



BUNGIE[®]

DESTINY®



BUILDING A HAIR TOOL FOR DESTINY

Natalie Burke, Character Technical Artist

HOW IS DESTINY UNIQUE?

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



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ART DIRECTION

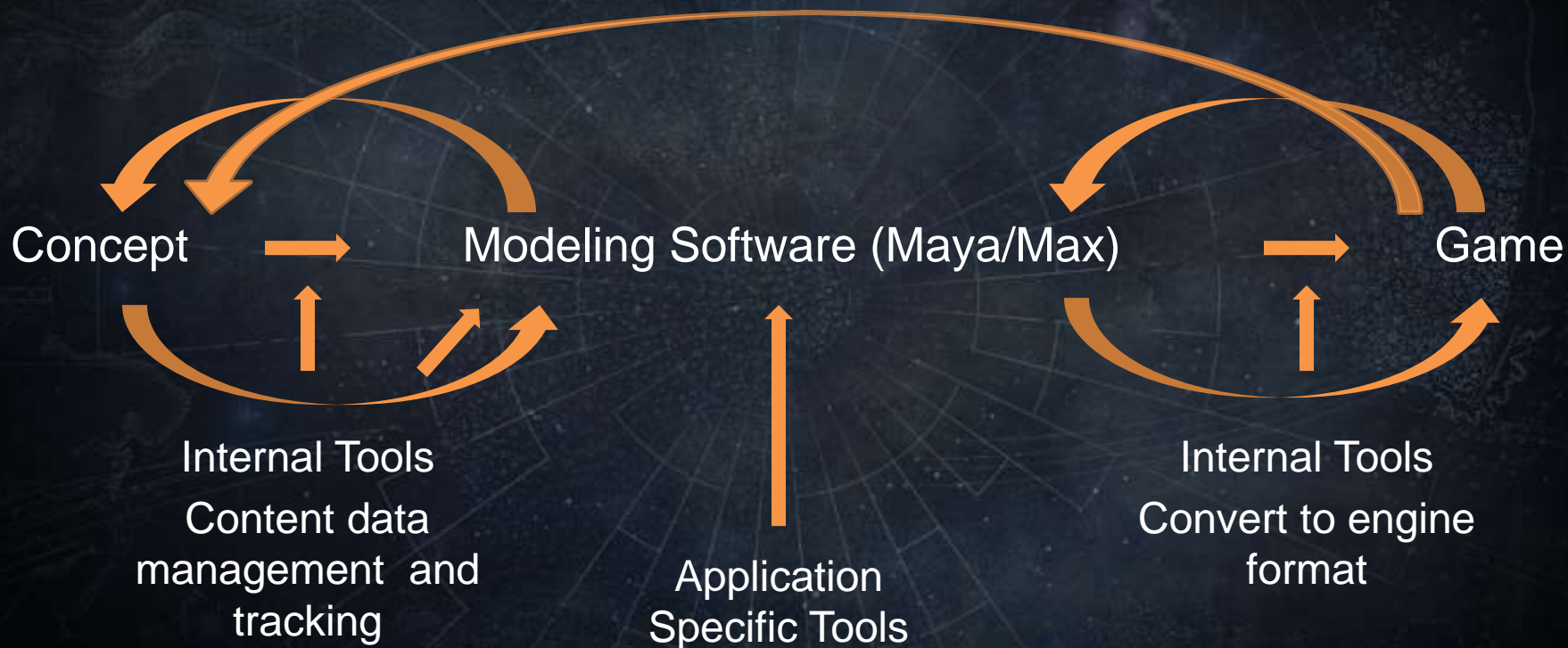
- Stylized Realism
- Distinct hair styles
- Fantasy Vibe





CREATING BELIEVABLE HAIR

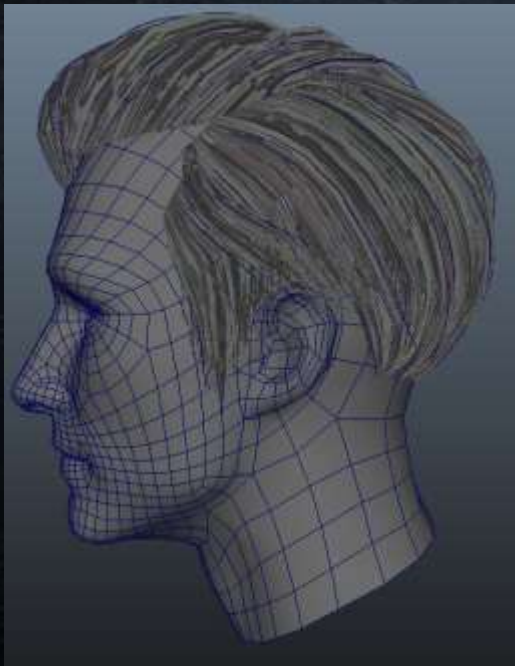
CONTENT PIPELINE



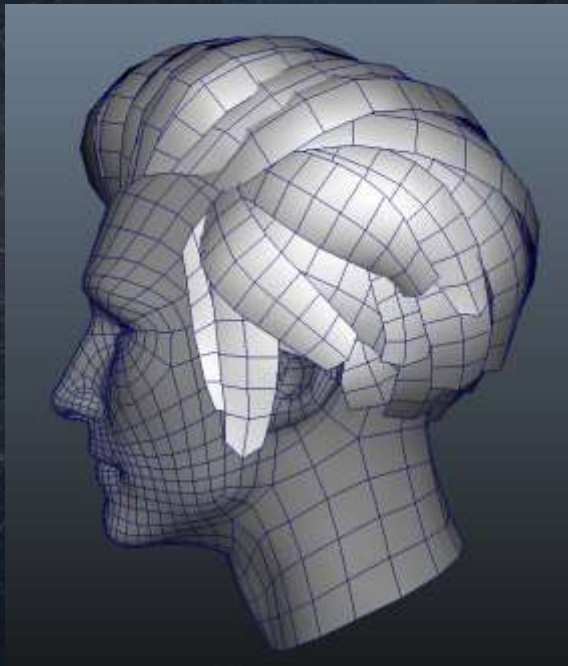
SHOULD HAIR BE BRUSHED OR SCULPTED?



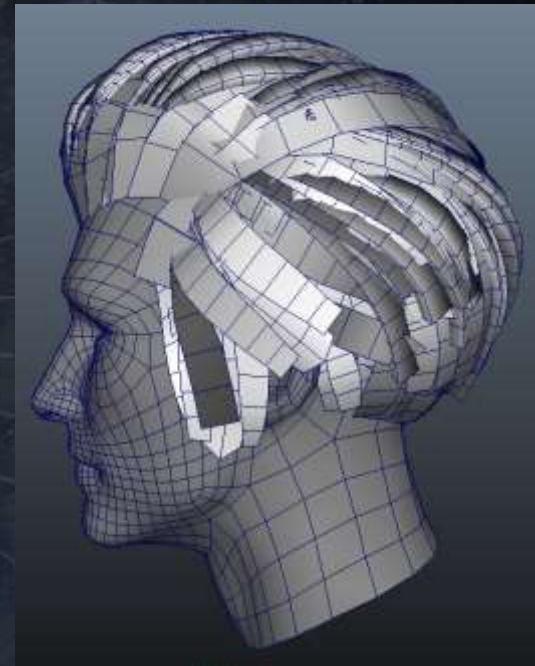
GEOMETRY CREATION



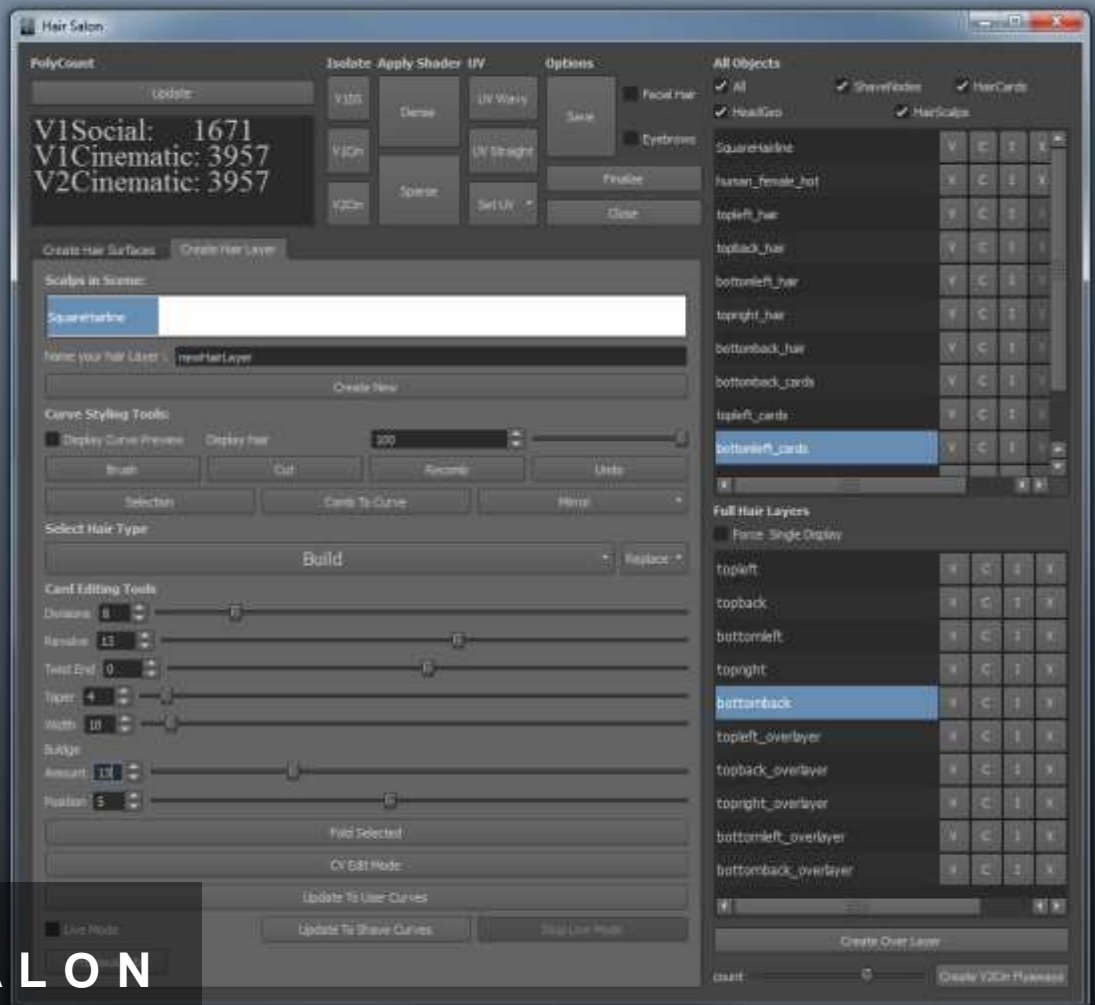
FUTURE PROOF



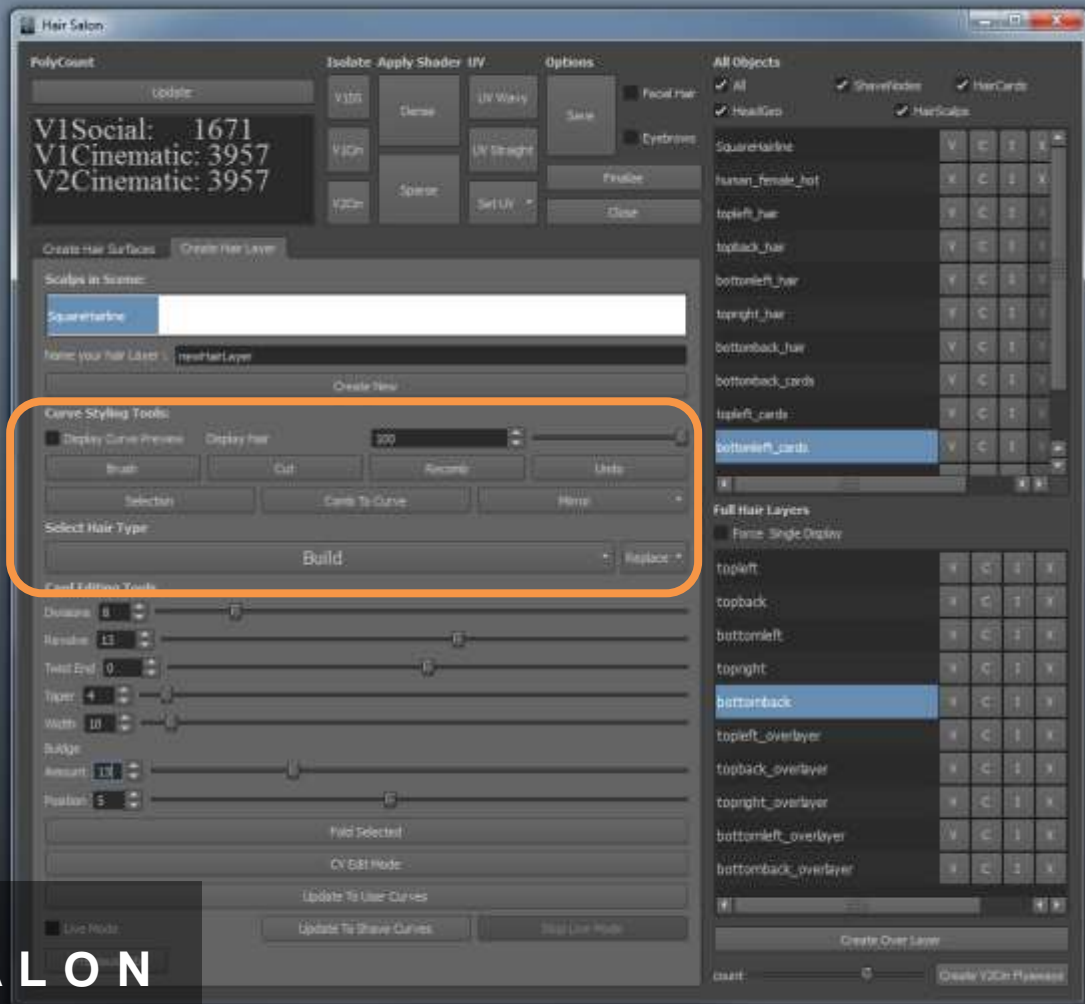
EASY TO CREATE



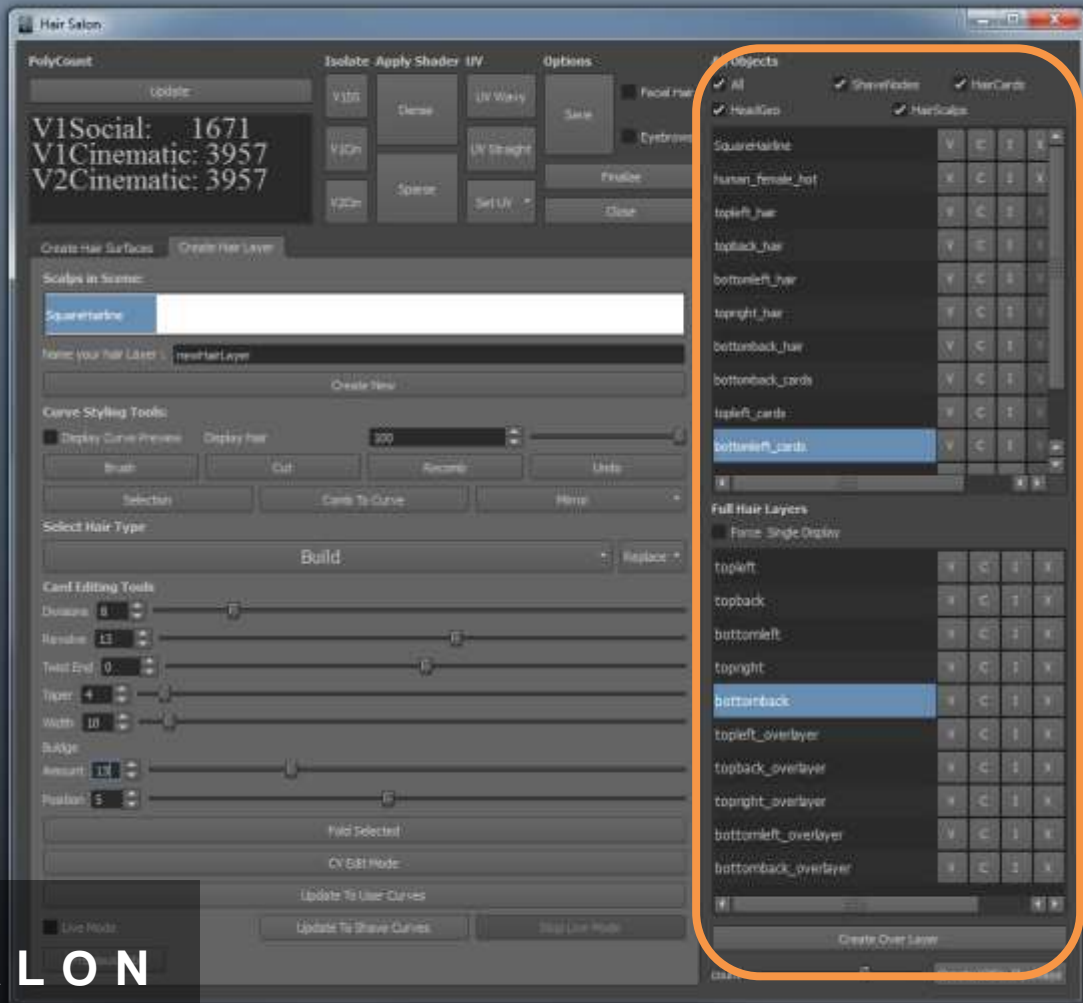
AUTOMATED ASPECTS



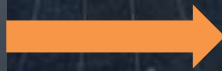
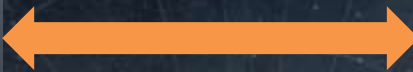
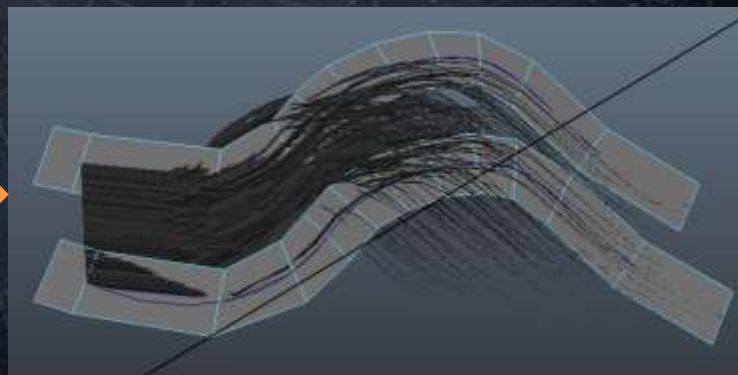
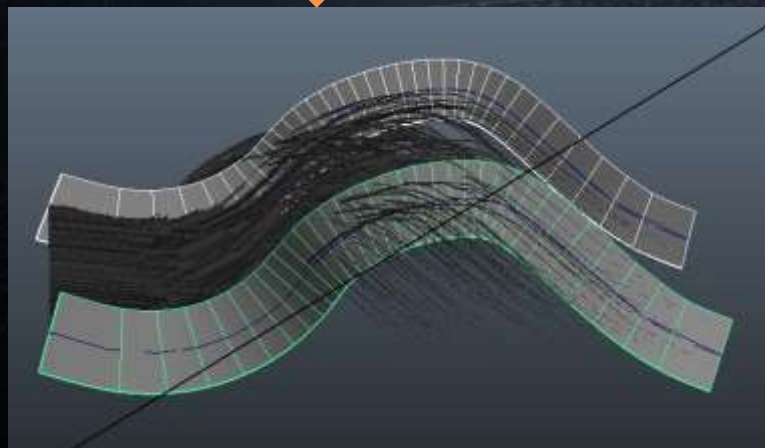
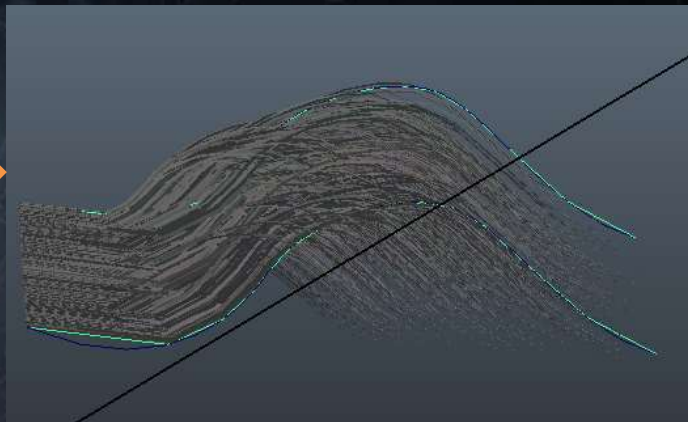
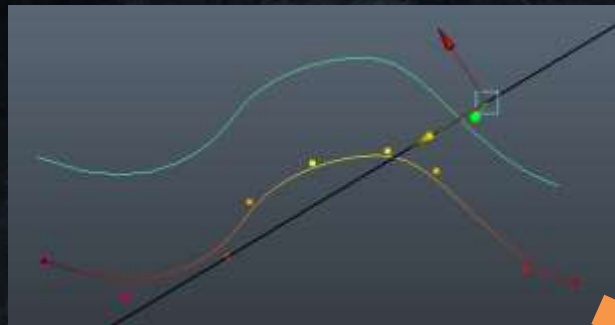
BUNGIE'S HAIR SALON



BUNGIE'S HAIR SALON



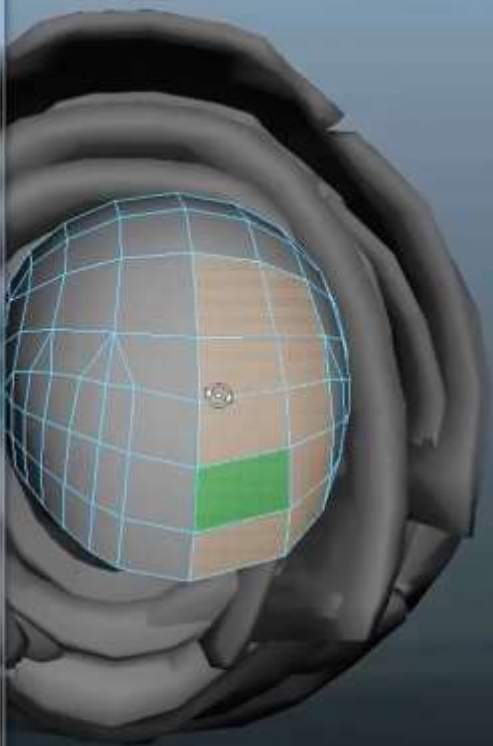
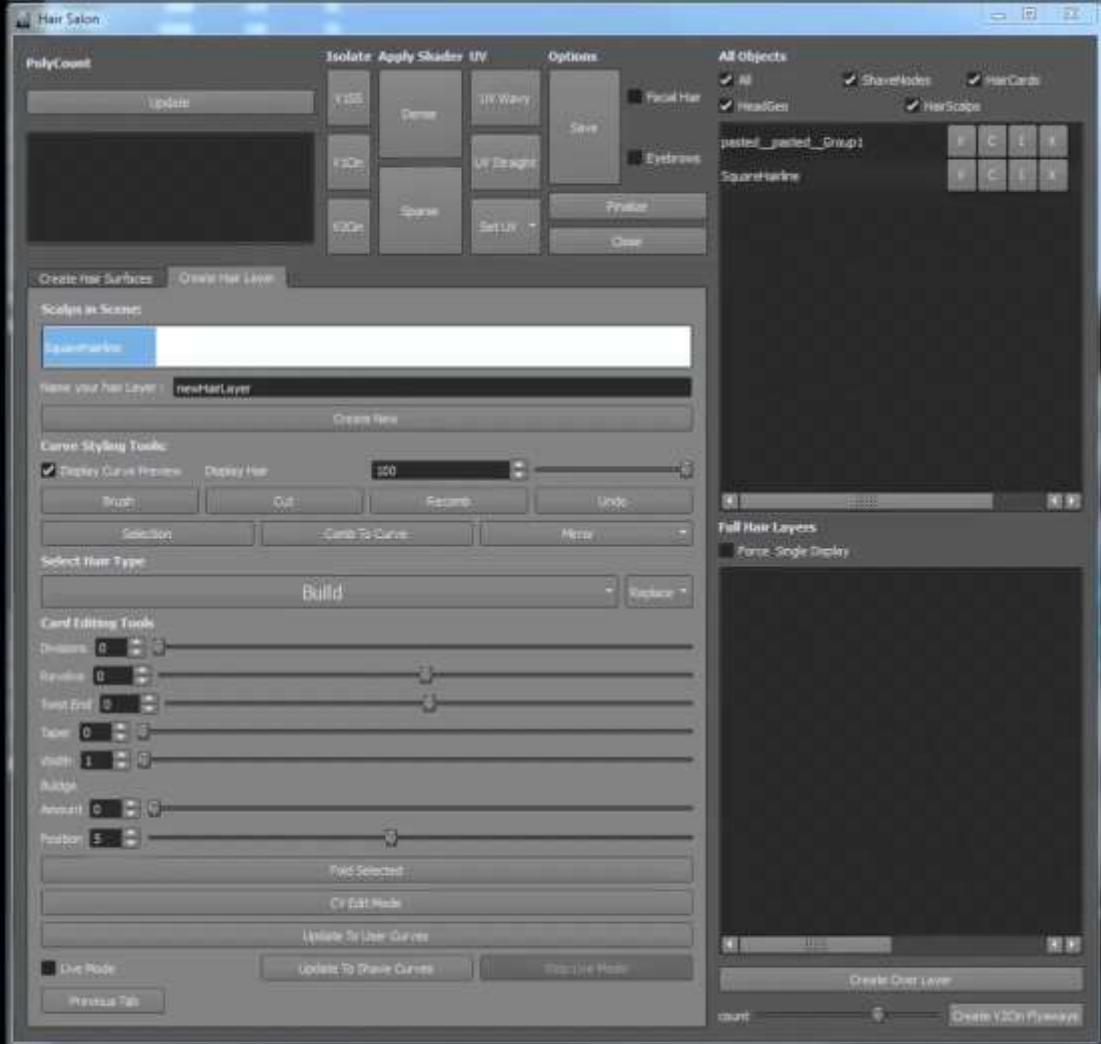
BUNGIE'S HAIR SALON

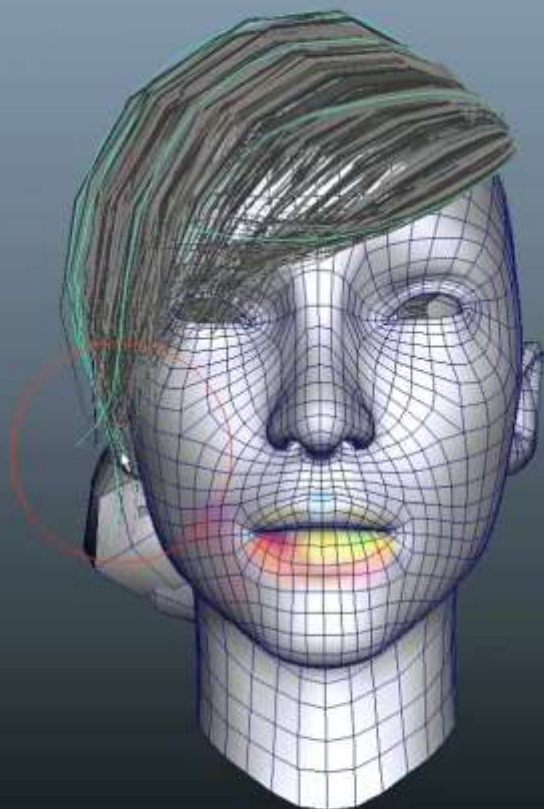
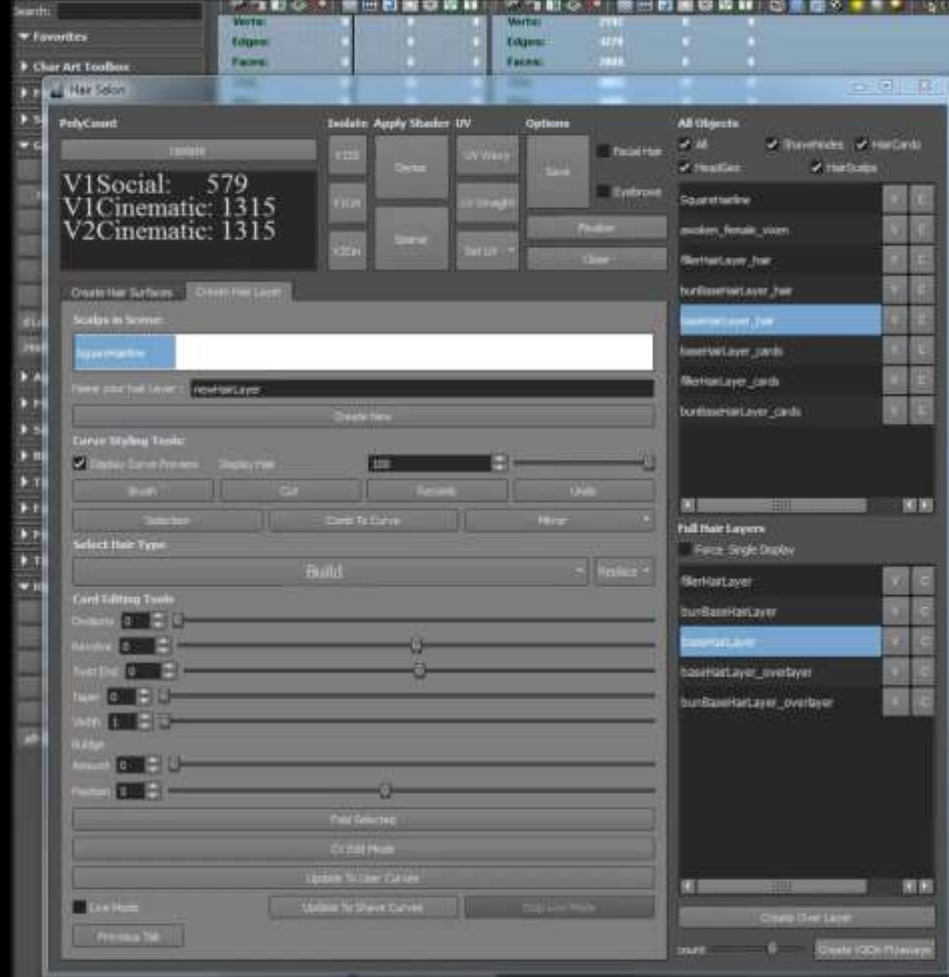


```
'''Hair Card Generation'''
#create user curves and shave guide curves based on the artist's desired workflow
#artist can either start with their own curves or curves created by shave
if user_curves:
    shave_guide_curves = user_curves
else if shave_guide_curves:
    user_curves = shave_guide_curves

#attach paint effects to curves
select(user_curves)
paint_effects = attach_brush_to_curves()

for pfx in paint_effects:
    #set initial attributes to give the appearance of hair card
    pfx.flatness.set(0)
    ...
    #create and prepare extruded card so placement matches paint effect
    extrude_card = duplicate(pfx)
    convert_to_poly(extrude_card)
    pm.delete(extrude_card.f[1: len(extrude_card.f) - 1])
    #poly extrude edge along the paint effects associated curve
    poly_extrude = poly_extrude_edge(extrude_card.e[1], input_curve = get_curve_connected(pfx).getShape())
    #wrap deform so extruded card follows paint effect
    wrap_deform(extrude_card, pfx)
```





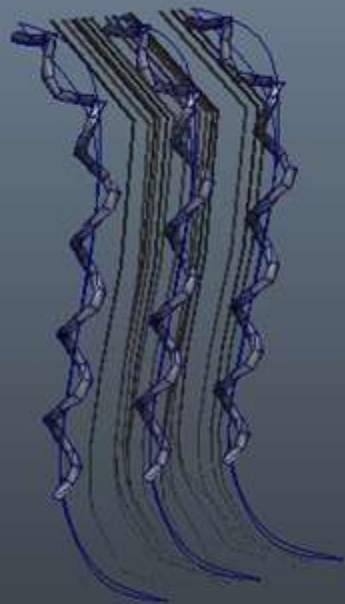
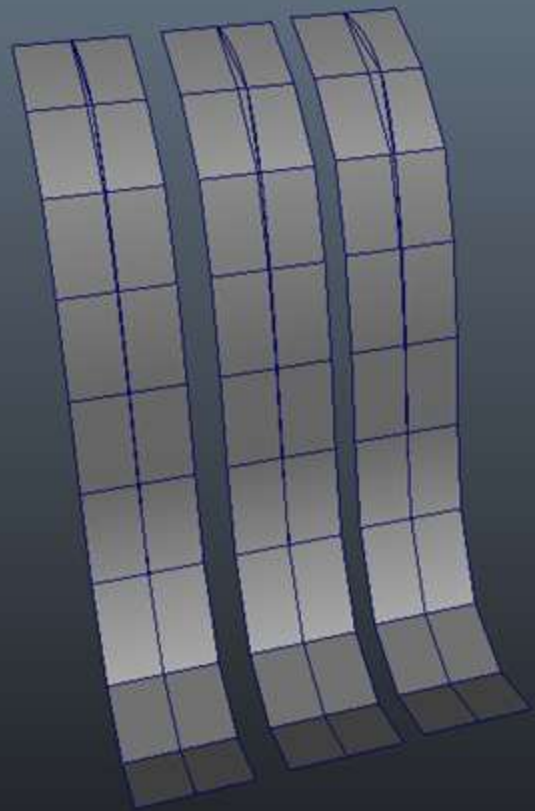
```
'''LIVE UPDATE'''
#uses pyqt timer
#create timer
timer = QTimer
#based on desired time change - every 100th of a second call the update curves function
connect(timer, lambda x = active_curve_indices, y = shave_node: update_curves(x,y))
#start timer
timer.start()

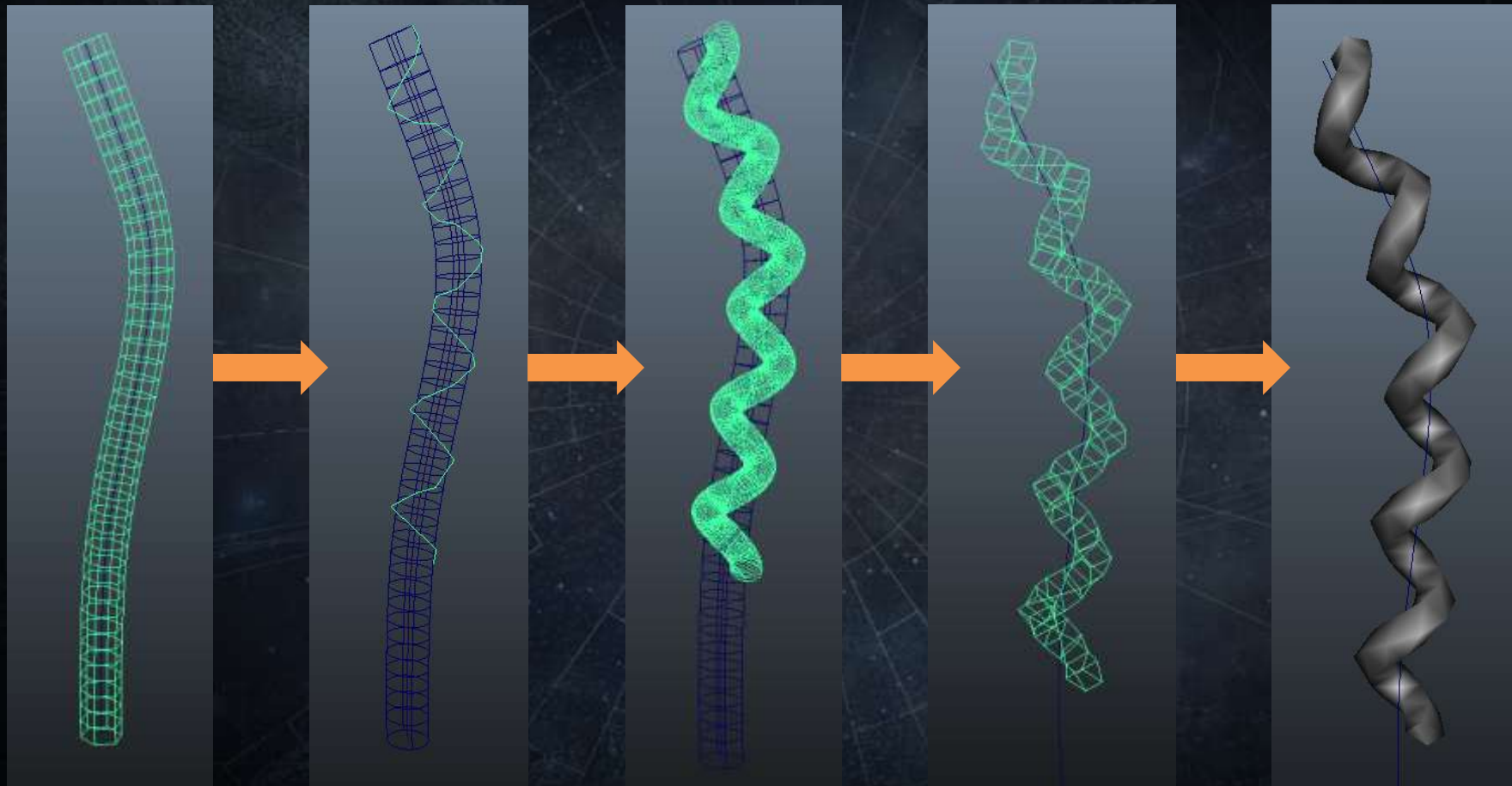
update_curves(active_curve_indices, shave_node):
    #convert current shave guides to new curves
    new_curves = shave_node.convert_guides_to_curves()
    #both sets of curves are generated from the same shave node so order is consistent
    #compare the current position of the active curves with the position of the new curves
    for c in active_curve_indices:
        for j, cv in enumerate(user_curves[c].cv):
            if cv.getPosition() != new_curves[c].cv[j].getPosition():
                #update user curves to match the new curves
                ...
    delete(new_curves)
```

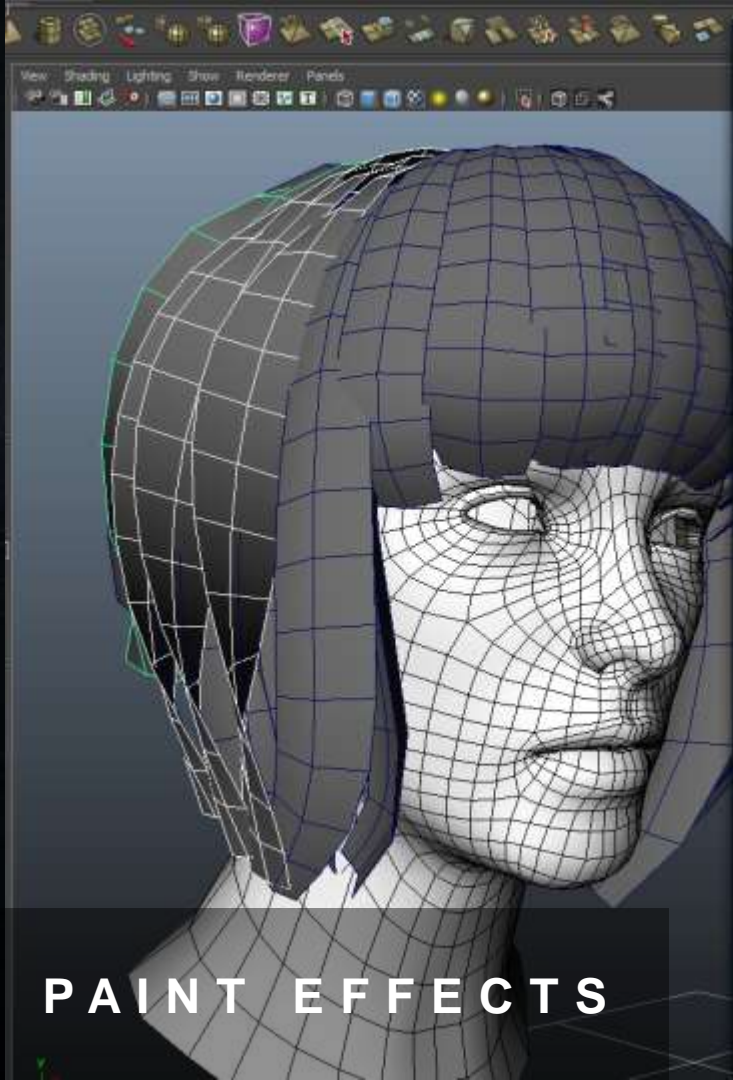
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    wrap_deform(extrude_card, pfx)
```







Hair Salon

PolyCount
Update
V1Social: 1733
V1Cinematic: 1733
V2Cinematic: 1733

Isolate VISE Dense UV Wavy UV Straight Sparse Set UV
Apply Shader UV
Options Parted Hair Eyebrows Fade Finalize Close

All Objects
✓ All ✓ ShowNodes ✓ Hair Cards
✓ InstSize ✓ HairScopes

SquareHairline V C
human_female_hot V C
main_hair V C
FB01_hair V C
FB03_hair V C
FB02_hair V C
main_cards V C
FB03_cards V C
FB01_cards V C
FB02_cards V C

Full Hair Layers
Force Single Display
main V C
FB01 V C
FB03 V C
FB02 V C

Create Hair Surfaces Create Hair Layer

Scales In Scene:
SquareHairline

Name your hair Layer: newHairLayer
Create New

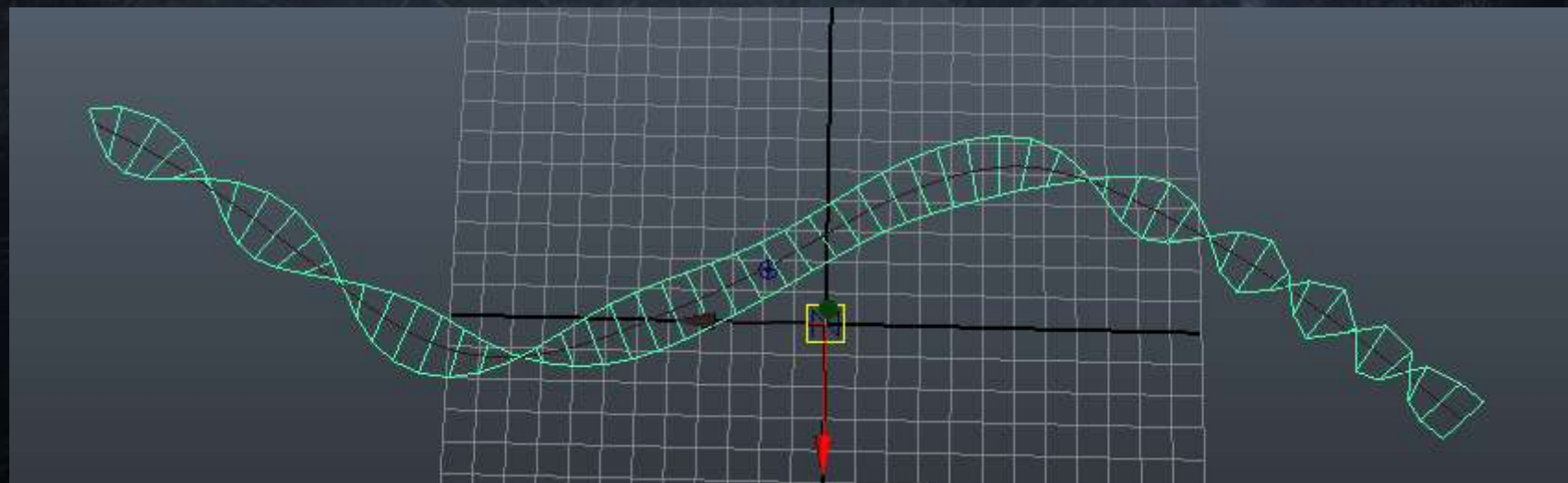
Curve Styling Tools
Display Curve Preview Display Hair 100
Brush Cut Recomb Undo
Selection Cards To Curve Mirror

Select Hair Type: Build Replace

Card Editing Tools
Division 16
Revolve -65
Twist End -243
Taper 7
Width 5
Subtype
Amount 11
Position 7
Fold Selected
CV Disk Mode
Update To User Curves
Live Mode Update To Shave Curves Stop Live Mode
Previous Tab

count Create V2Cn Flyaway

PAINT EFFECTS

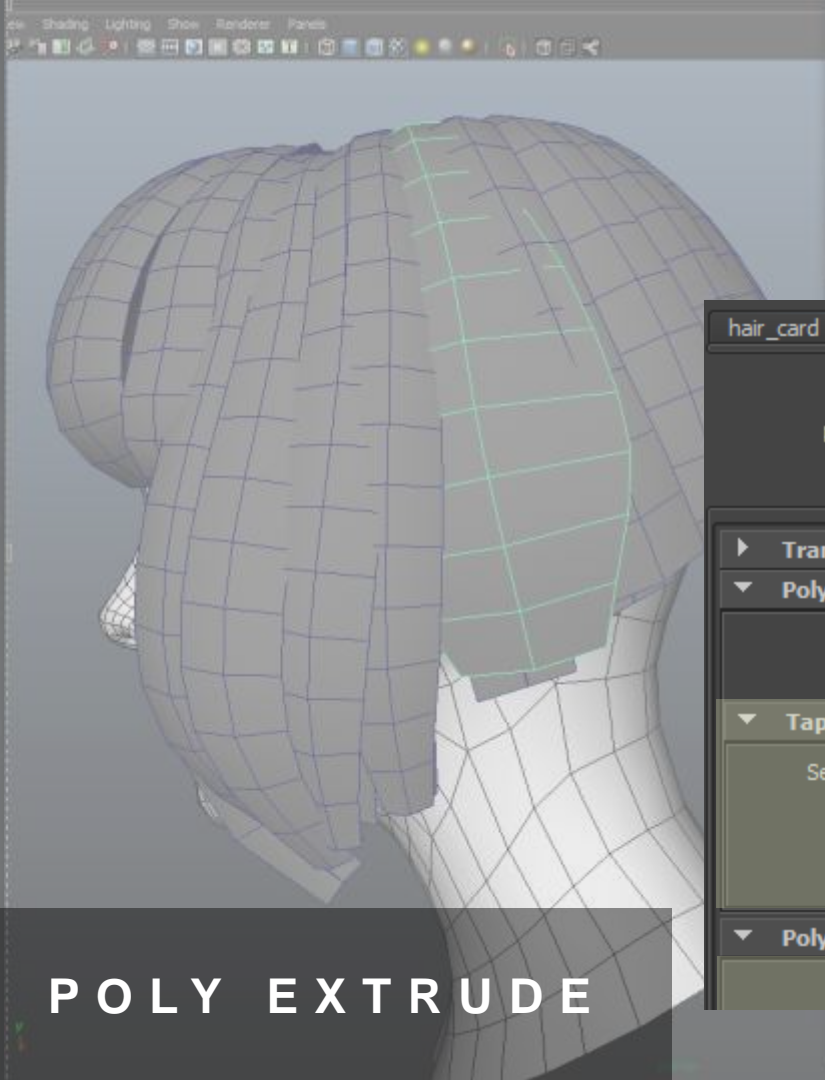


HAIR PFX

```
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    #poly extrude edge along the paint effects associated curve
    poly_extrude = poly_extrude_edge(extrude_card.e[1], input_curve = get_curve_connected(pfx).getShape())
    #wrap deform so extruded card follows paint effect
    wrap_deform(extrude_card, pfx)
```

Hair Salon

PolyCount

Updating

V1Social: 1733
V1Cinematic: 1733
V2Cinematic: 1733

Create Hair Surfaces Create Hair Layer

Scalps In Scene:

Isolate: Apply Shader UV Options

V2D Densit UV Wavy Save Facial Hair
V2On UV Straight Eyebrows
V2OH Sparse Set UV Finalize Close

All Objects

- All
- ShowNodes
- HairCards
- HeadGeo
- HairScalp

SquareHairline V C
human_female_hot V C
man_hair V C
R01_hair V C
R03_hair V C
R02_hair V C
man_cards V C
R03_cards V C
R01_cards V C
R02_cards V C

Full Hair Layers

Force: Single Display

- man V C
- R01 V C
- R03 V C
- R02 V C

Create Dye Layer

count Create V2On Polyways

hair_card hair_cardShape hair_card_poly_extrude deleteComponent3

polyExtrudeEdge: hair_card_poly_extrude

Focus
Presets
Show Hide

Transform Attributes

Poly Extrude Curve Attributes

Twist 0.000

Taper 1.000

Poly Extrude Edge History

Divisions 25

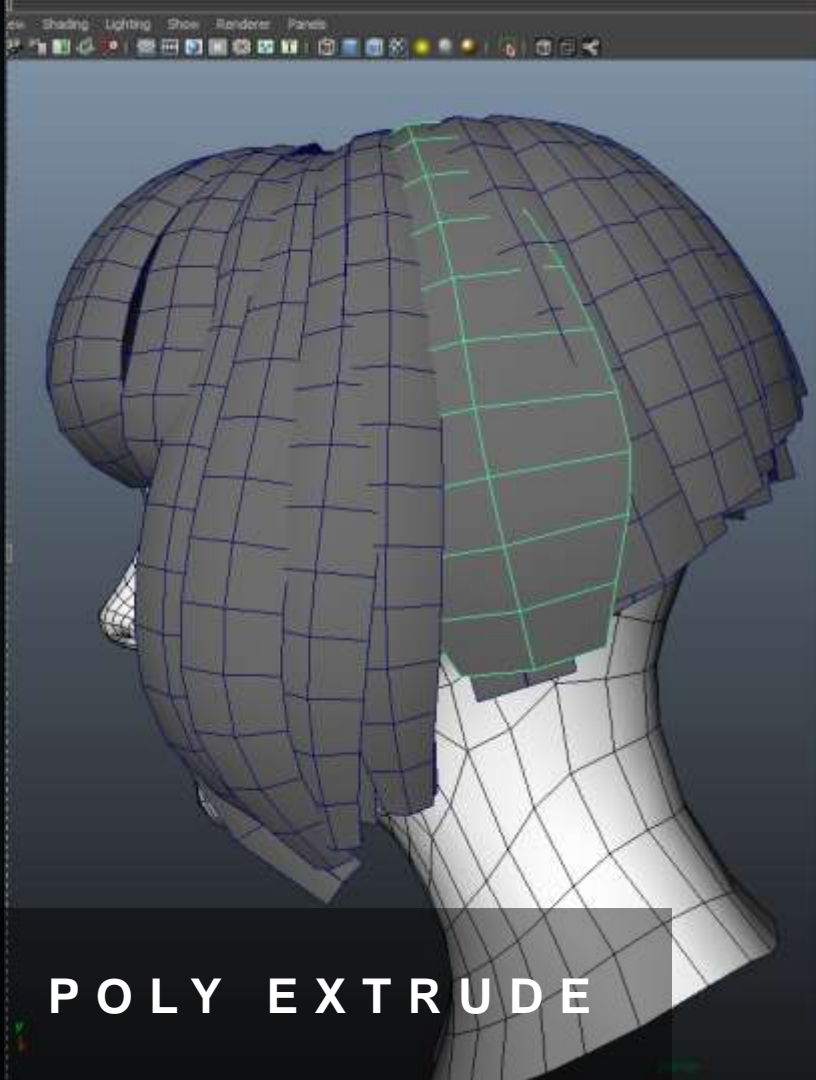
Taper Curve

Selected Position 0.270

Selected Value 0.780

Interpolation Linear

POLY EXTRUDE



POLY EXTRUDE

Hair Salon

PolyCount

Update

V1Social: 1733
V1Cinematic: 1733
V2Cinematic: 1733

Isolate: Apply Shader UV Options

V2DS Deno UV Wavy Save Facial Hair
V1On UV Straight Finalize Eyebrows
V2OH Sparse Set UV 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 Out Recomb Undo

Selection Comb To Curve Mirror

Select Hair Type

Build Replace

Card Editing Tools

Divisions 12

Radius 0

Twist End 0

Twist 21

Width 5

Bulge

Amount 13

Position 6

Fold Selected

Of Edit Mode

Update To User Curves

Live Mode Update To Shave Curves Stop Live Mode

Previous Tab

All Objects

✓ All ✓ ShaveNodes ✓ HairCards
✓ HeadGeo ✓ HairScalp

SquareHairline V C
human_female_hot V C
man_hair V C
R01_hair V C
R03_hair V C
R02_hair V C
man_cards V C
R03_cards V C
R01_cards V C
R02_cards V C

Full Hair Layers

Force: Single Display

man V C
R01 V C
R03 V C
R02 V C

Create Dye Layer

count Create V2On Flyaways

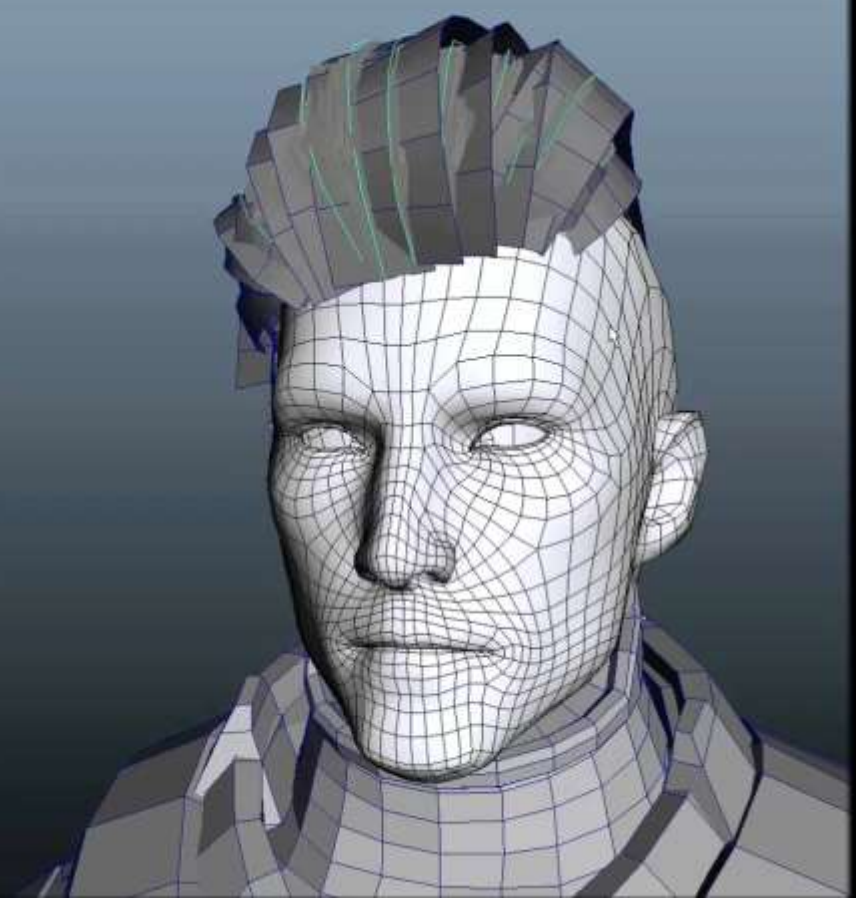
PolyCount
 V1Social: 780
 V1Cinematic: 780
 V2Cinematic: 780

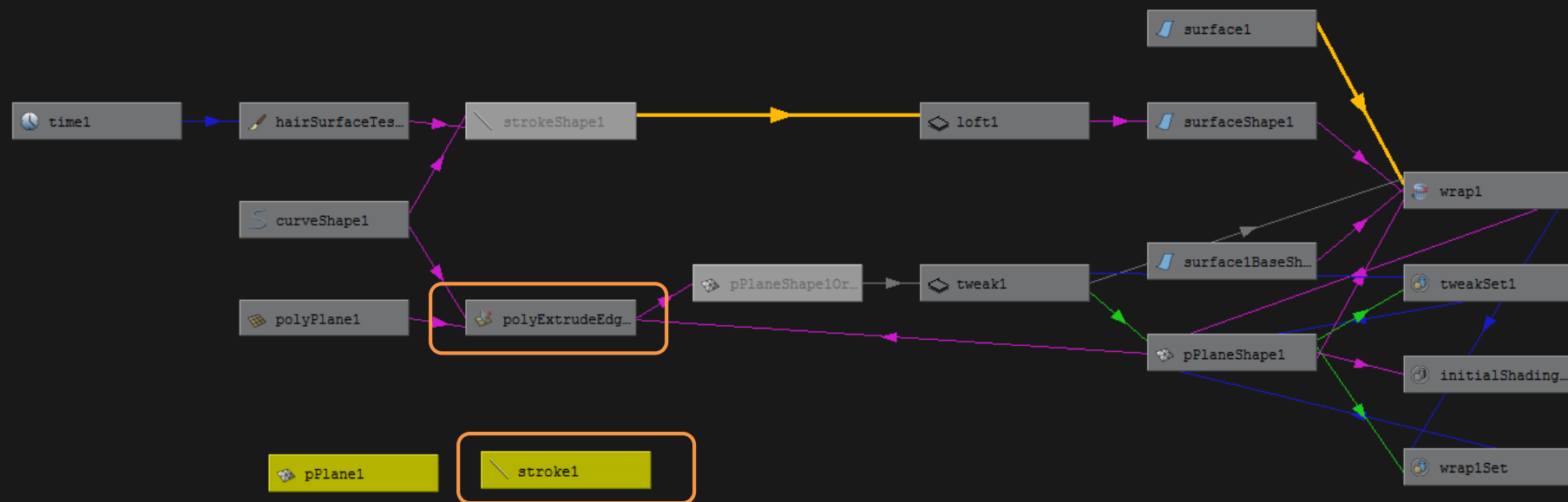
Isolate Apply Shader UV Options
 Facial Hair
 Eyebrows
 Save
 Finish
 Done

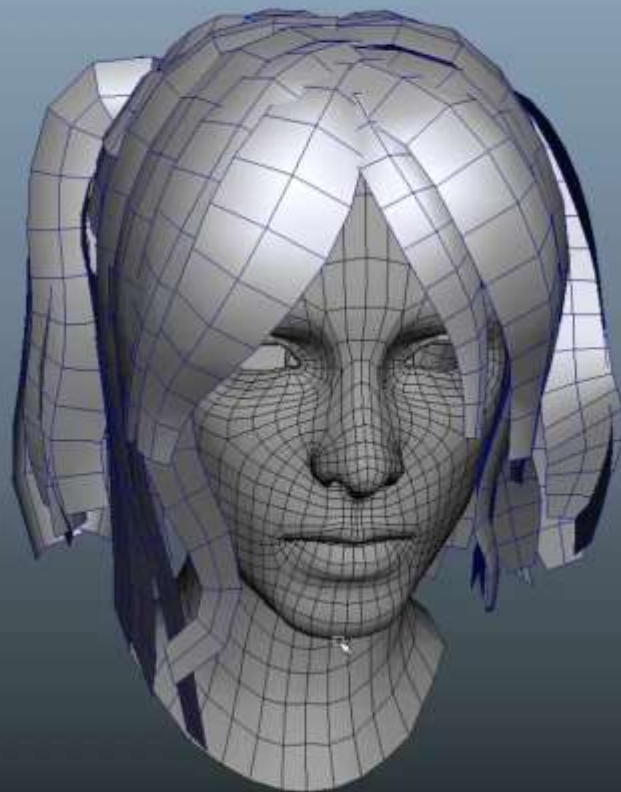
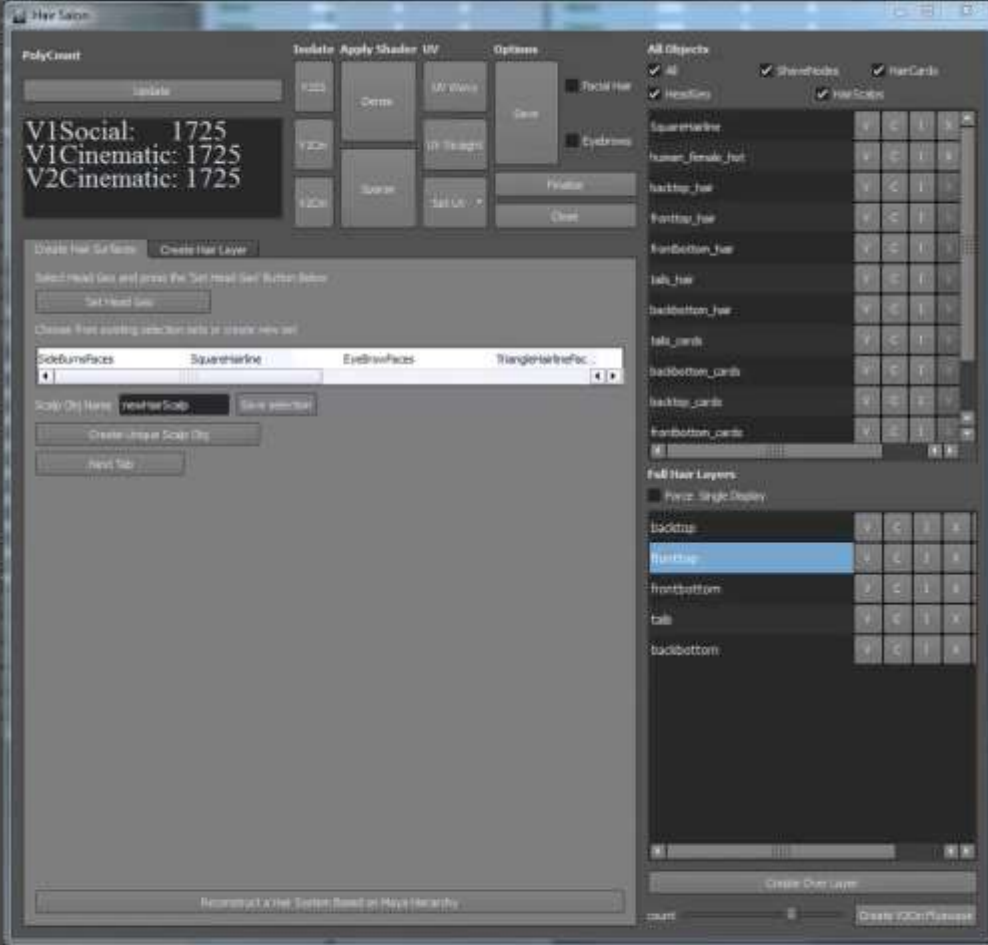
Create Hair Surface Create Hair Layer
 Select Head Cap and press the "Set Head Cap" button below.
 Set Head Cap
 Choose Hair-casting selection sets to create new set.
 SideburnPieces SquarHairline EyebrowPieces TriangularHairPic
 Build Obj Name newHairCap Save selection
 Create Unique Sub-Obj
 Next Tab
 Reconstruct a Hair System Based on Place Hierarchy

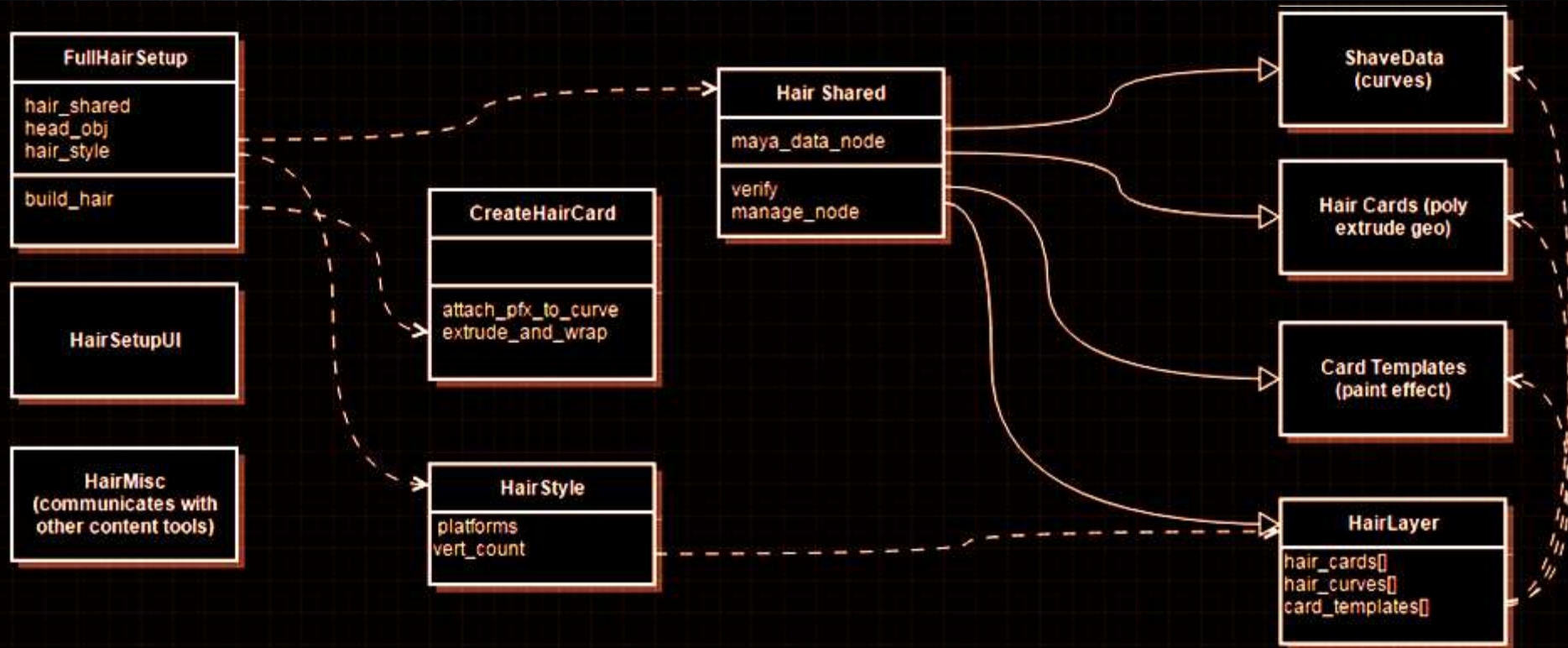
All Objects
 All ShowNodes HairCards
 HeadSkin HairCops
 SquarHairline
 awoken_male_pony_Straighten
 newHairLayer_02_hair
 newHairLayer_02_hair
 Hair01_hair
 newHairLayer_02_cards
 Hair01_cards
 newHairLayer_01_cards

Full Hair Layers
 HairC Single Display
 newHairLayer_02
 newHairLayer_01
 Hair01
 Create Hair Layer
 Create VOP Placer

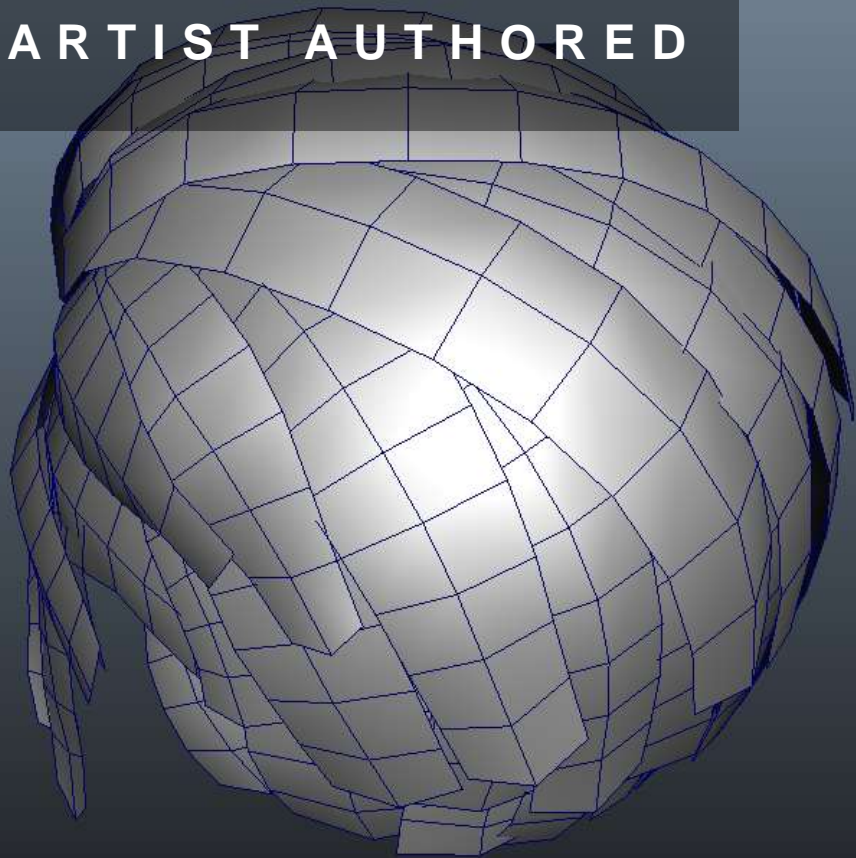








ARTIST AUTHORED

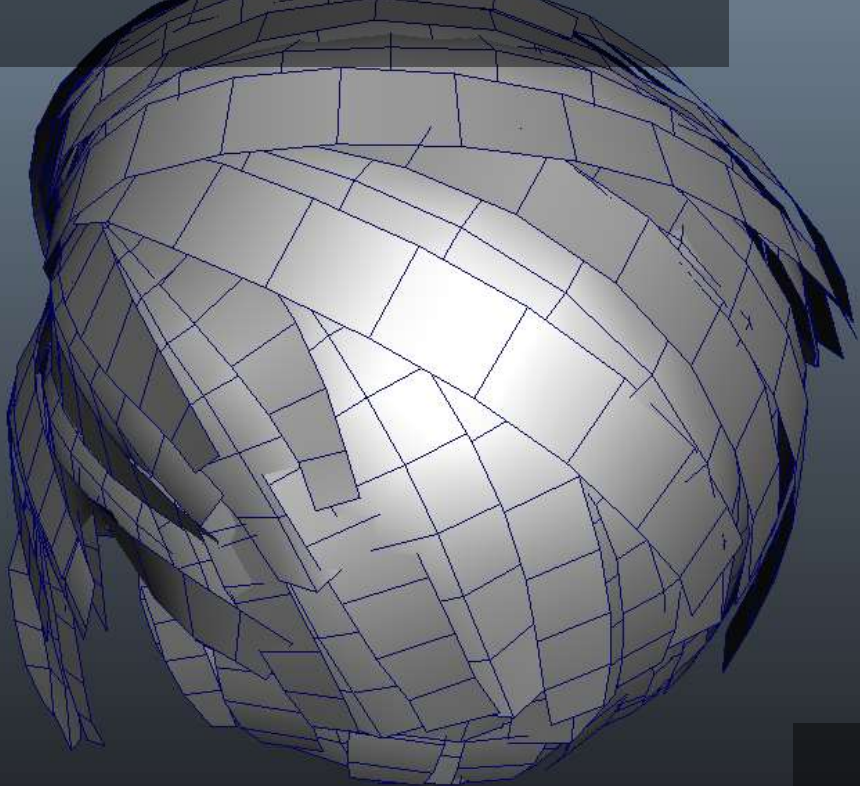


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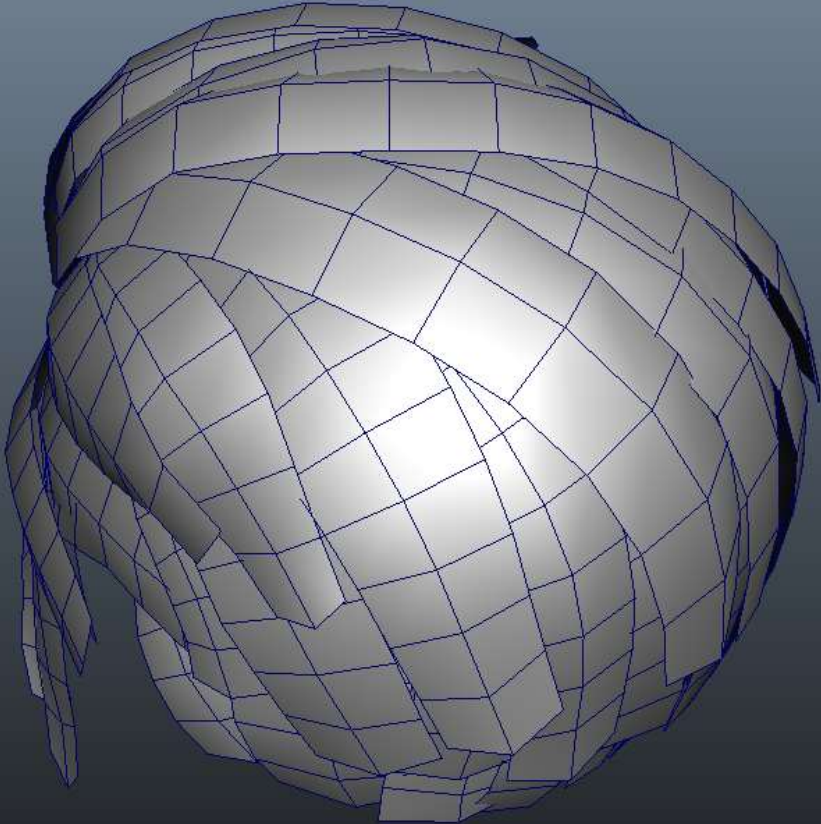


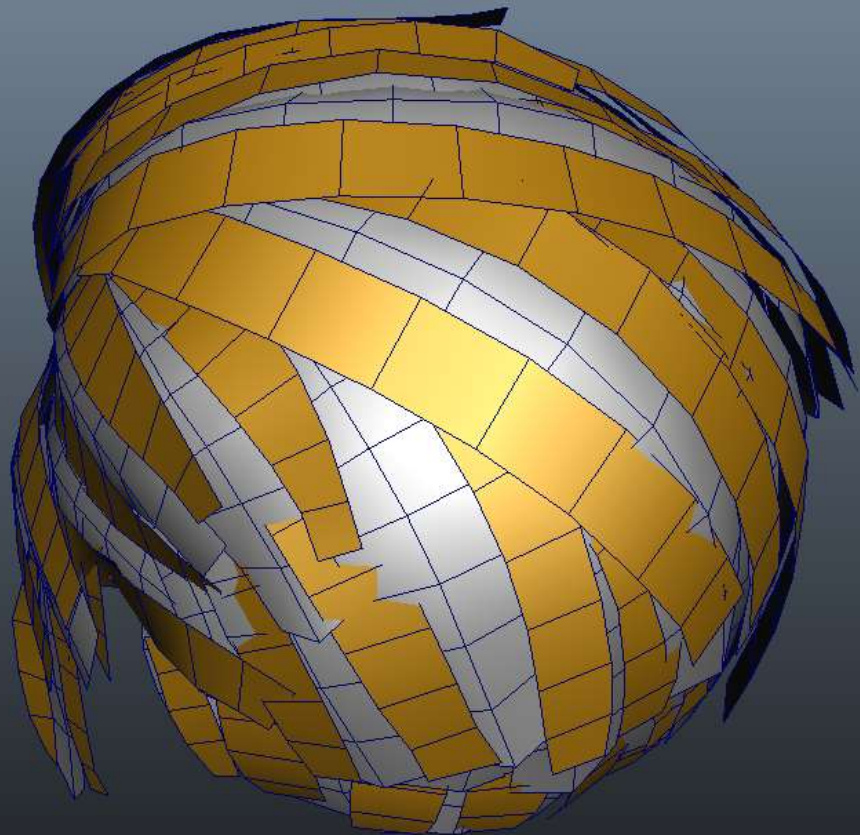
LAST GEN GAMEPLAY

OVERLAYER

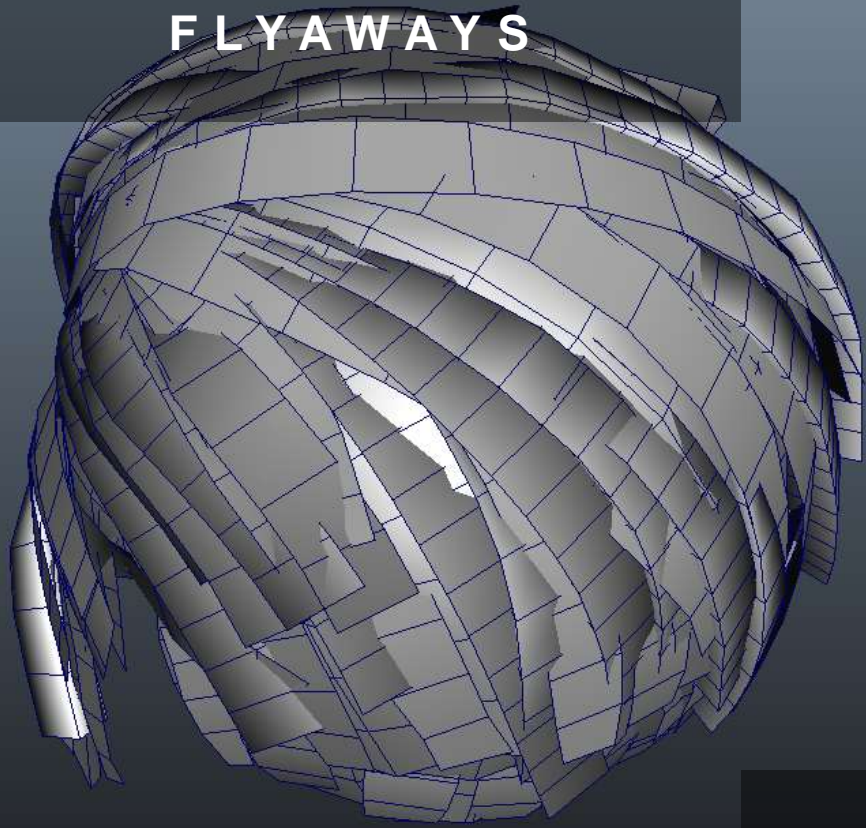


LAST GEN CINEMATICS AND
CURRENT GEN GAMEPLAY

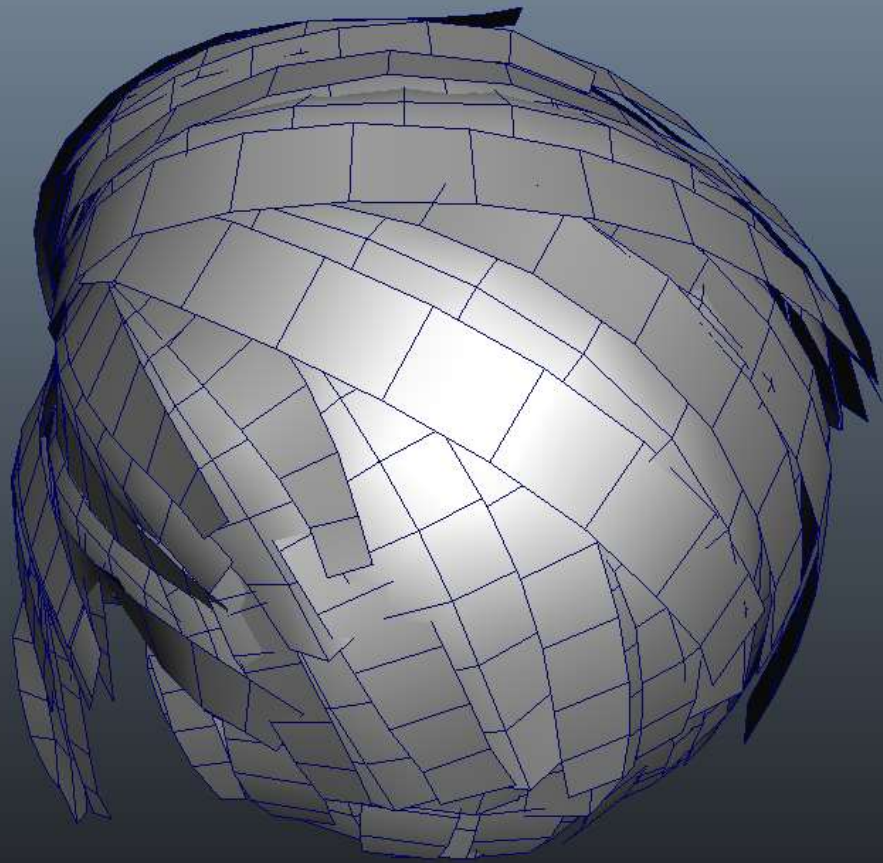


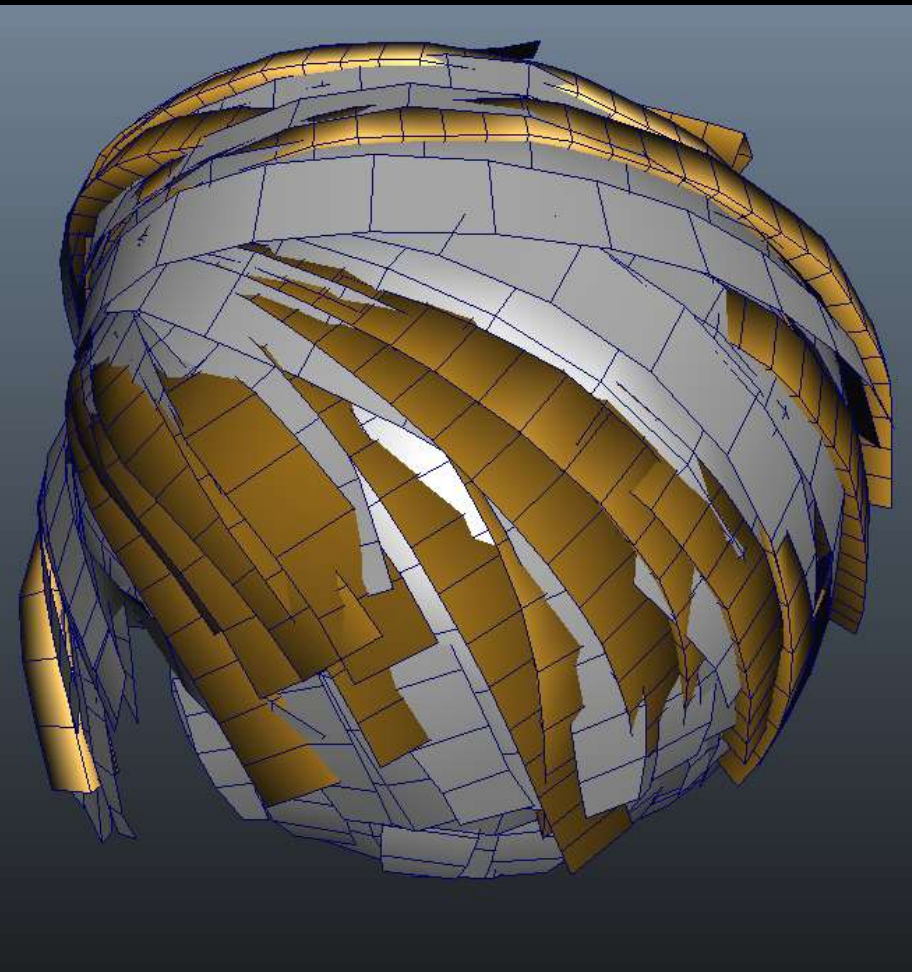


FLYAWAYS



CURRENT GEN CINEMATICS





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AUTOMATED ASPECTS

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LAST GEN GAMEPLAY

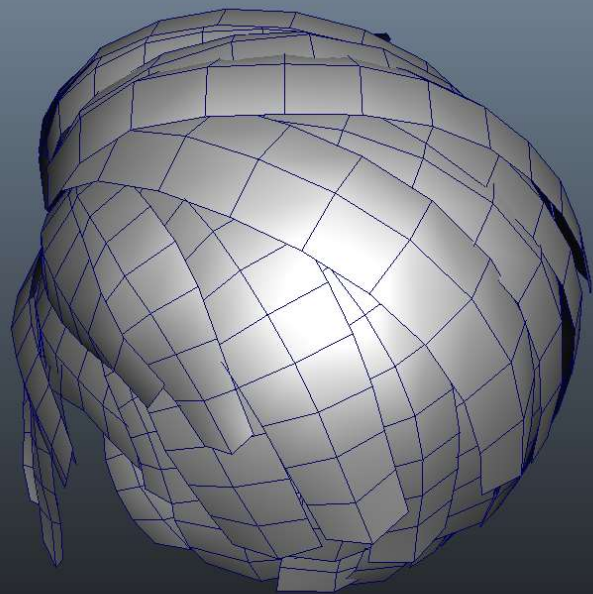


LAST GEN CINEMATIC
AND CURRENT GEN
GAMEPLAY

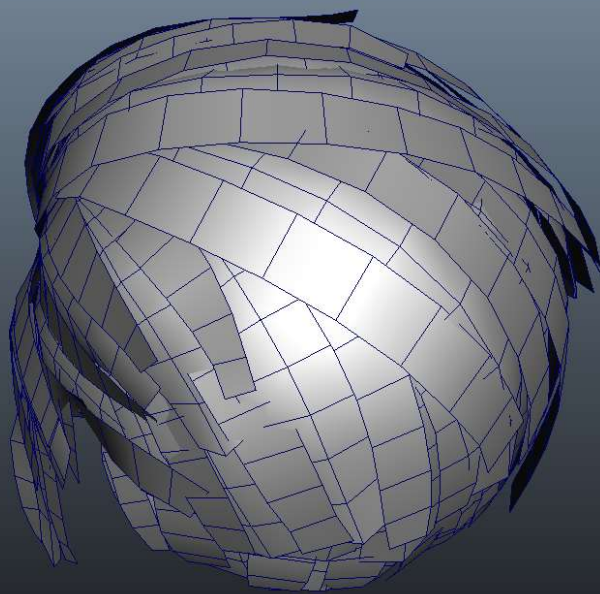


CURRENT GEN CINEMATIC

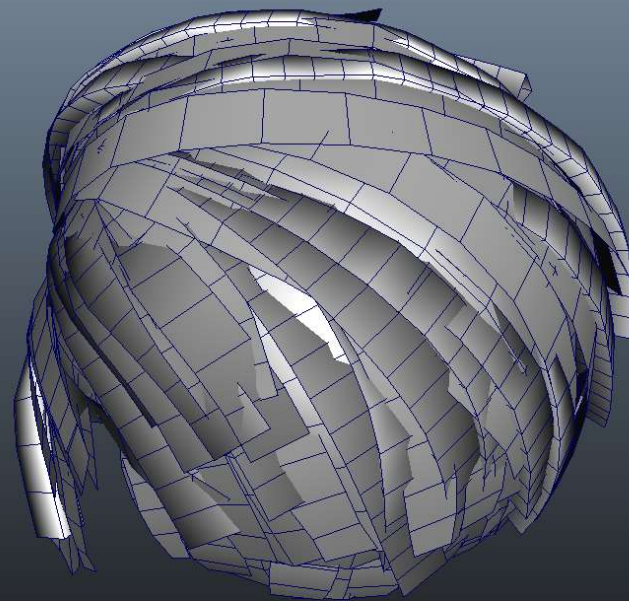
AUTOMATED ASPECTS



LAST GEN GAMEPLAY



LAST GEN CINEMATIC
AND CURRENT GEN
GAMEPLAY

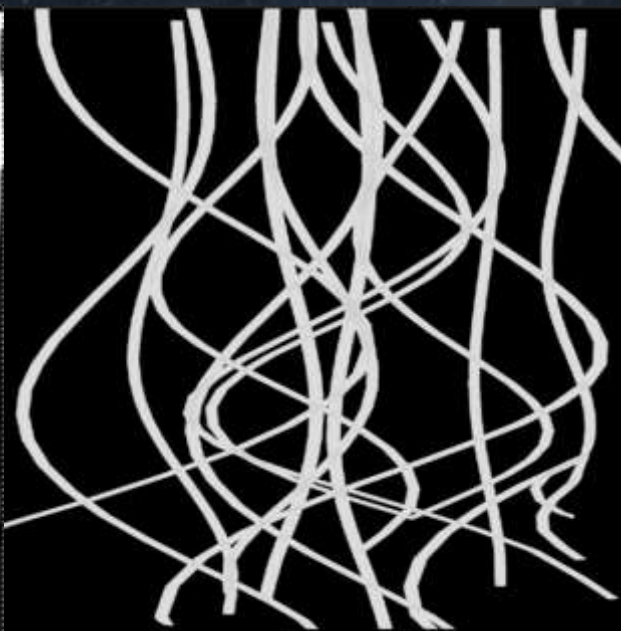


CURRENT GEN CINEMATIC

AUTOMATED ASPECTS



LAST GEN GAMEPLAY

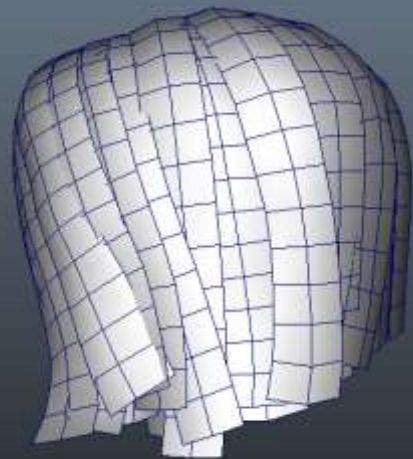


LAST GEN CINEMATIC
AND CURRENT GEN
GAMEPLAY

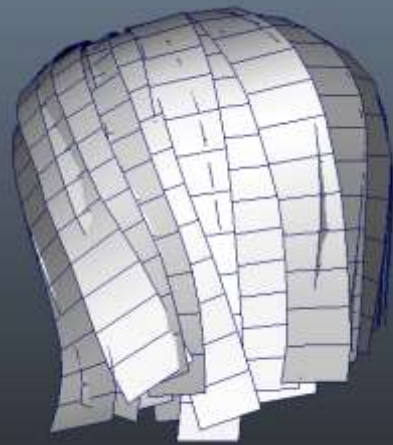


CURRENT GEN CINEMATIC

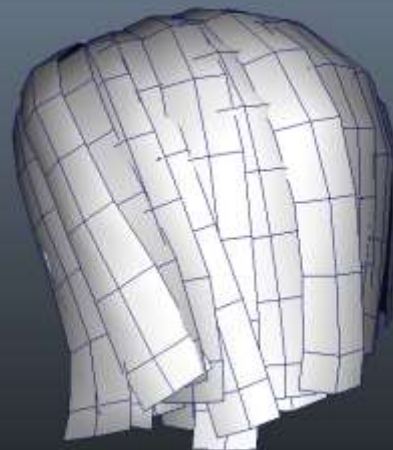
DECIMATION



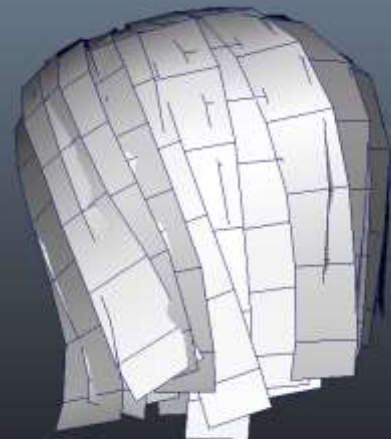
1305



870

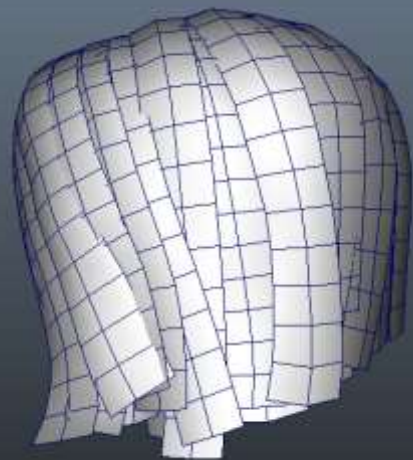


719

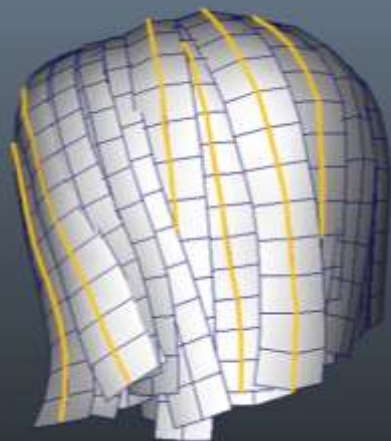


510

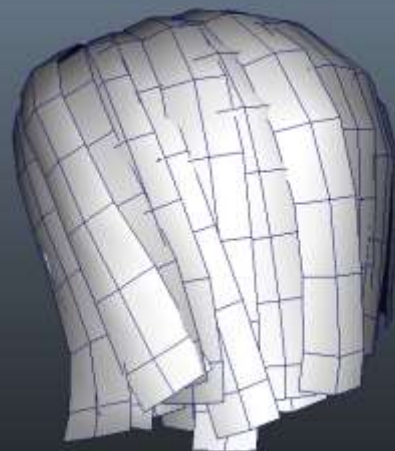
DECIMATION



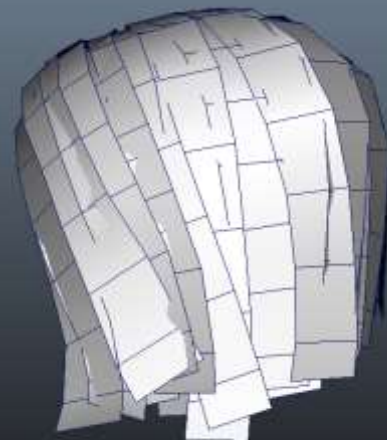
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870

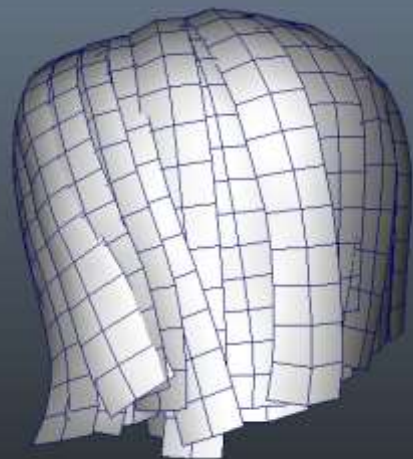


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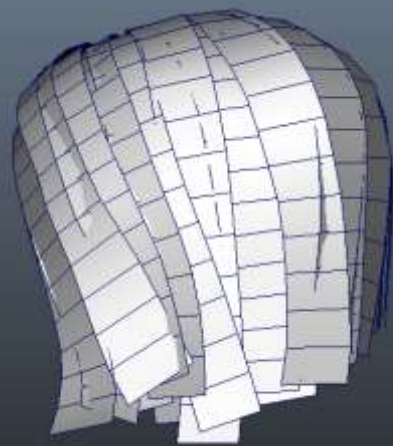


510

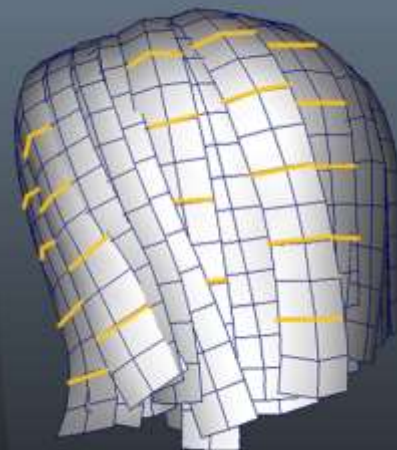
DECIMATION



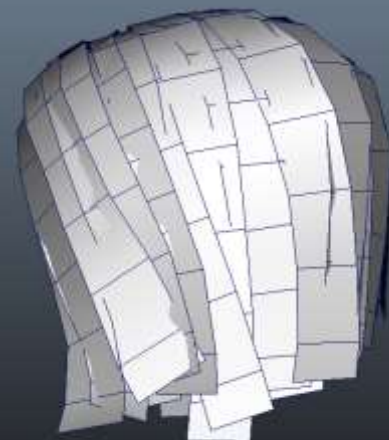
1305



870

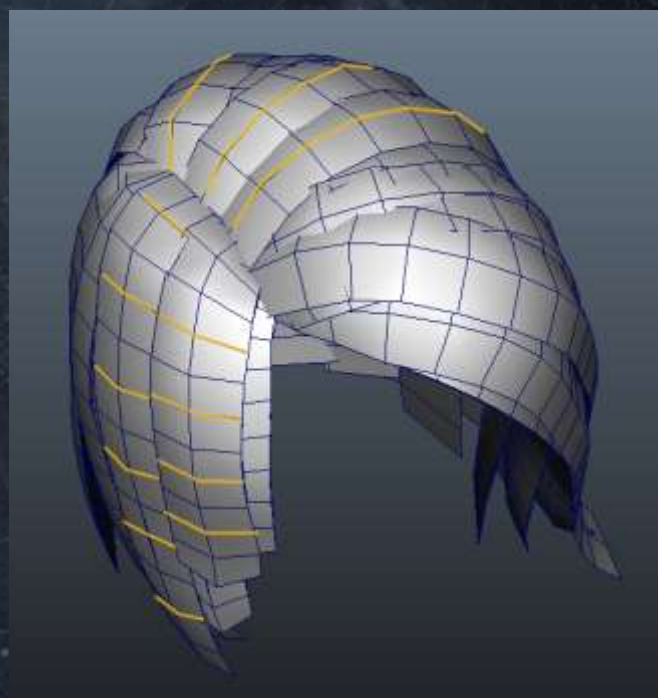
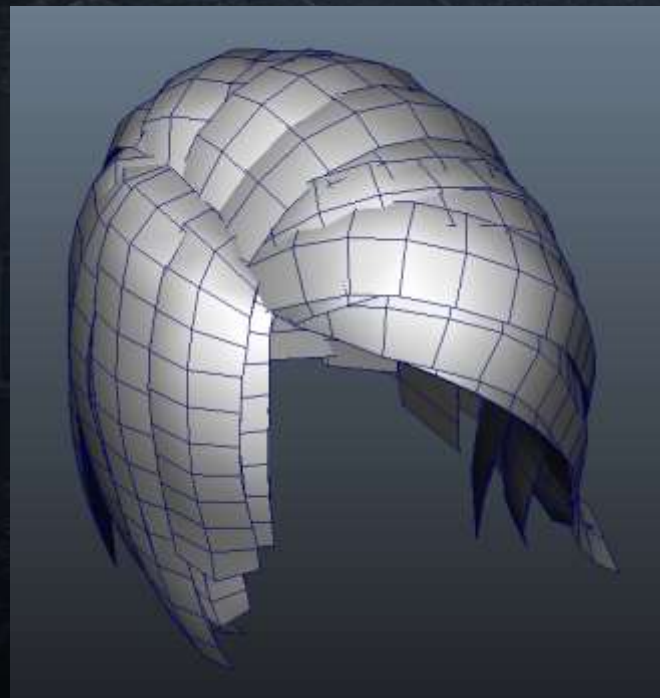


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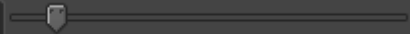


510

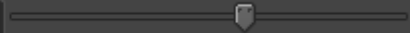
DECIMATION



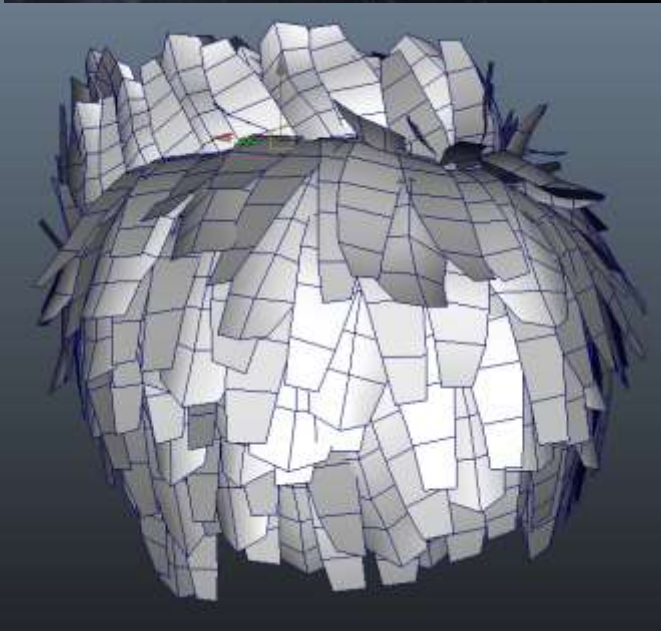
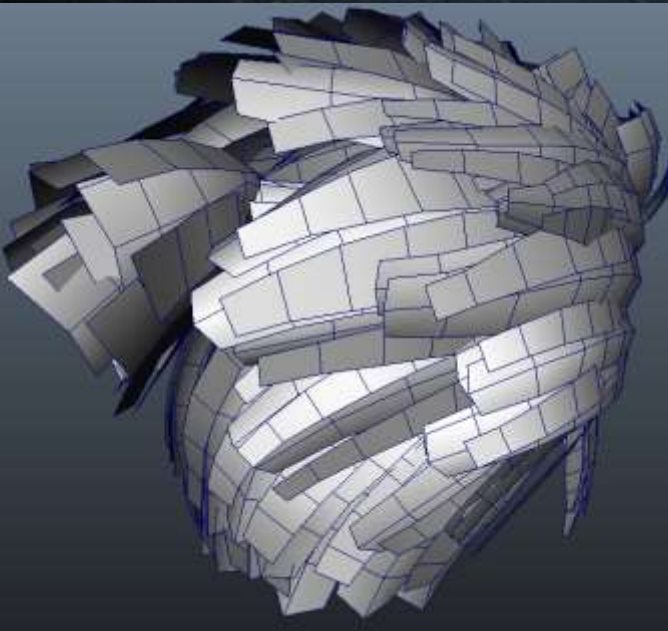
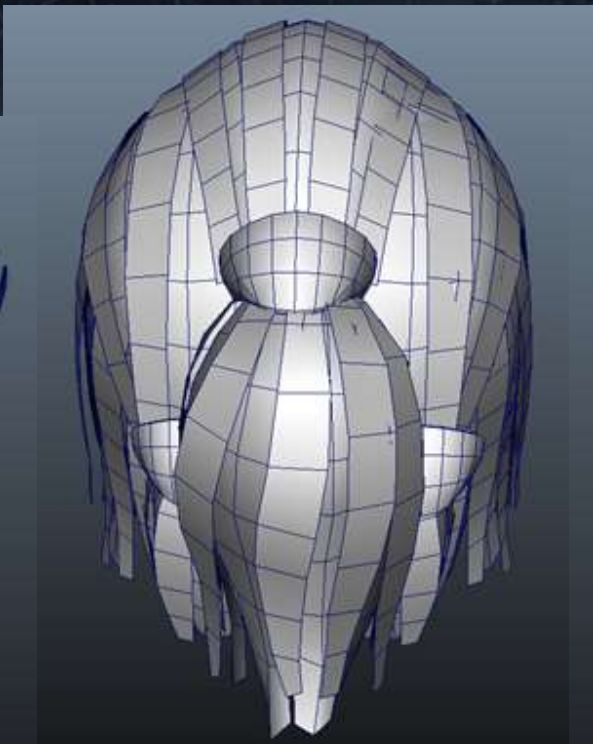
Fold Threshold 0.200

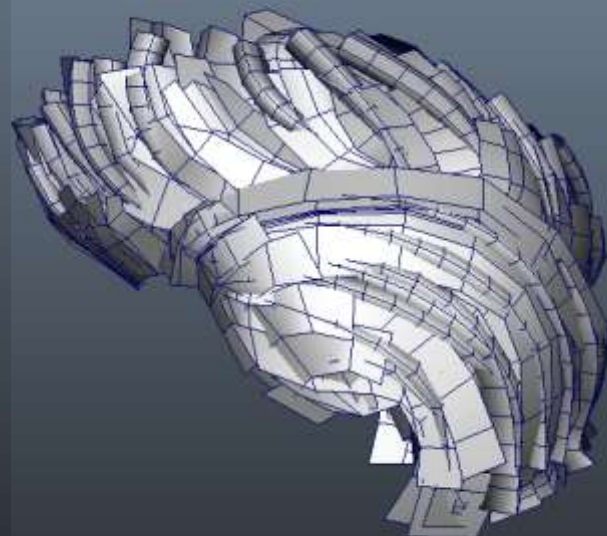
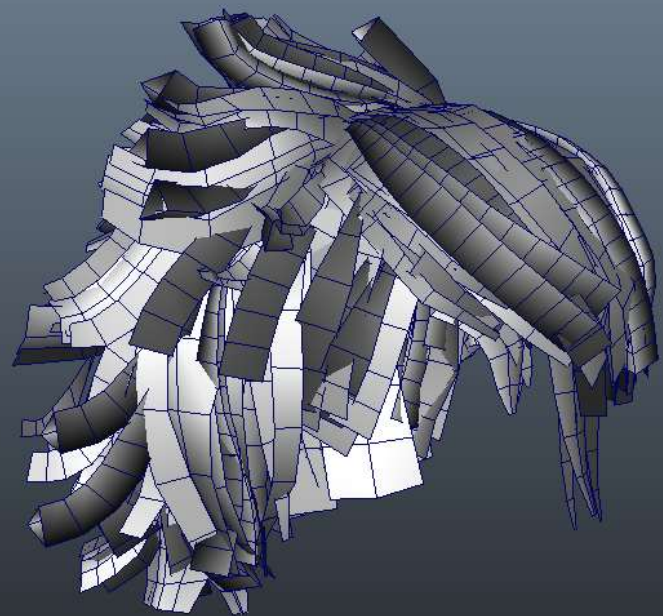
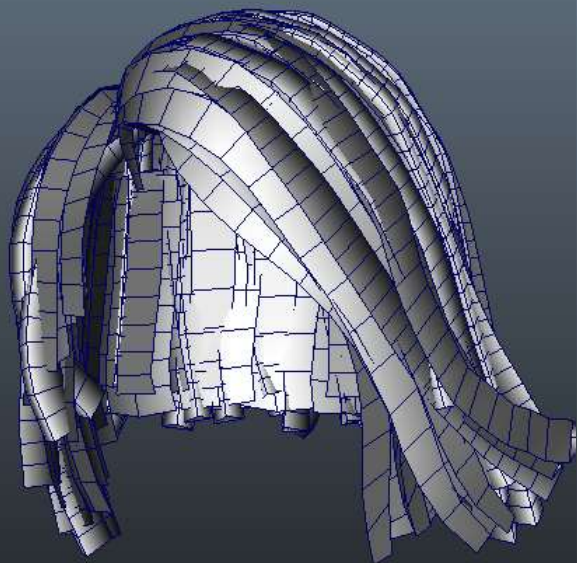


Curvature Threshold 1.200



720







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FUTURE WORK

- Improve live update in complex scenes
- Tool support for hairline polish
- Create more varied hair types, coarse, curly, etc.
- Allow for twisting along the length of the hair card - hpx

SPECIAL THANKS

ART

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SHIKAI WANG

TECH ART

TOM SANOCKI
JASON GARRIS JONES

ENGINEERING

NATASHA TATARCHUK
BRAD LOOS