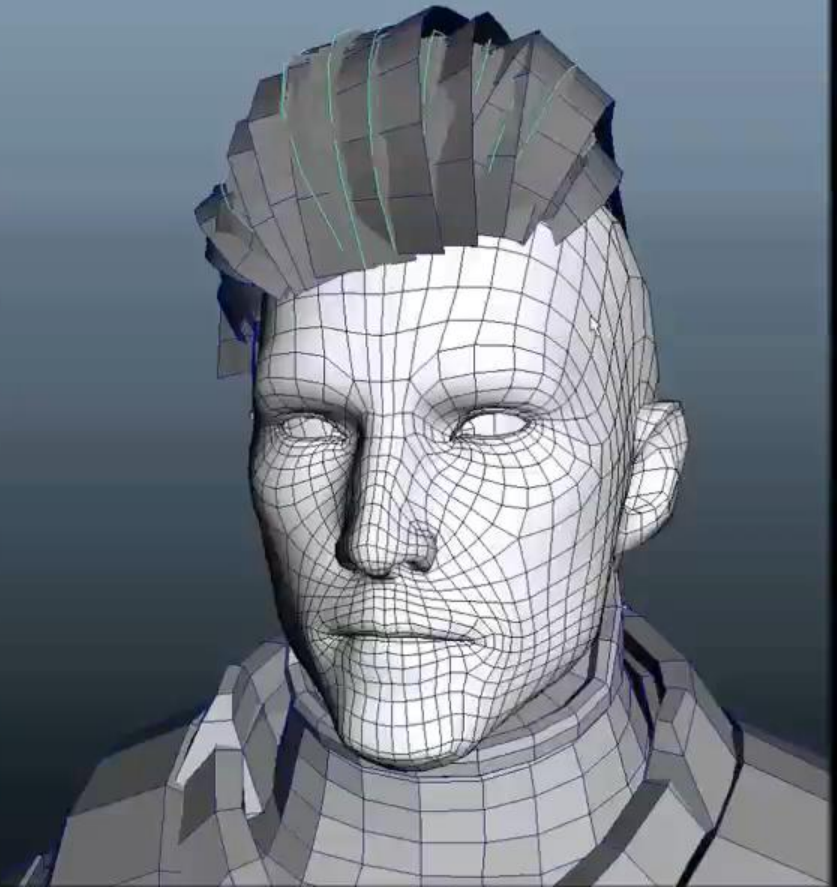
Full Hair Layers

Force: Single Display

newHairLayer_02	V	C	I	X
newHairLayer_01	V	C	I	X
hair01	V	C	I	X

Create Over Layer

count Create V2Cin.Plywaves



Hair Salon

PolyCount
 Update
 V1Social: 1725
 V1Cinematic: 1725
 V2Cinematic: 1725

Isolate: Apply Shader UV
 V1SS Dense UV Wavy
 V1Cn UV Straight
 V2Cn Sparse Set UV

Options
 Save
 Finalize
 Close

All Objects
 All
 ShaveNodes
 HairCards
 HeadGeo
 HairScalp

SquareHairline	V	C	I	X
human_female_hot	V	C	I	X
backtop_hair	V	C	I	X
fronttop_hair	V	C	I	X
frontbottom_hair	V	C	I	X
tails_hair	V	C	I	X
backbottom_hair	V	C	I	X
tails_cards	V	C	I	X
backbottom_cards	V	C	I	X
backtop_cards	V	C	I	X
frontbottom_cards	V	C	I	X

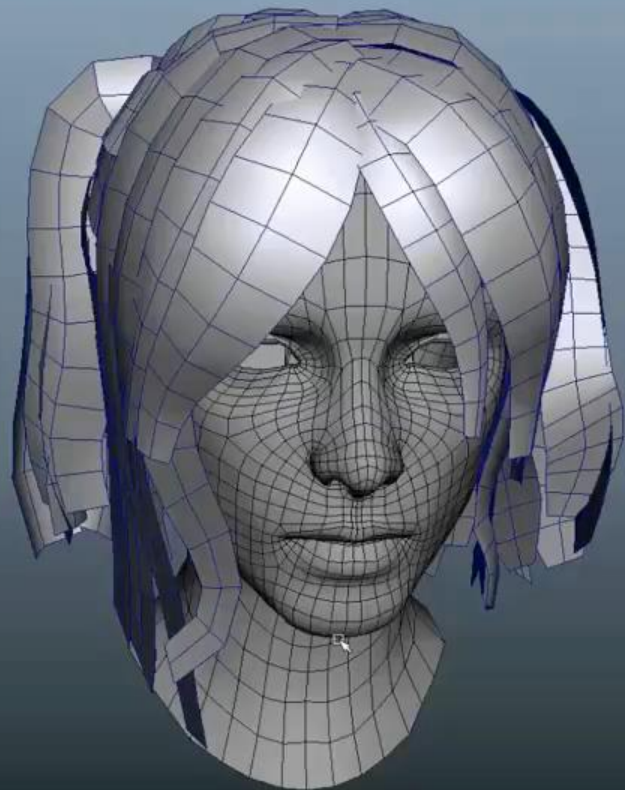
Full Hair Layers
 Force Single Display

backtop	V	C	I	X
fronttop	V	C	I	X
frontbottom	V	C	I	X
tails	V	C	I	X
backbottom	V	C	I	X

count Create V2Cn Plymaps

Reconstruct a Hair System Based on Maya Hierarchy

Create Hair Surfaces Create Hair Layer
 Select Head Geo and press the 'Set Head Geo' Button Below
 Set Head Geo
 Choose from existing selection sets or create new set
 SideBurnFaces SquareHairline EyeBrowFaces TriangleHairlineFac...
 Scalp Obj Name: NewHairScalp Save selection
 Create Unique Scalp Obj
 Next Tail



Platform differences



Last gen gameplay



Last gen cinematic and
current gen gameplay

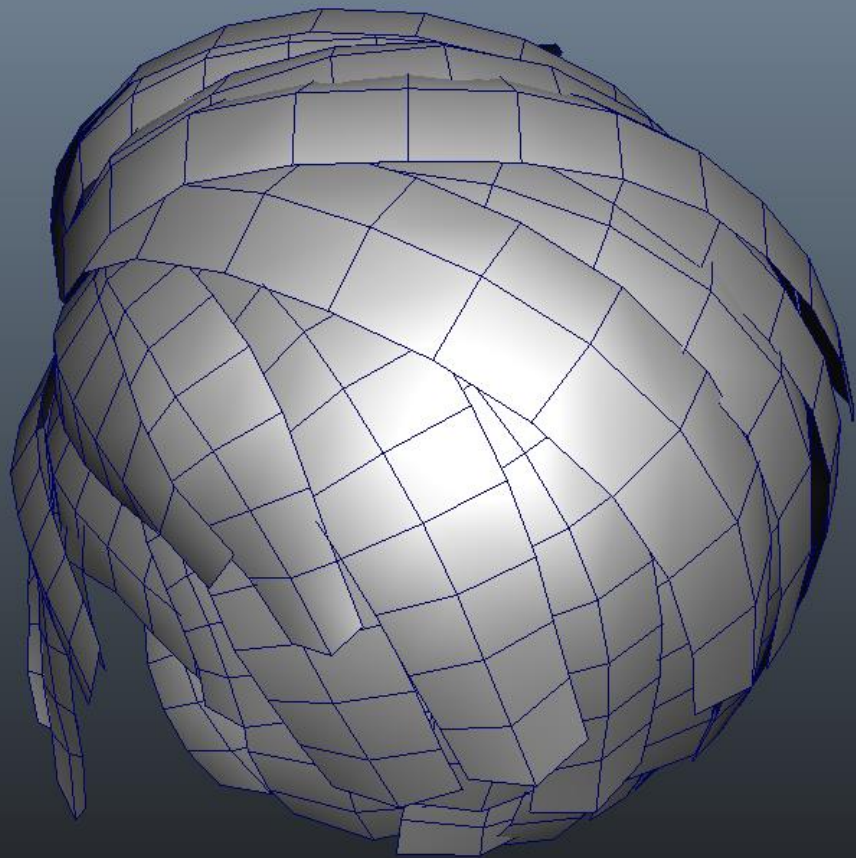


Current gen
cinematic

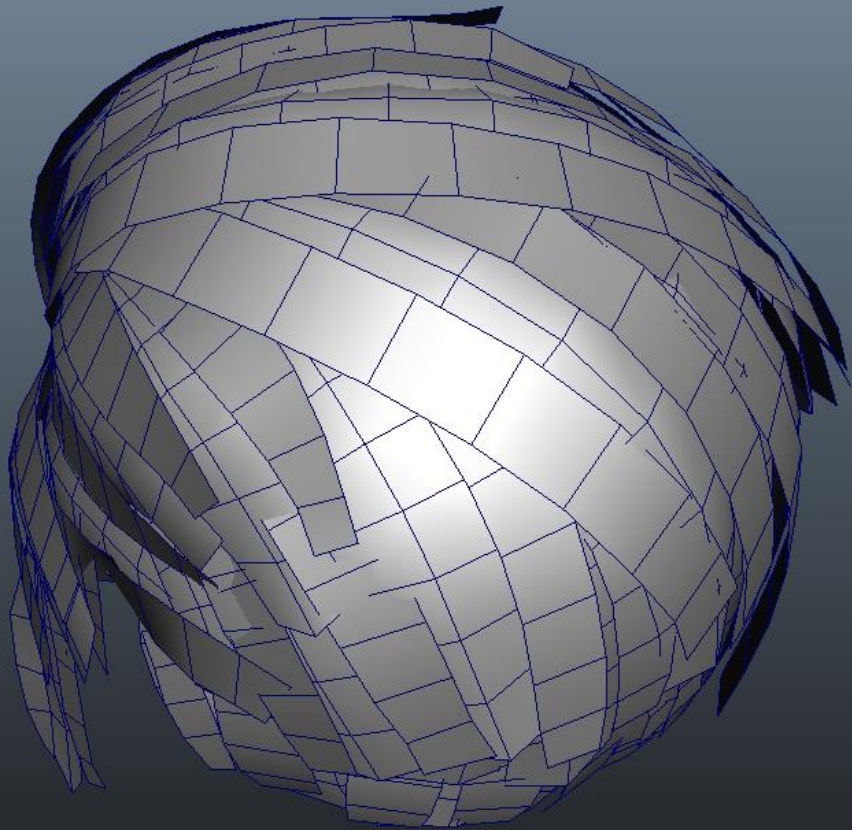
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In Game Cinematic

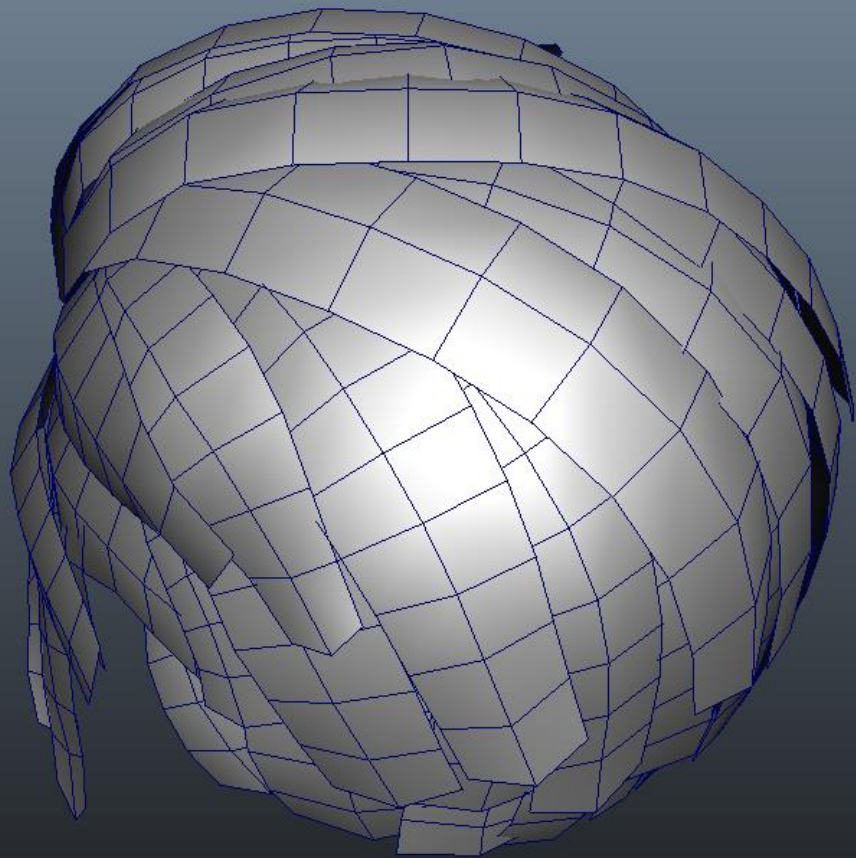




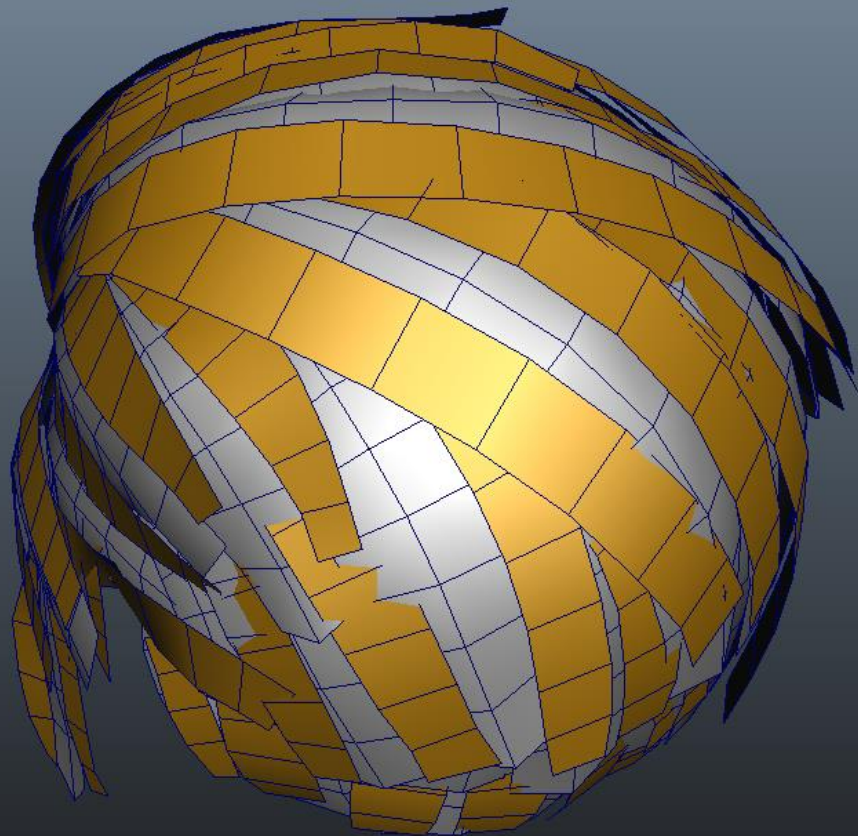
Last Gen Gameplay



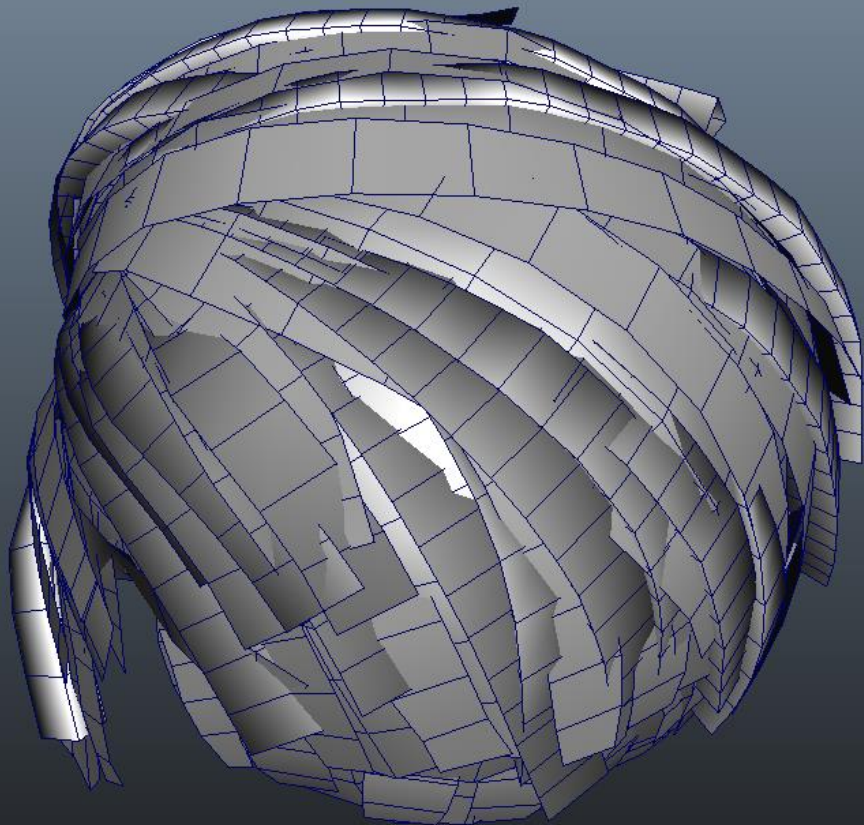
Last Gen Cinematics and Current Gen Gameplay



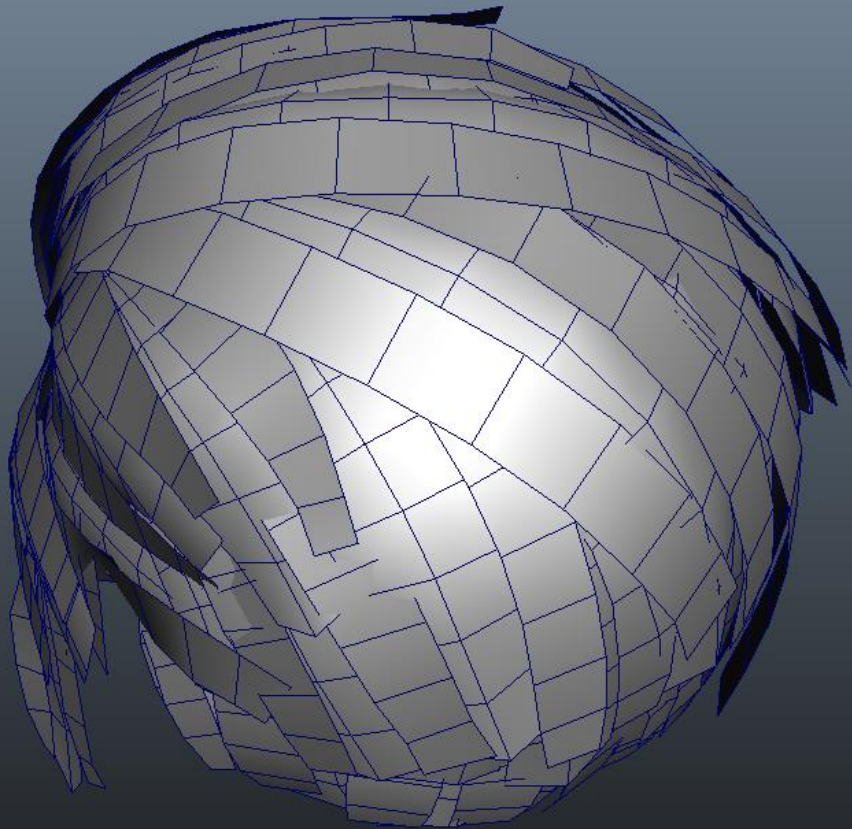
Last Gen Gameplay



Last Gen Cinematics and Current Gen Gameplay

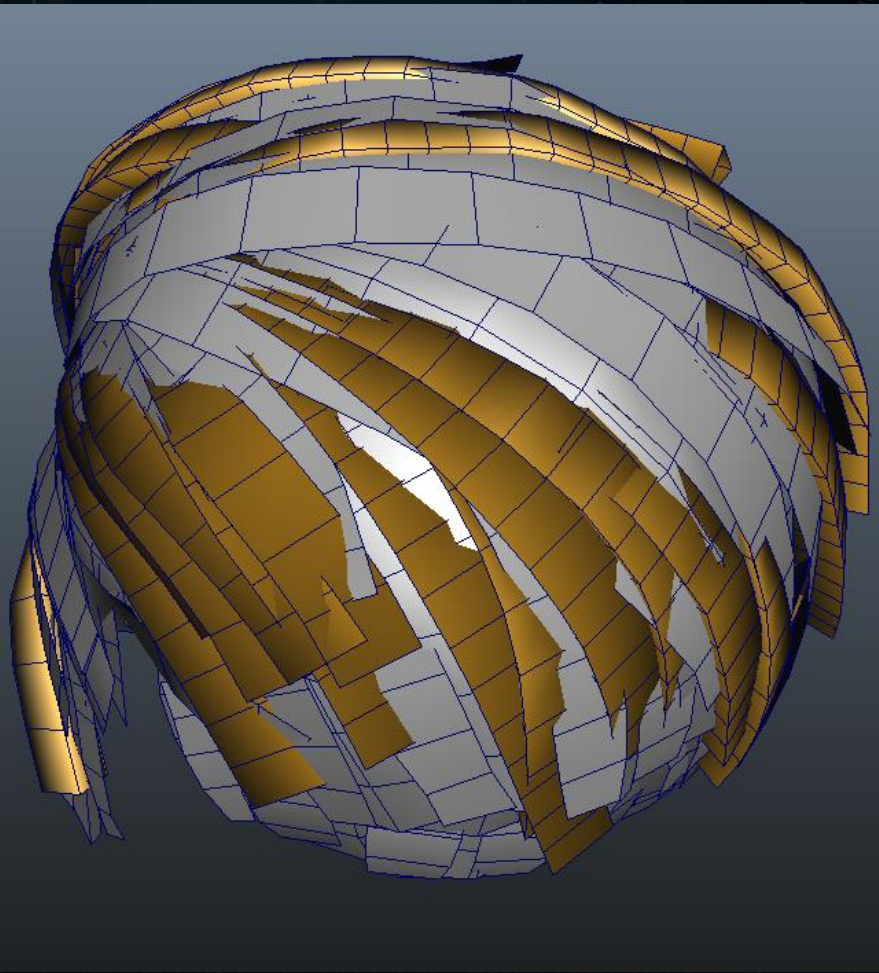


Current Gen Cinematics



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Last Gen Cinematics and Current Gen Gameplay



Platform differences



Last gen gameplay



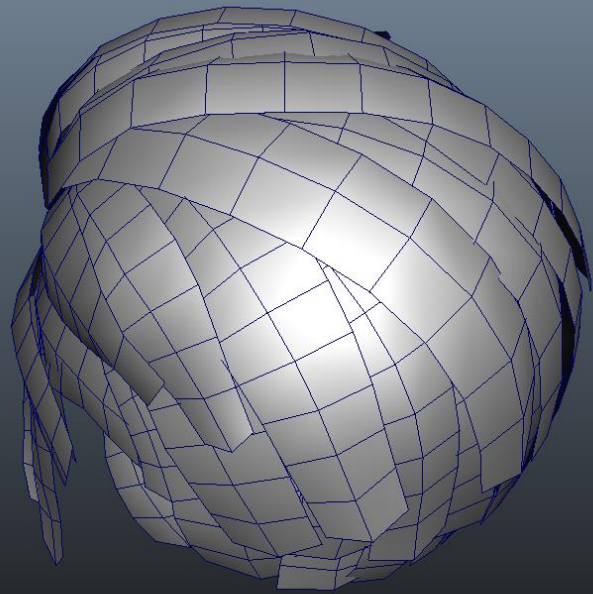
Last gen cinematic and
current gen gameplay



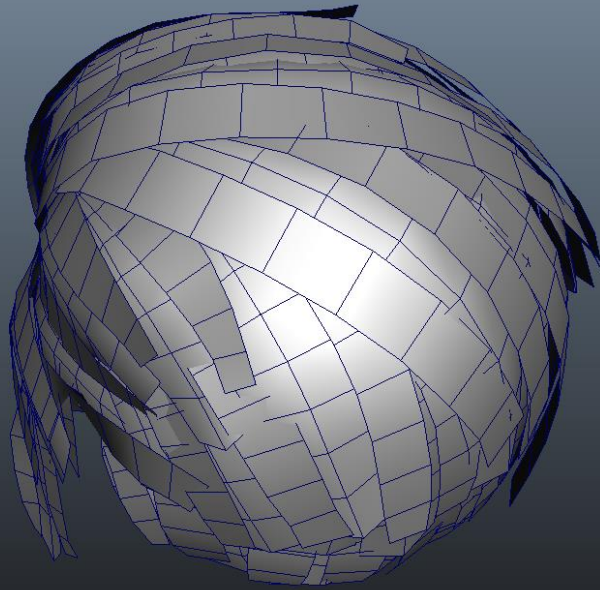
Current gen
cinematic

© Bungie

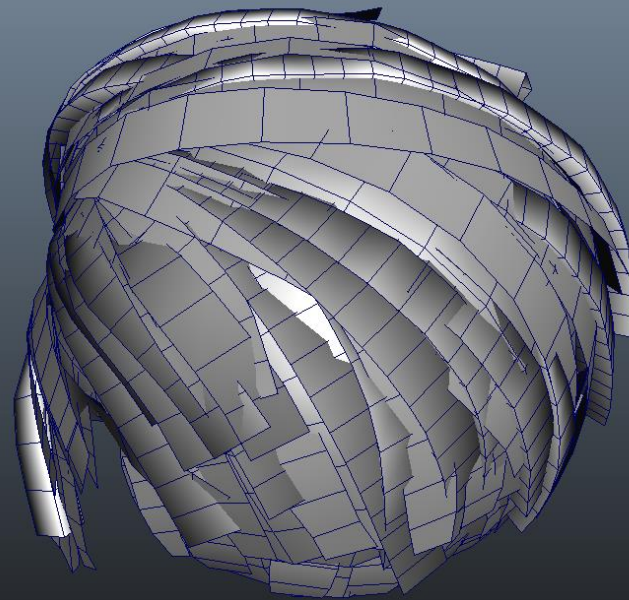
Platform differences



Last gen gameplay



Last gen cinematic and
current gen gameplay

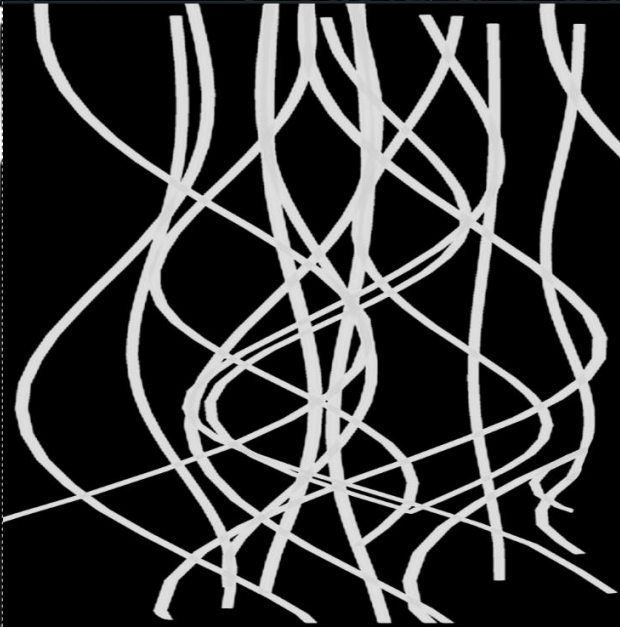


Current gen
cinematic

Platform differences



Last gen gameplay

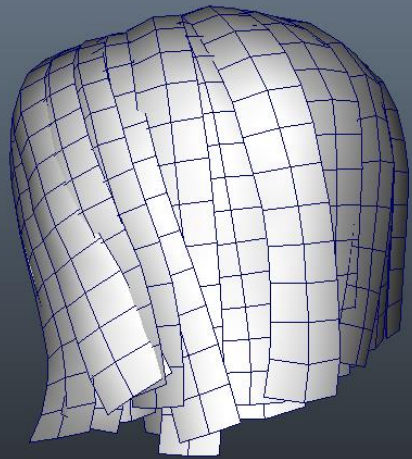


Last gen cinematic and
current gen gameplay

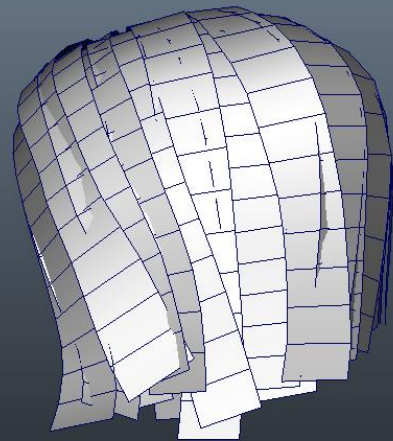


Current gen
cinematic

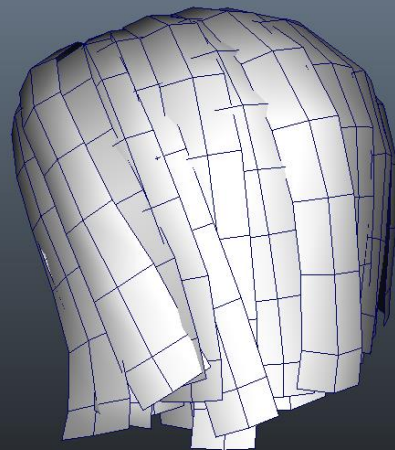
Decimation



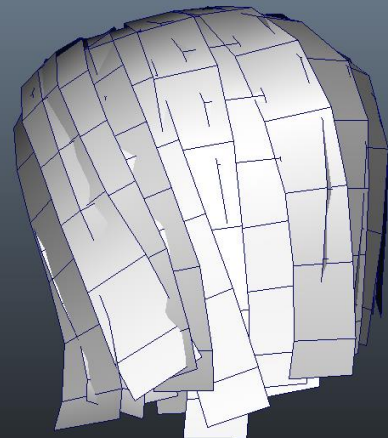
1305



870

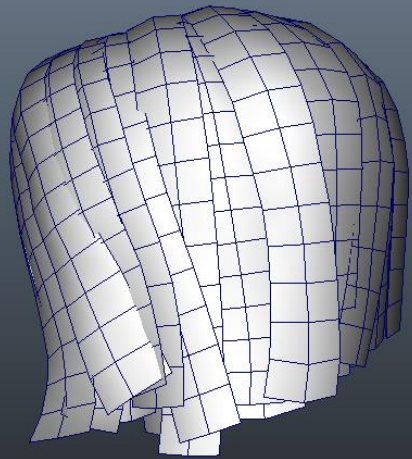


719

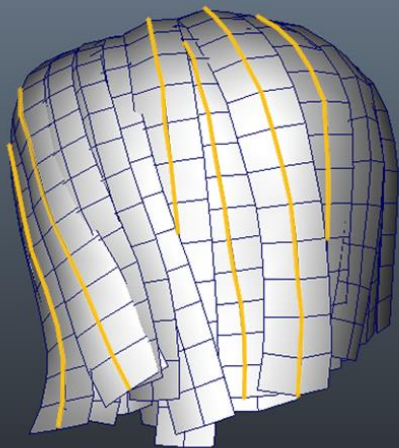


510

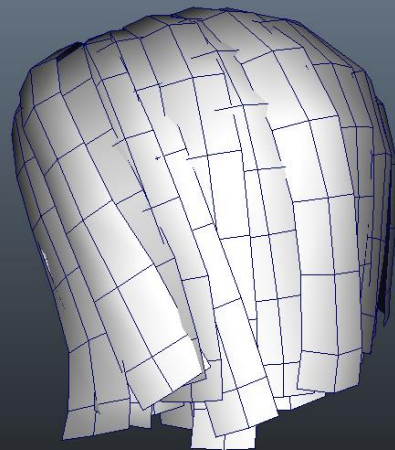
Decimation



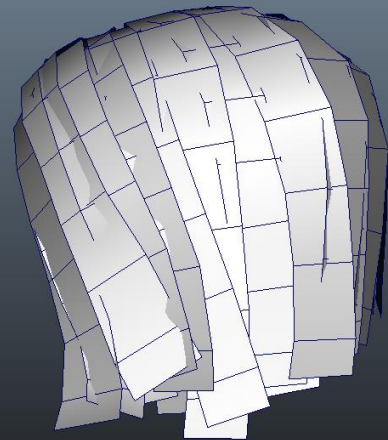
1305



870

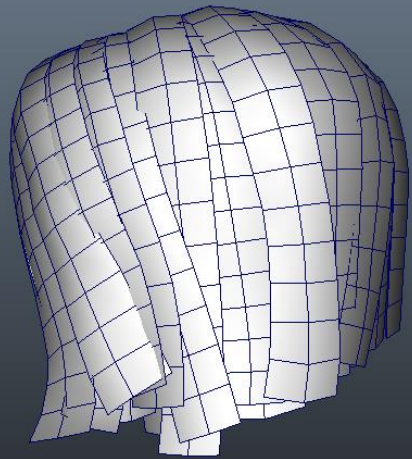


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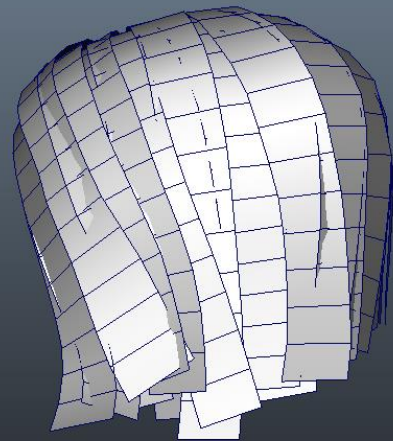


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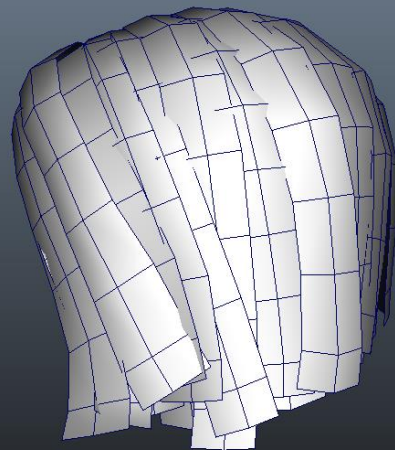
Decimation



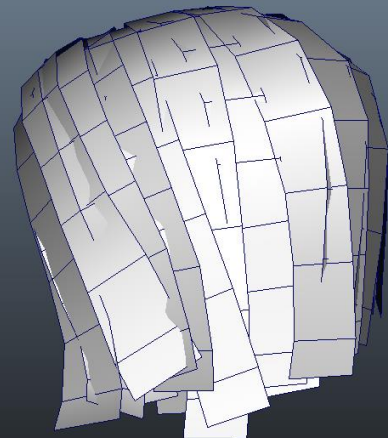
1305



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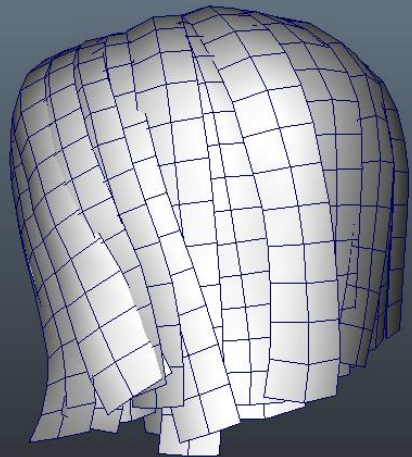


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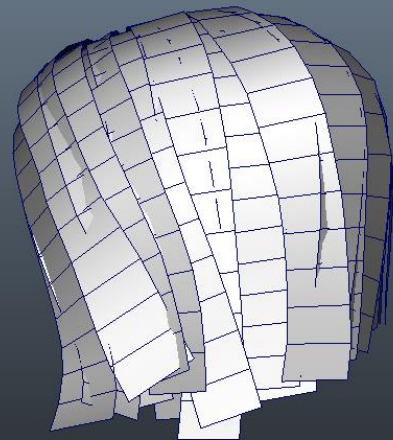


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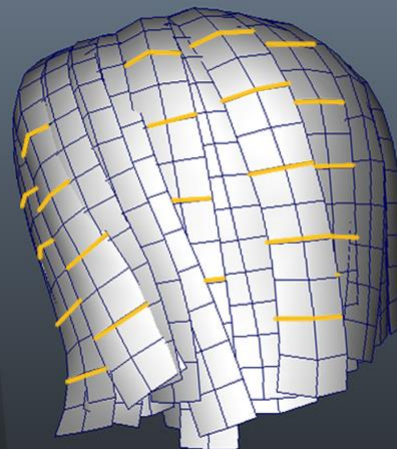
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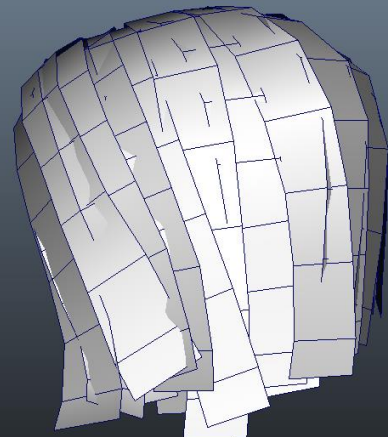
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870

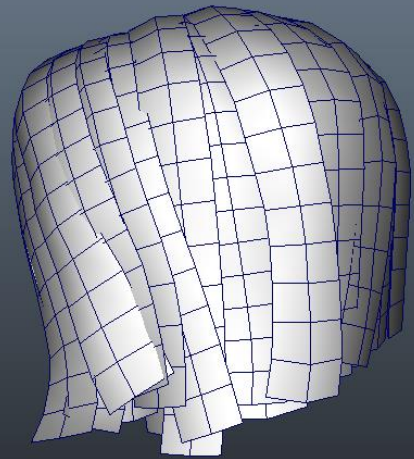


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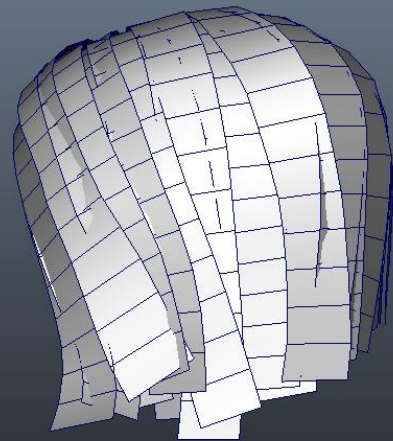


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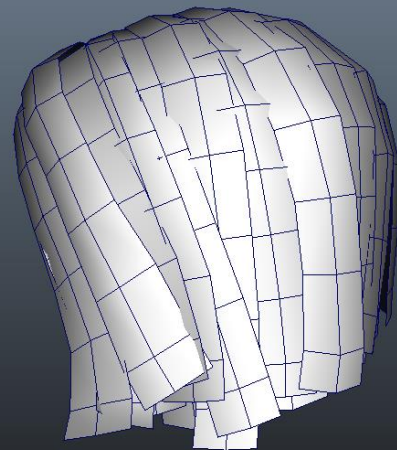
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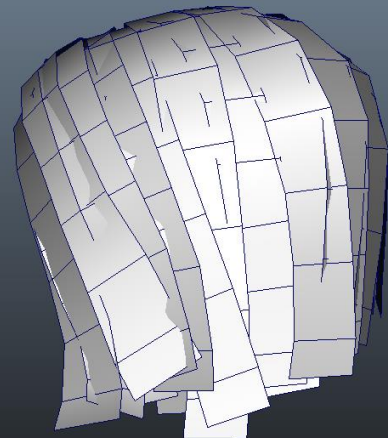
1305



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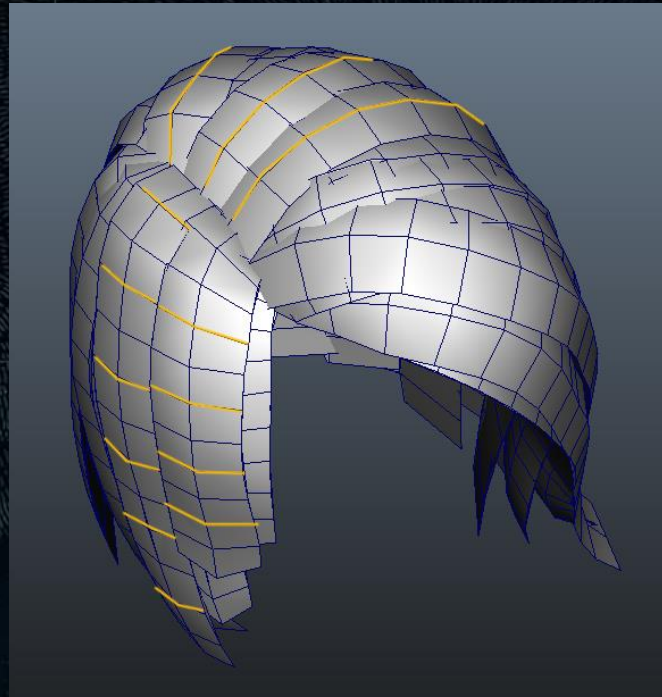
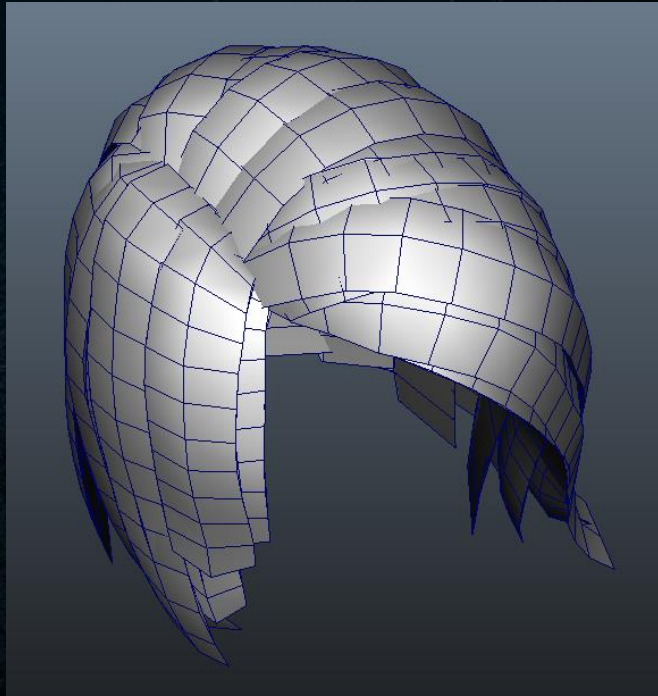


719



510

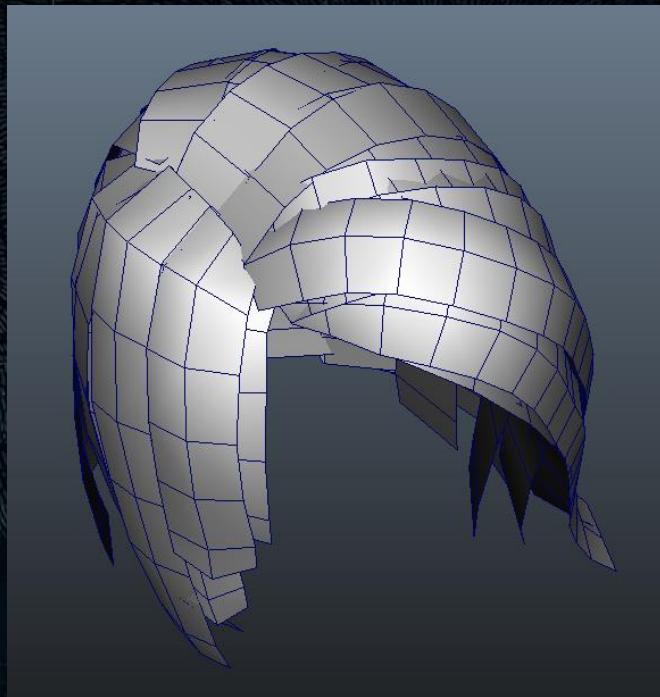
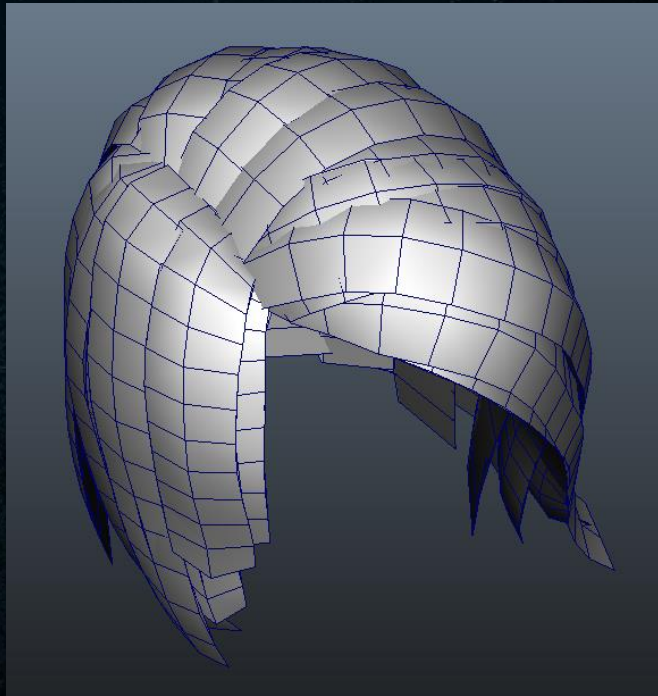
Decimation



Fold Threshold	0.200	<input type="range"/>
Curvature Threshold	1.200	<input type="range"/>

720

Decimation



Fold Threshold	0.200	<input type="range"/>
Curvature Threshold	1.200	<input type="range"/>

720

Shading



© Bungie



© Bungie



© Bungie

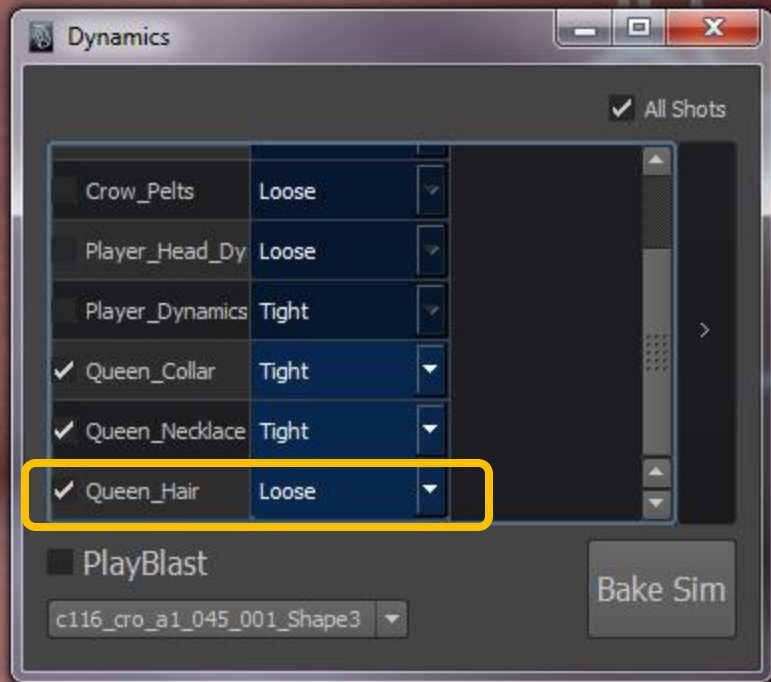


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Cinematic Only Characters







Dynamics Tool



Dynamics

All Shots

Rigs	Settings	shot01	shot02	shot03	shot04	shot05
<input checked="" type="checkbox"/> Crow_Hair	Medium	Medium	Medium	Medium	Medium	Medium
<input checked="" type="checkbox"/> Crow_Pelts	Tight	Tight	Tight	Loose	Tight	Tight
<input type="checkbox"/> Player_Head_Dy	Loose	Loose	Loose	Loose	Loose	Loose
<input checked="" type="checkbox"/> Queen_Hair	Medium	Medium	Medium	Medium	Medium	Medium
<input type="checkbox"/> Queen_Collar	Tight	Tight	Tight	Tight	Tight	Tight

PlayBlast

c116_cro_a1_050_001_Shape1

Bake Sim



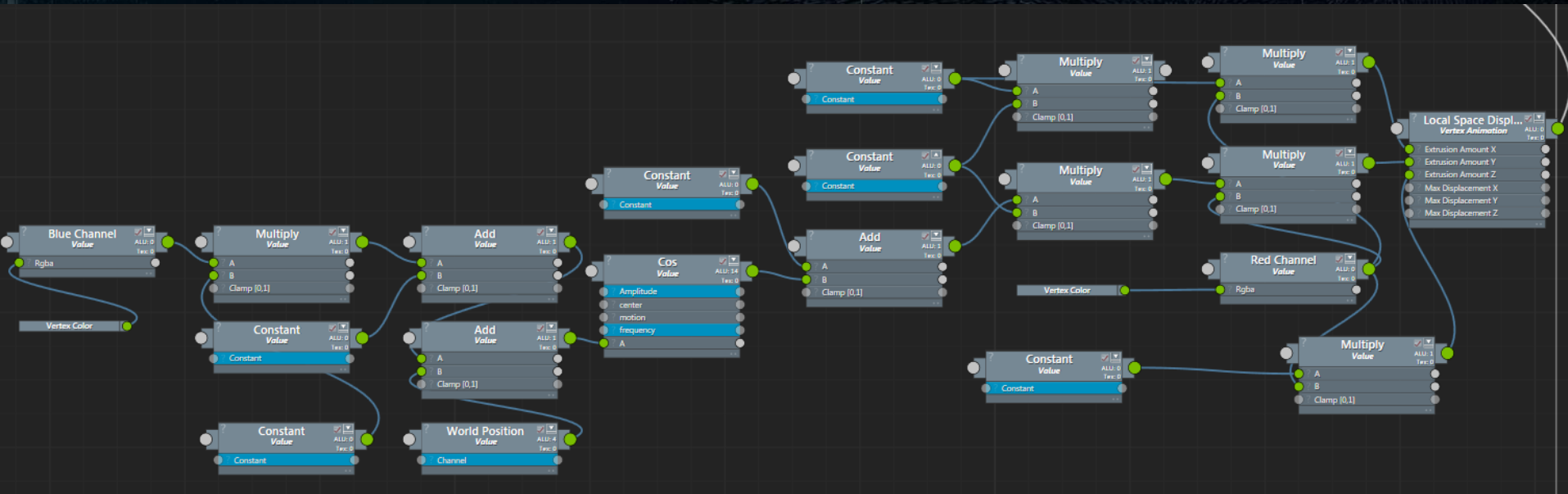


Player Characters

- Large number of animating assets
- Unpredictable movements
- Shared data

Vertex Animation as a Hair Sim

Vertex Animation





Base Motion

Player Linear Speed



Base Motion



Channels

2: vertex_animation_w_spring



Name

vertex_animation_w_spring

? Description

used for tuning vertex animation to player speed, does

? Owner

nburke

Type

1: scalar



Function



linear_speed * (1- airborne) * (1-in_seat) * 0.1



Interpolation

Damped Spring



Spring

Higher strength makes the spring move faster in response to changes. Higher damping makes it less bouncy.

? Strength

25

Damping

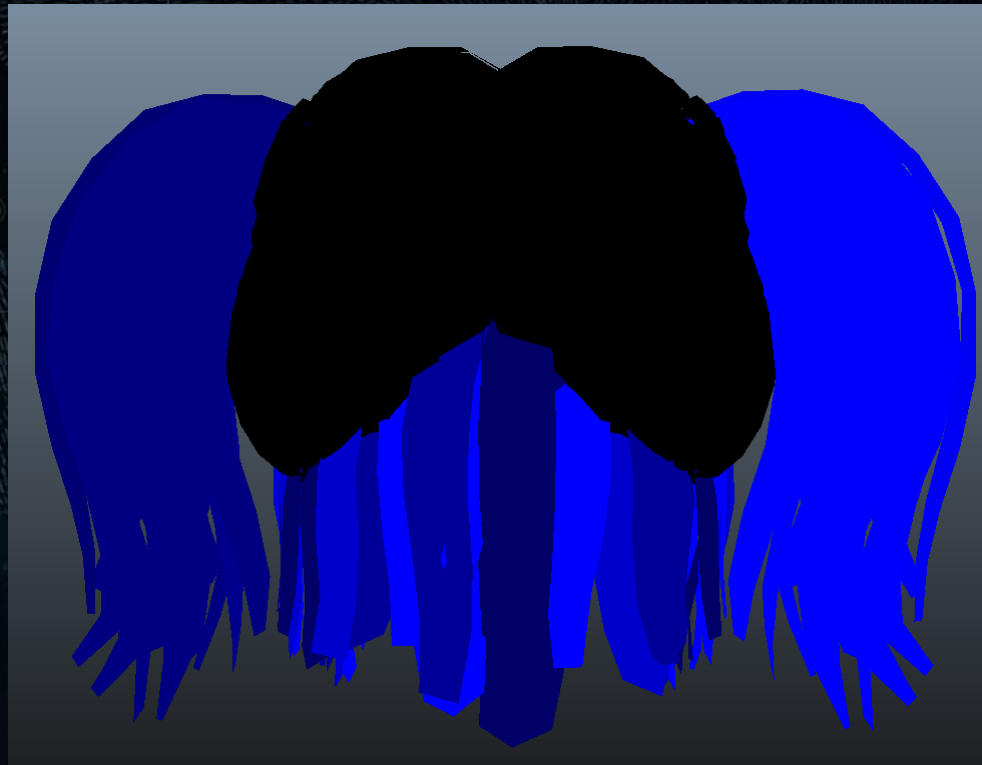
8

Blue Vertex Color



Base Motion

blue channel = timing of movement





Movement Strength

Red Vertex Color



Movement Strength

red channel = strength of movement





Additive Noise



GO TO ORBIT

When you are finished in the Tower, press  then hold  to go to Orbit.



Future work

- Improve live update in complex scenes
- Tool support for hairline polish
- Create more varied hair types, coarse, curly, etc.
- Add up and down movement for hair when player jumps
- Minimize stiffness when very straight hair animates

Special Thanks

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