Innovations in The Sims 4 Character Creator

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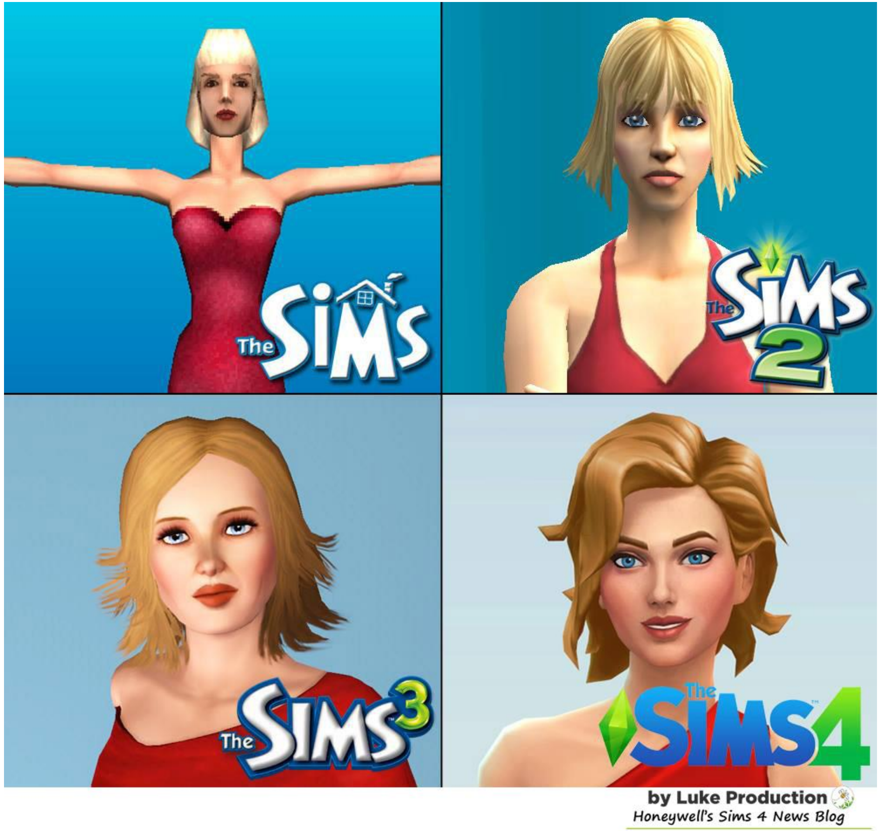
The Sims

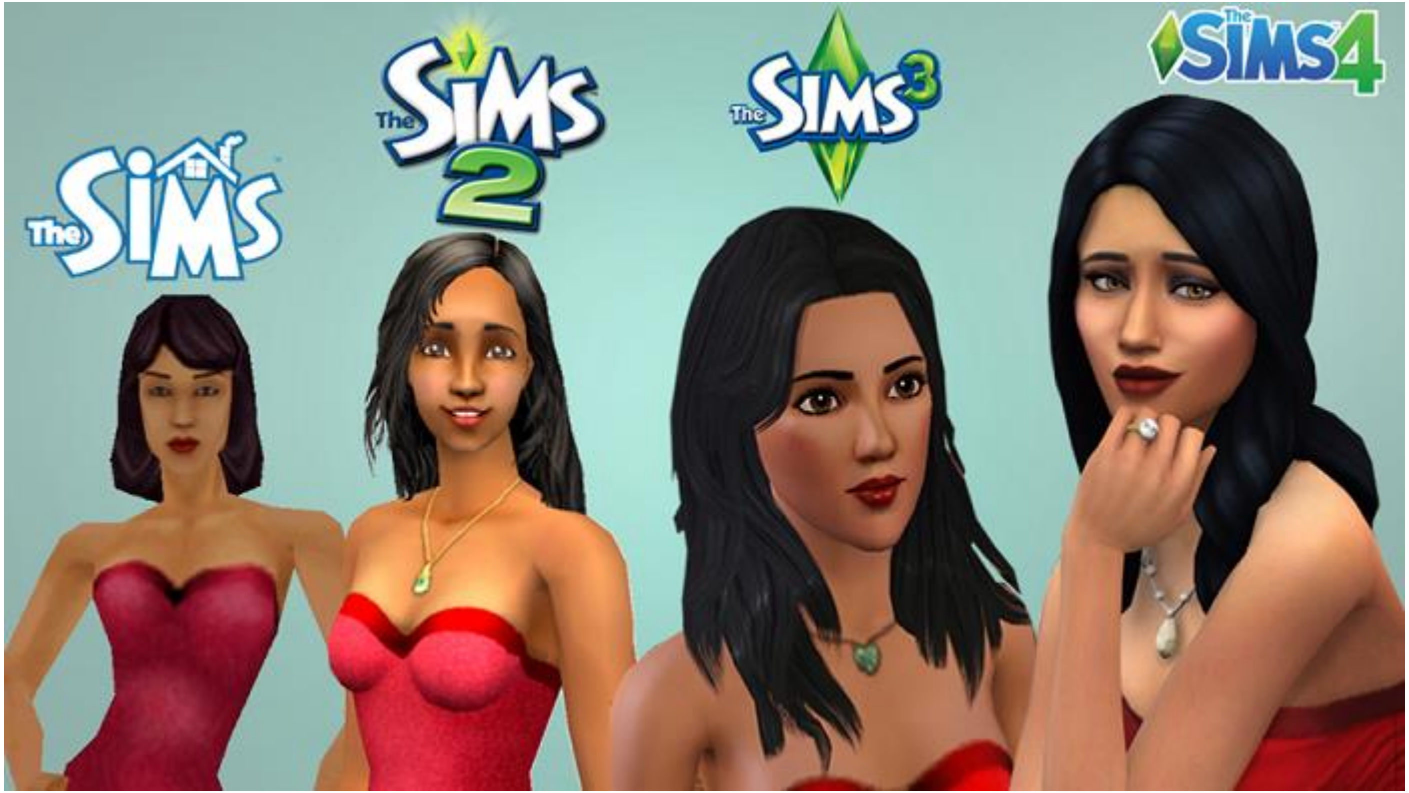
The Sims

- Sims is a life simulation game
- Over 20 million fans following
- 15 year anniversary

Sims characters over generations



Sims characters over generations



The Sims 4 - Create A Sim

Agenda

- Core-X & Goals
- How we achieved the goals
- Q & A

Character Creator – Core X

- Accessible & Fun
- Deep customization

Character Creator – Core X

- Accessible & Fun
  - Minimalist UI
  - Direct Manipulation
  - Smart Randomization
  - Fast response

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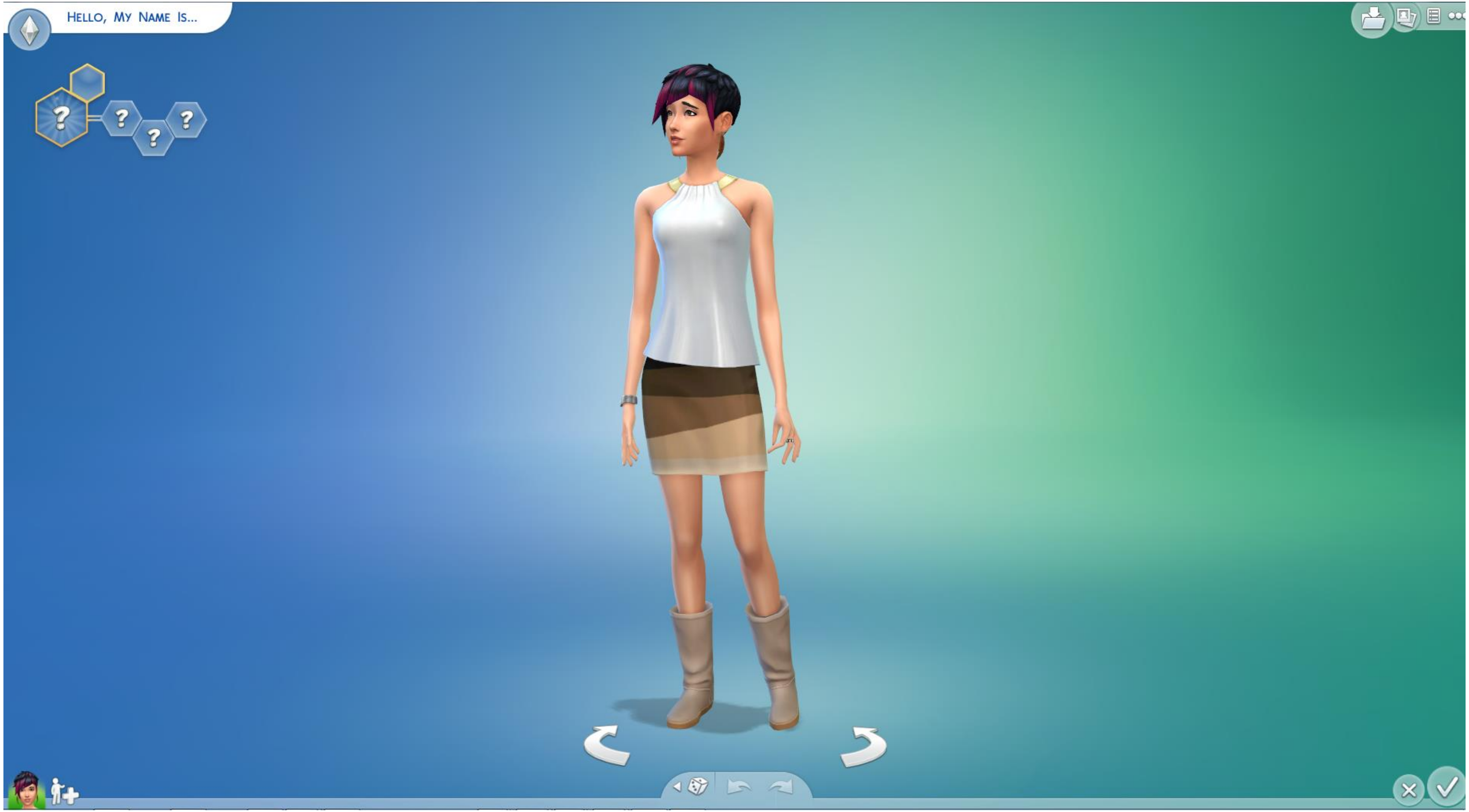
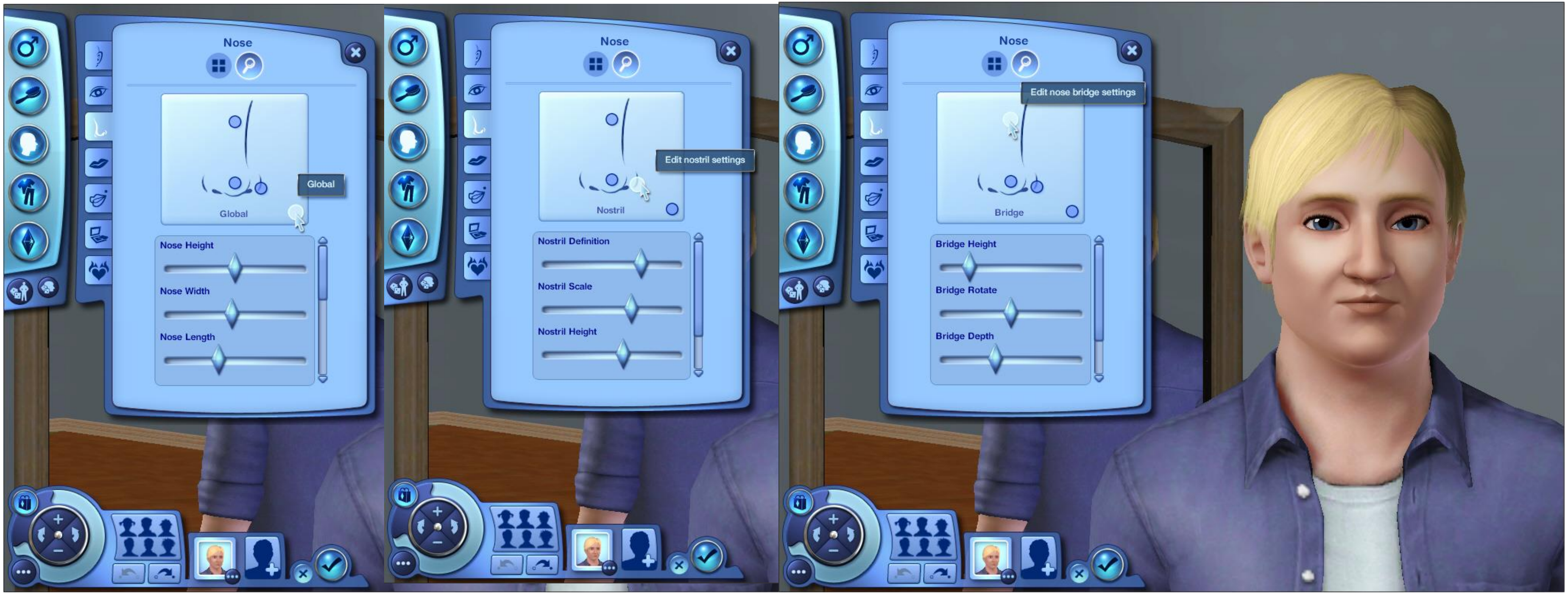

Hello, My Name Is...
?
?
?
?

Character Creator – Core X

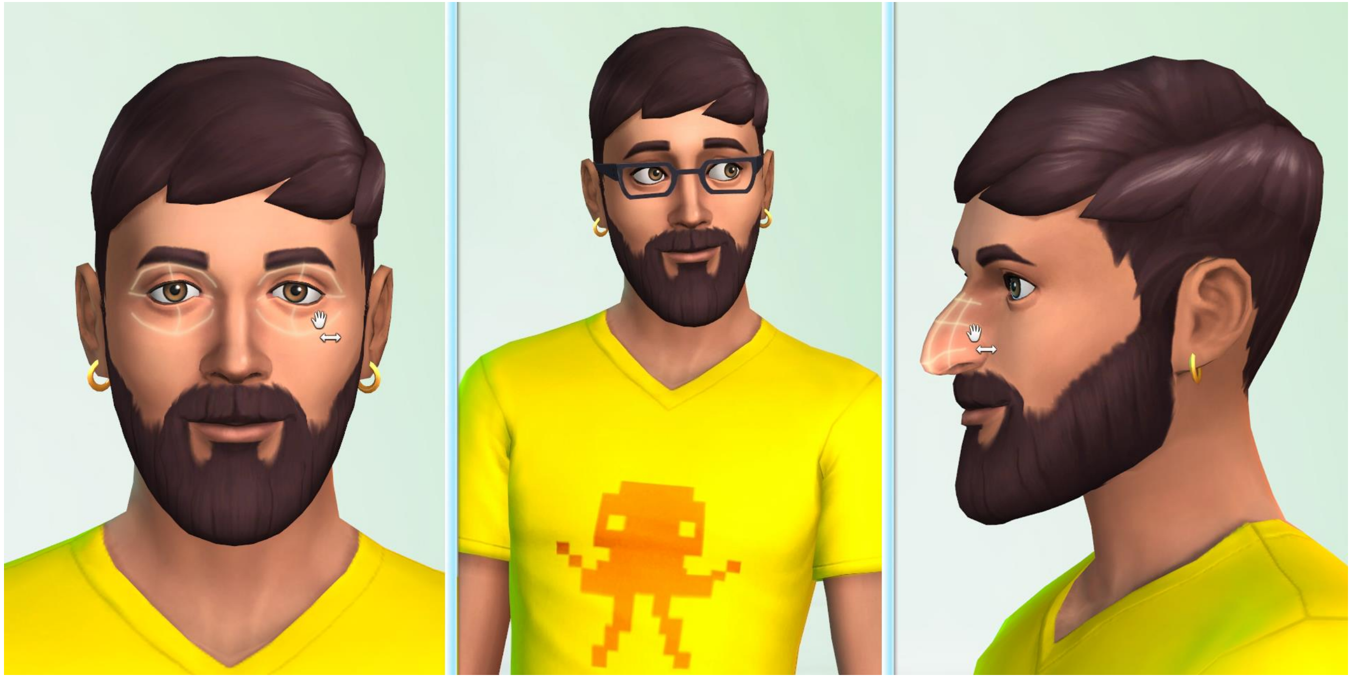
- Accessible & Fun
  - Minimalist UI
  - Direct Manipulation
  - Smart Randomization
  - Fast response

Previous Sims Games

- Series of UI sliders in Sims 3



Direct Manipulation



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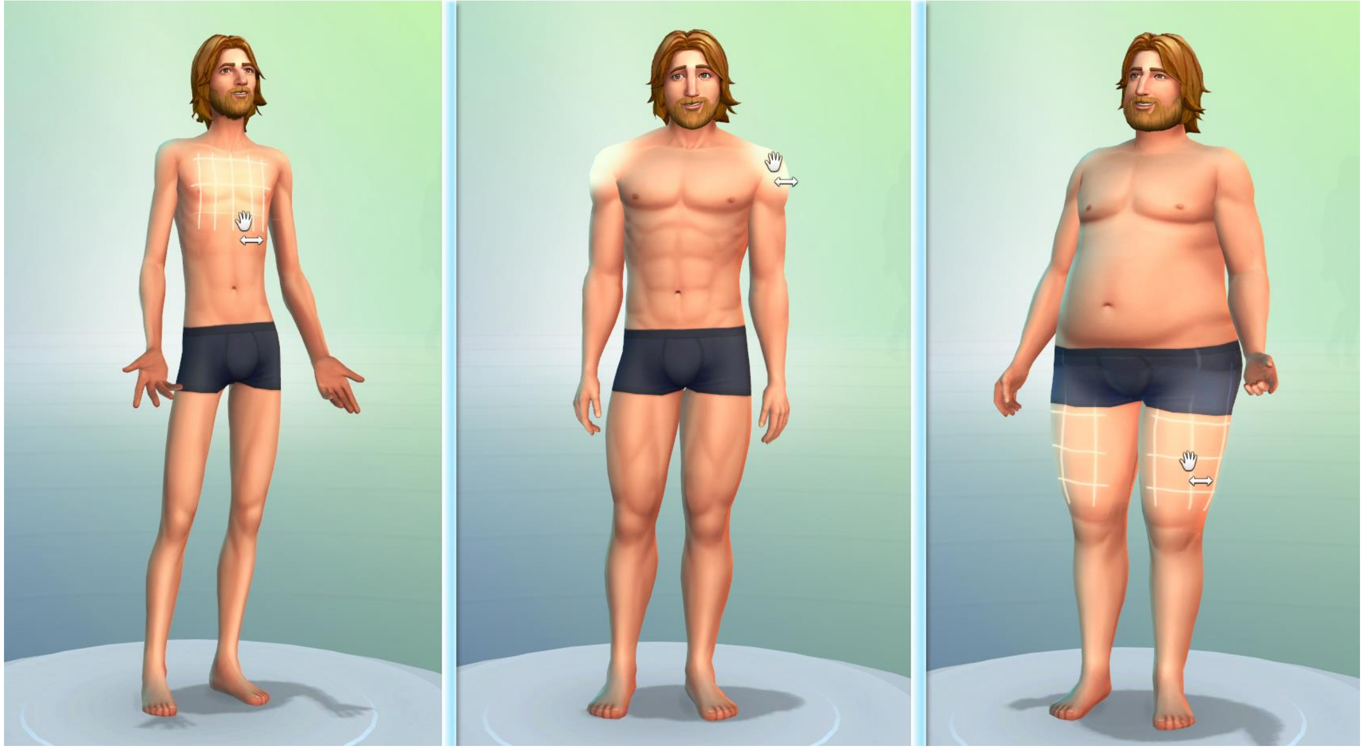
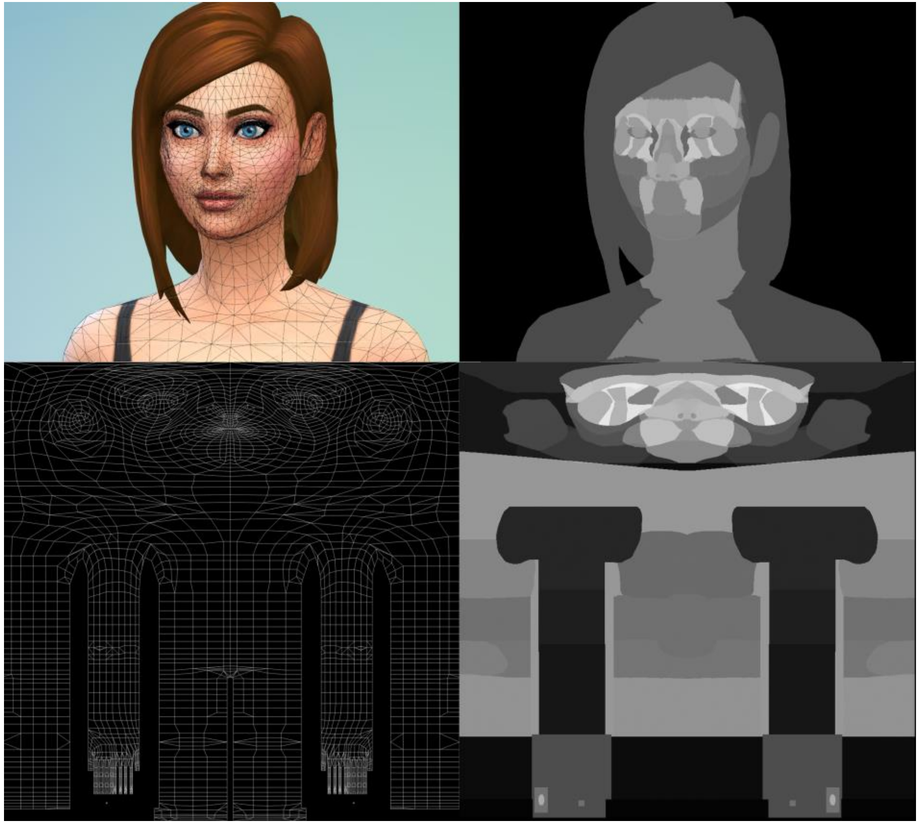


Direct Manipulation – Contd.



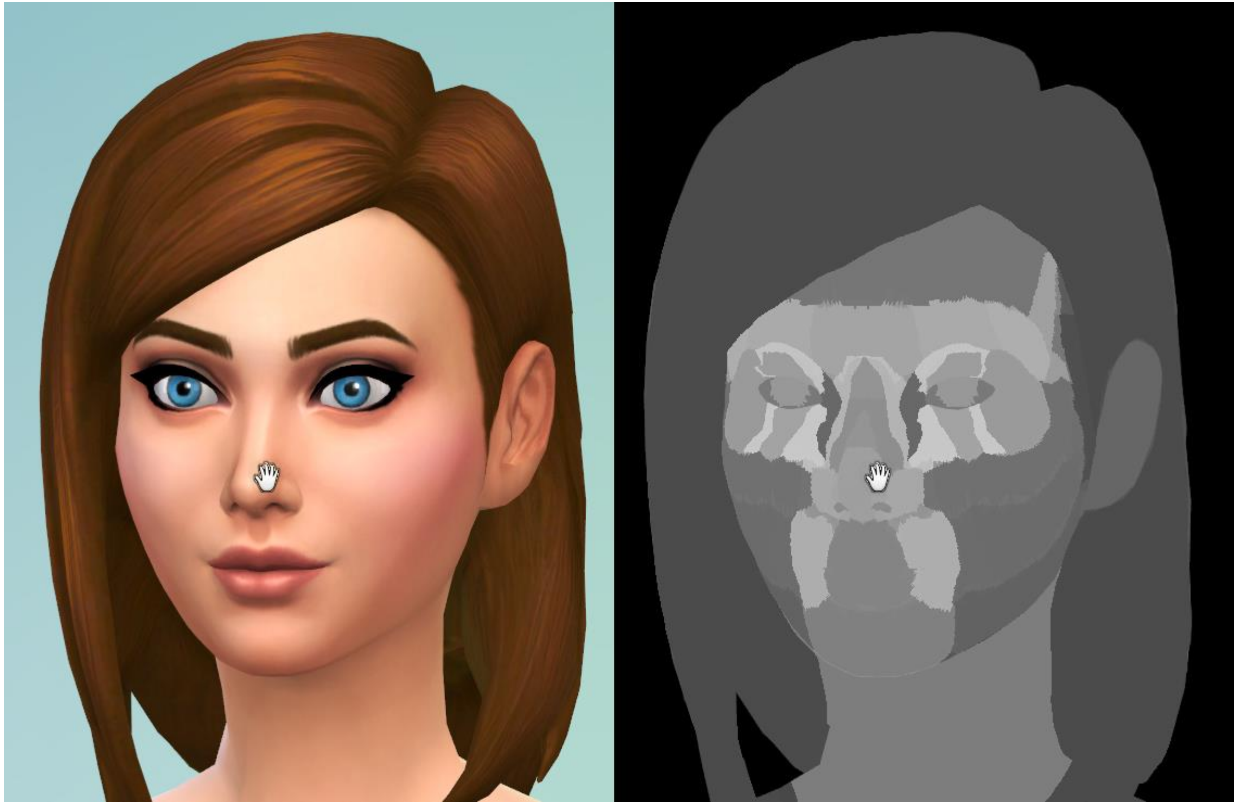
Direct Manipulation – Contd.

- Each pickable region (hotspot) on character is assigned a unique color value

Direct Manipulation – Contd.

- Uses render/shader based mouse picking that retrieves the color information under the cursor

Direct Manipulation – Contd.

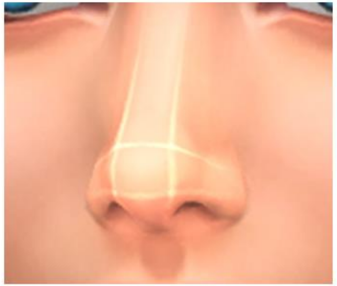


Direct Manipulation – Contd.

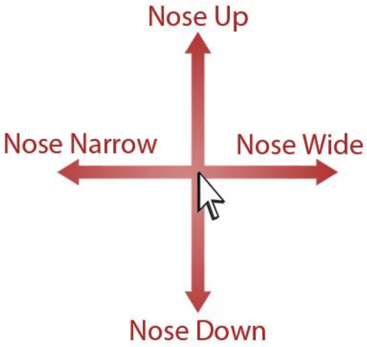
- A Hotspot resource stores region id, highlight, modifiers, cursor type, etc.

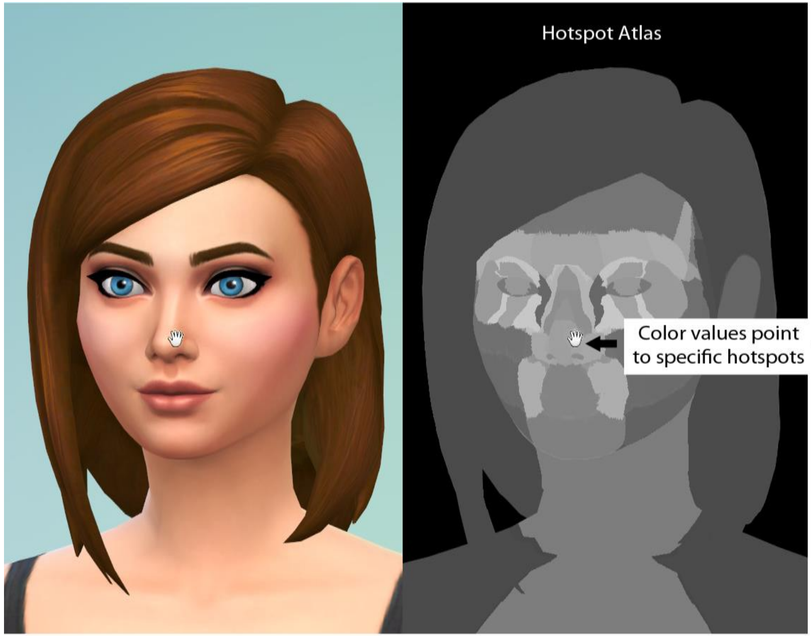
Direct Manipulation – Contd.

Highlight texture is applied



Specific modifiers are mapped to mouse movement





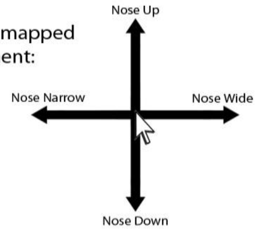
Color values point to specific hotspots

Nose Hotspot

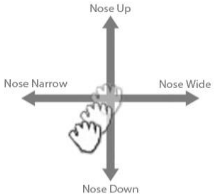
Based on the current camera orientation ("pie wedge"):

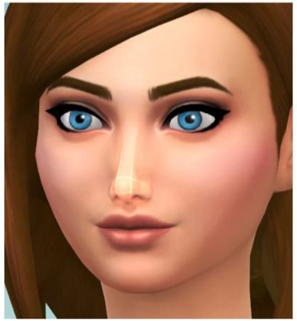
-A specific highlight texture is applied:

-Specific modifiers are mapped to mouse movement:



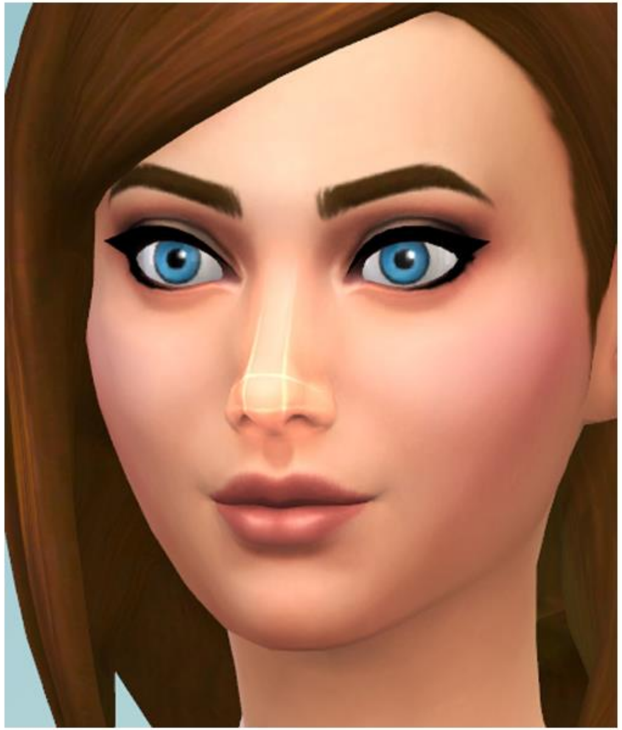
After clicking, dragging the cursor will apply the modifiers associated with that movement

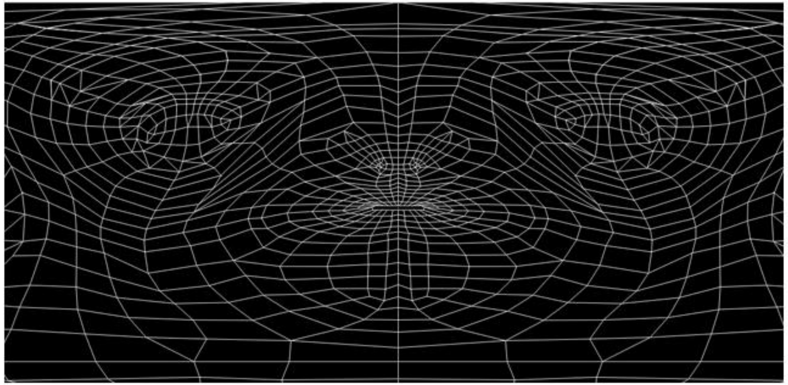


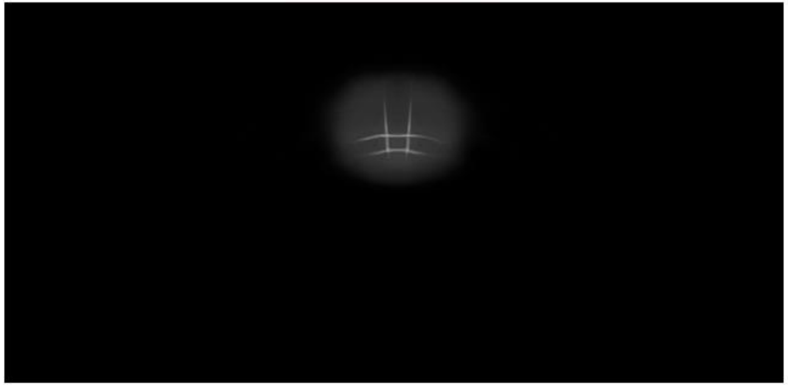


Direct Manip – Contd.

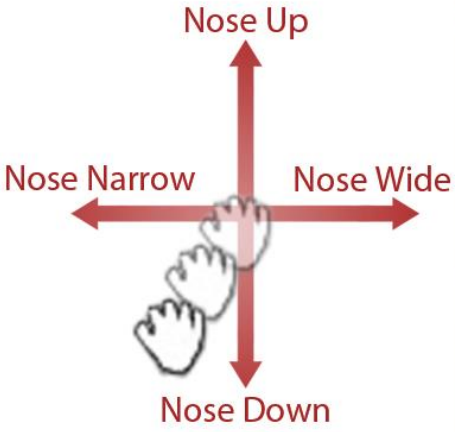
Highlights



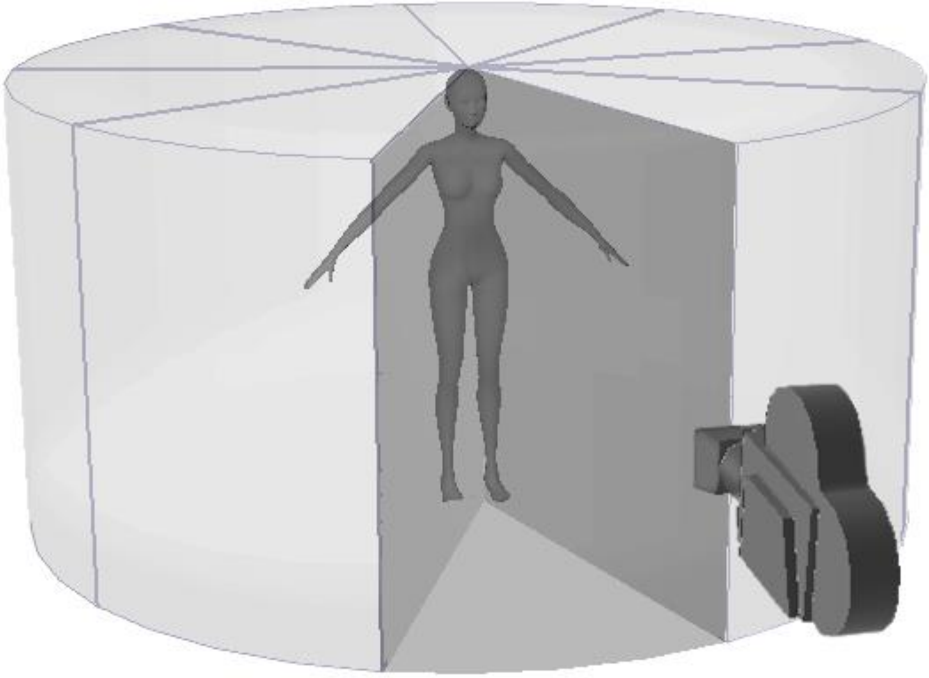




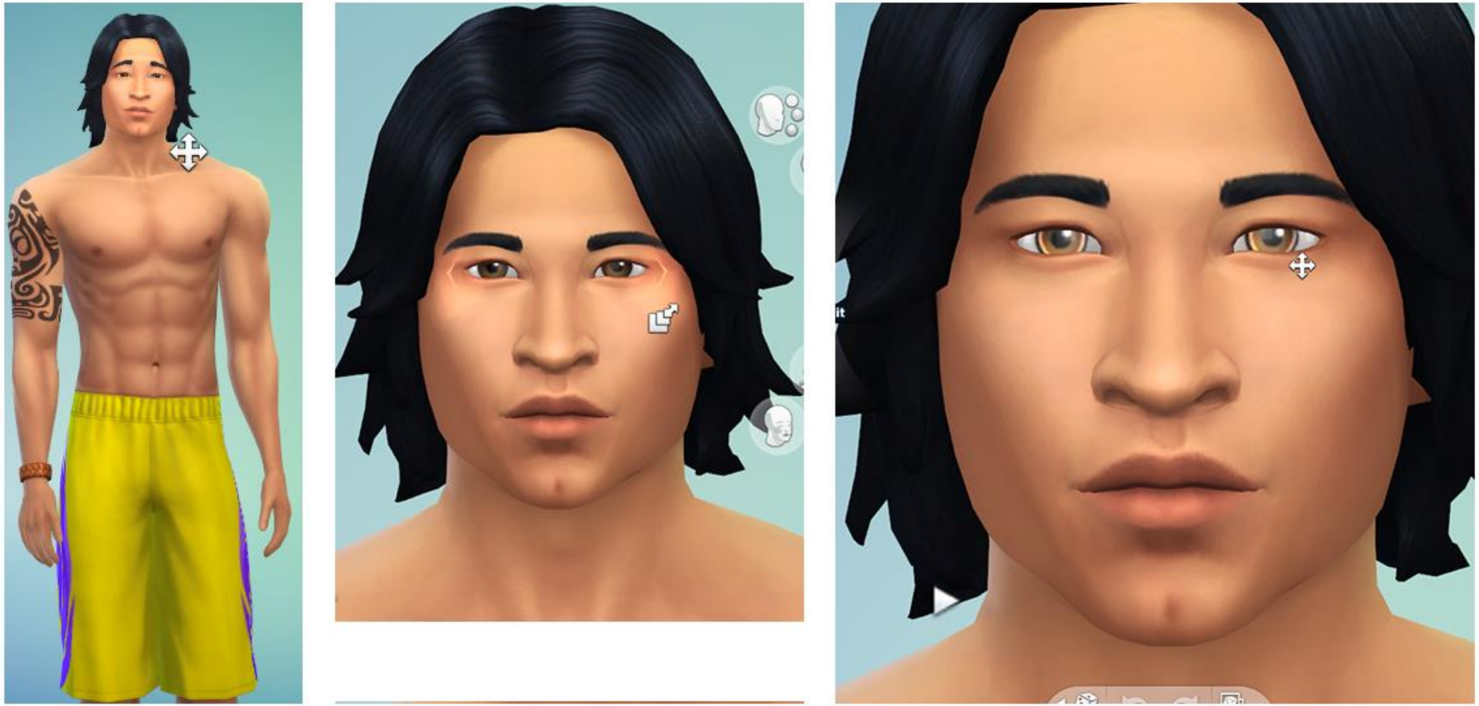
Direct Manipulation – Contd.



Direct Manipulation – Pie Wedges

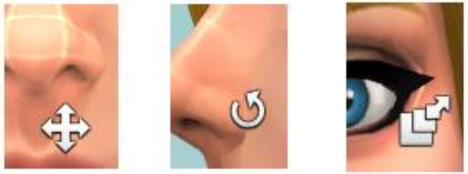


Direct Manipulation – Levels



Direct Manipulation – Contd.

- Hotspots were data driven and stored:
  - The modifiers – For X and Y axis
  - Detail level - Top, Macro or Micro
  - Highlight texture
  - Available pie-wedges
  - Region ID
  - Cursor type – move, rotate, scale



Direct Manipulation – Code

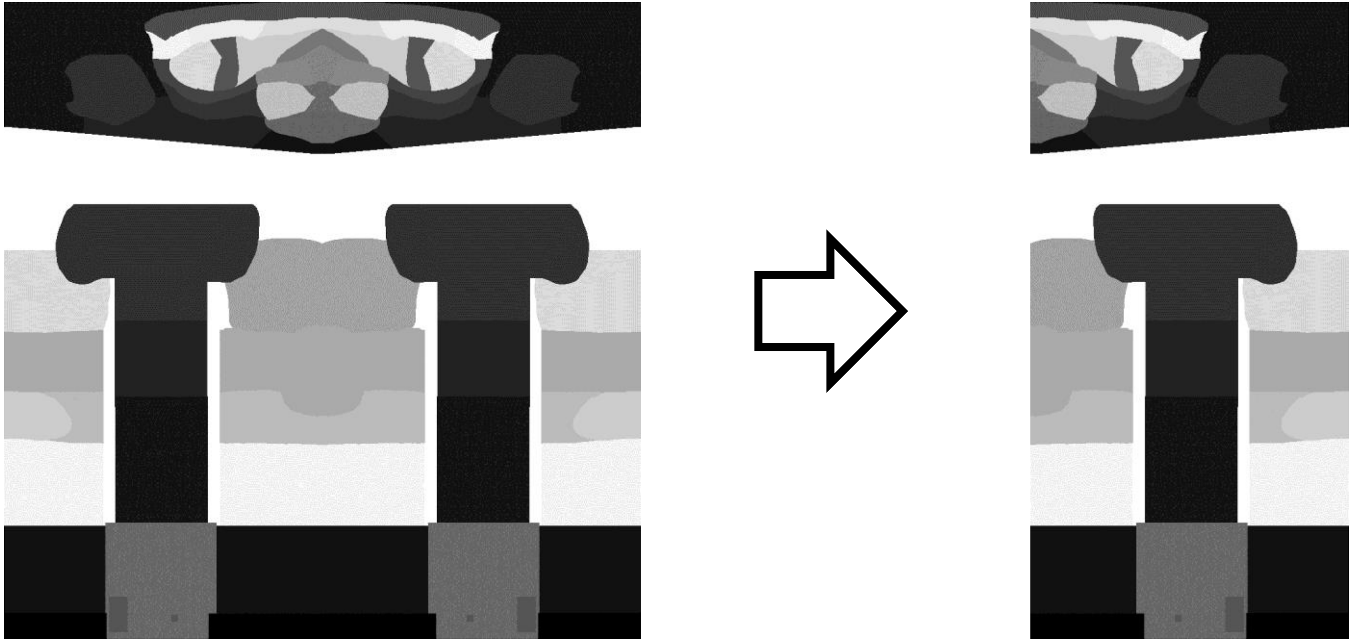
```
// Region ID is encoded as color
pickResult= GetLastRenderPick(UV);
// pickResult.r=Top, g=Macro, b=Micro
regionId = GetRegionId(pickResult, mode);
// bodyType encoded as alpha channel of pick result
bodyType = pickResult.a;
```

Direct Manipulation – Code

```
// Find hotspot for a given angle and regionId
hotspotControl = GetHotspot(regionId, angle);
// Now that we found the hotspot, render highlight
Render(hotspot.highlightTexture);
// Update corresponding modifiers with mouse drag
Mesh.SetModifier(hotspotControl.modifiers, deltaXY);
```

Direct Manipulation – Contd.

Utilizes the vertical symmetry



Direct Manipulation – Contd.

- Added resistance at the extremes
- Highlights turn red to indicate extremes
- Movement delta scaled proportional to the area each modifier encompasses

Character Creator – Core X

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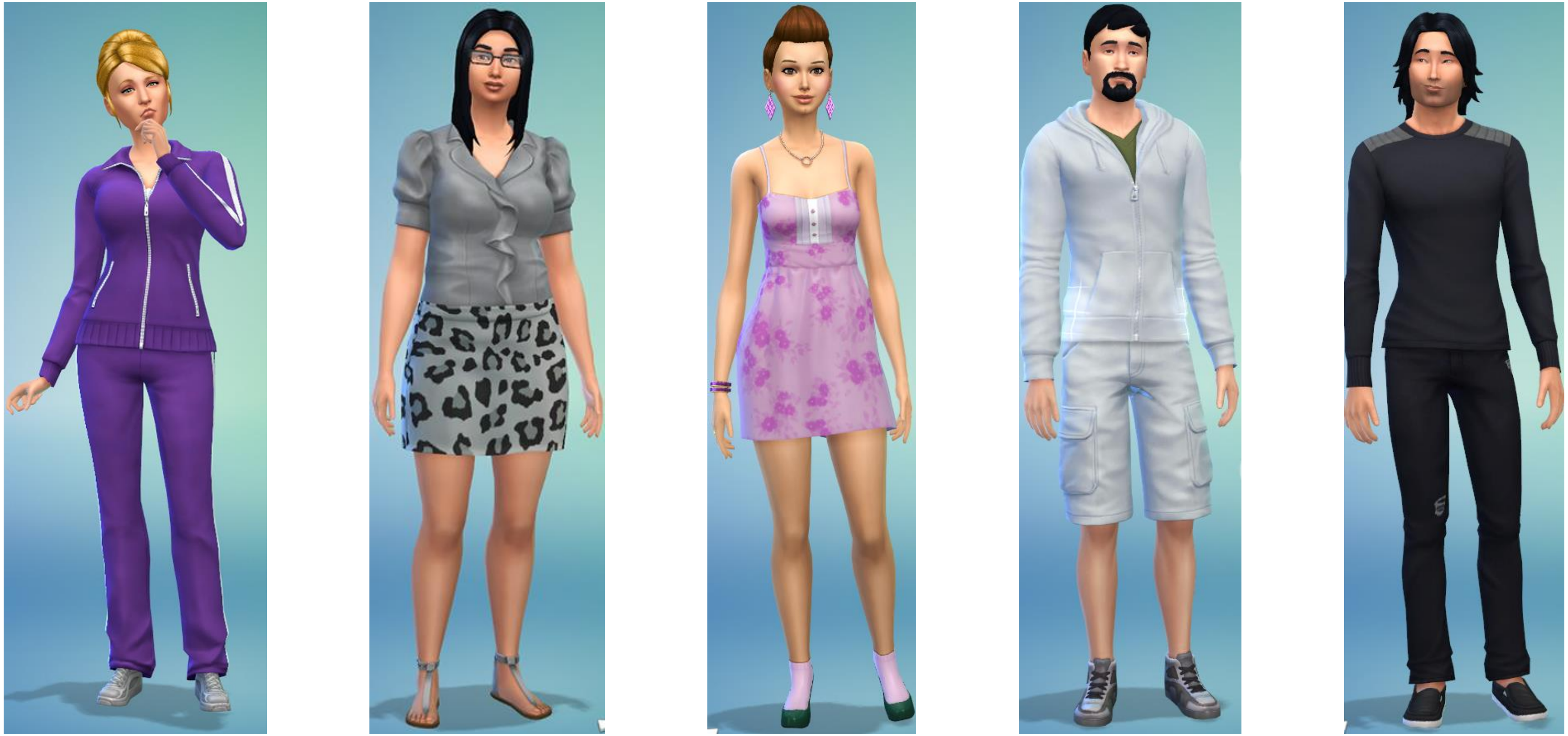
  - Smart Randomization
  - Fast response

Smart Randomization



Smart Randomization

- Allows auto-generation of sims with cohesive look & style
- Utilizes tagging system to assign attributes to assets
- Attributes - Age, Gender, Outfit Type, Archetype, Style, Color palette, etc.

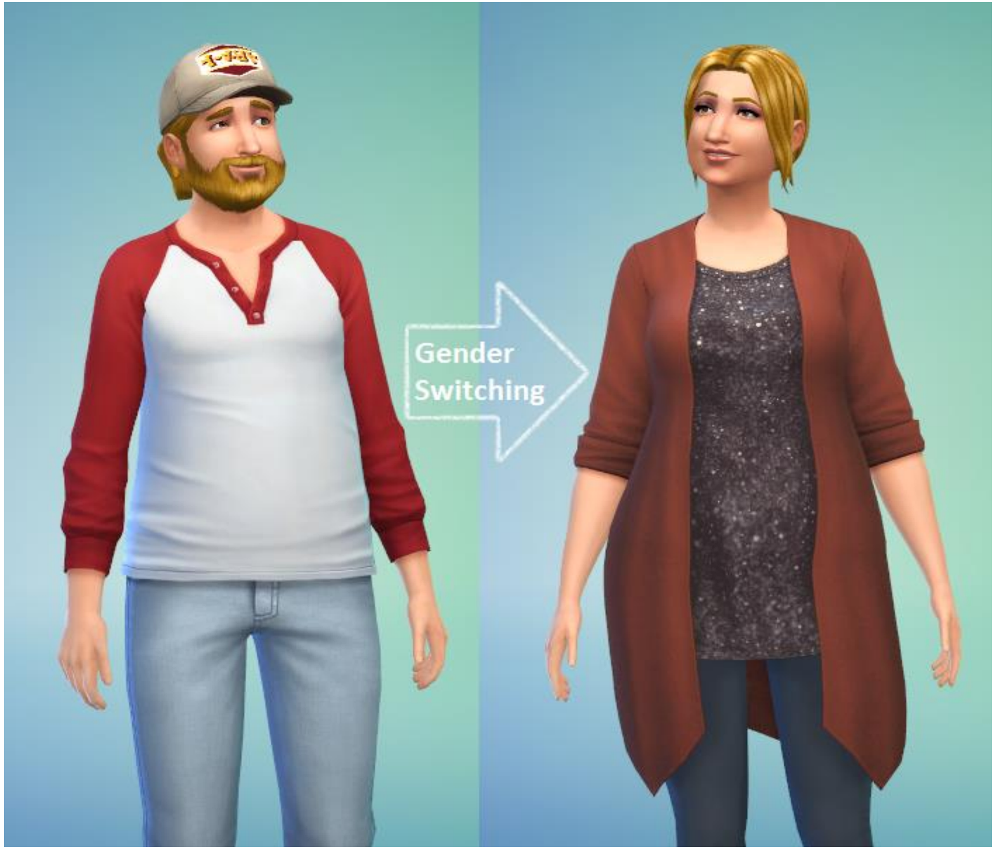
Smart Randomization – Contd.

- The randomizer throws the dice on available tags and finds assets that match those tags
- If failed, a prioritization scheme was used to prune the tags and continue to look until a match was found.

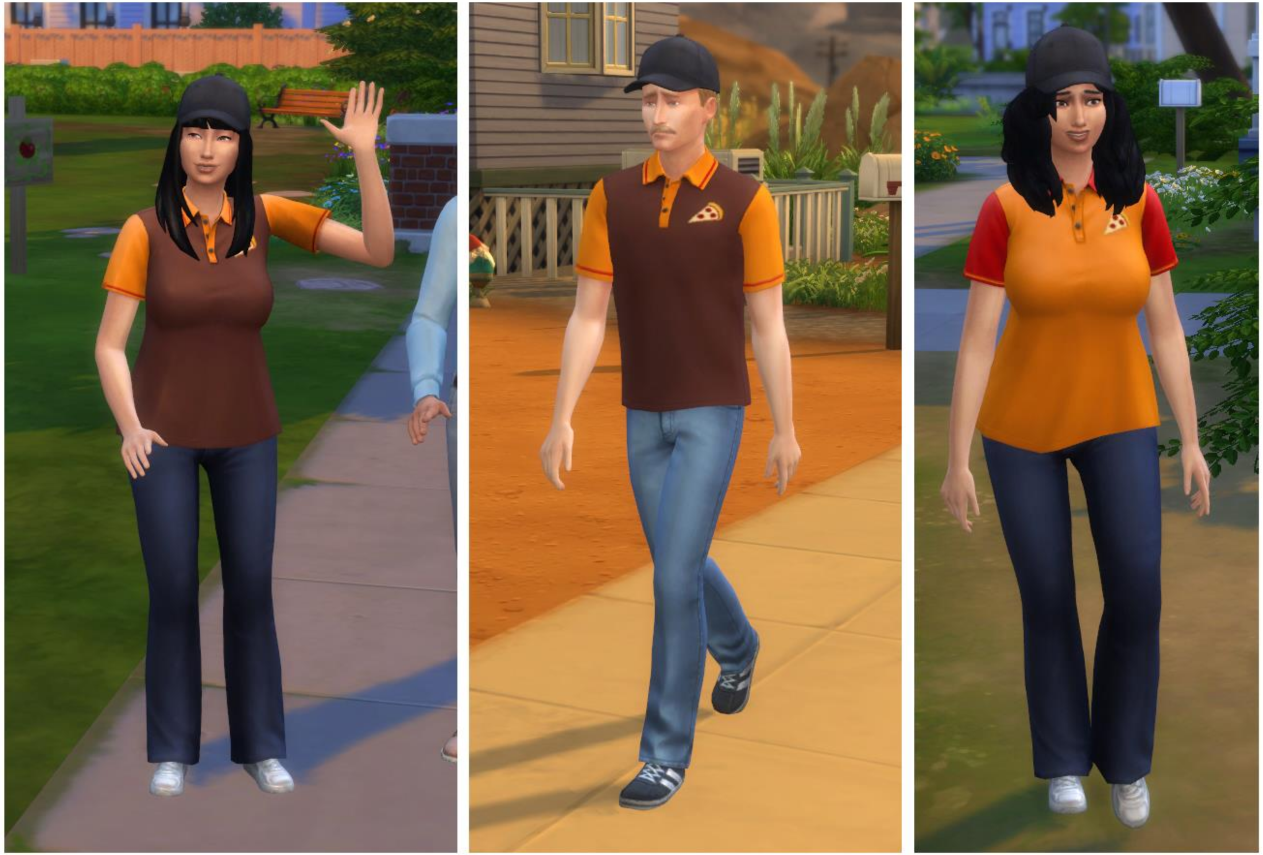
Smart Randomization – Contd.

- Also used in
    - Age/Gender switching
    - NPC generation
    - Genetics

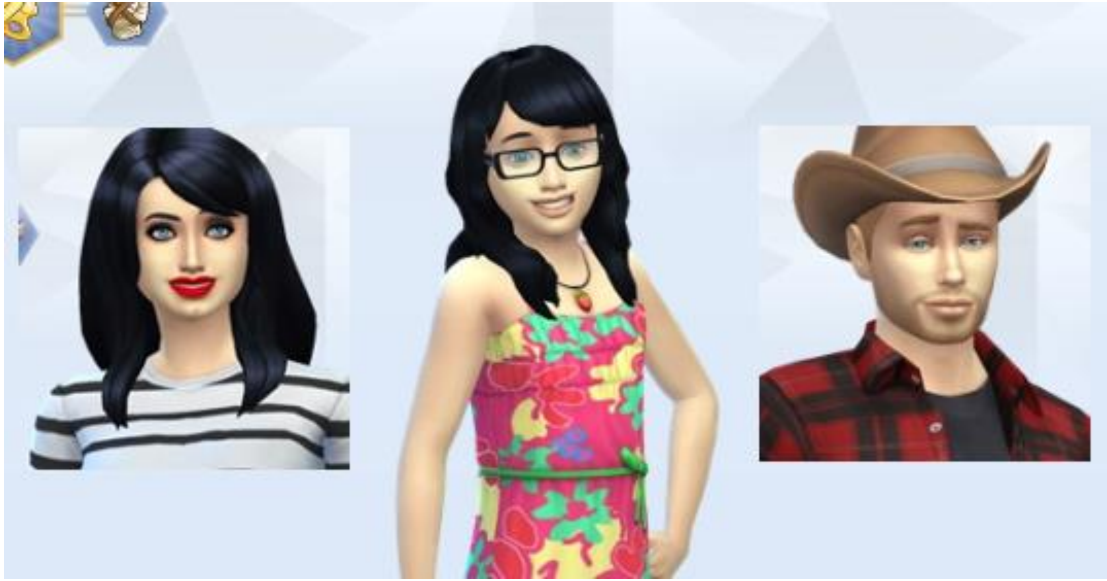
Smart Randomization – Contd.



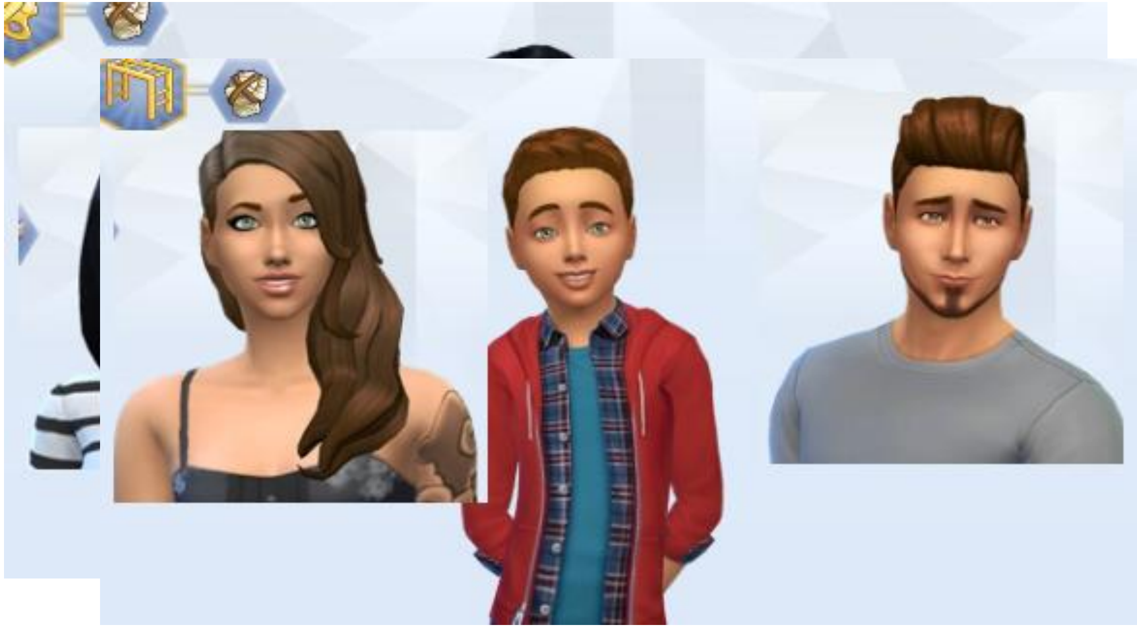
Smart Randomization – Contd.



Smart Randomization – Genetics



Smart Randomization – Genetics



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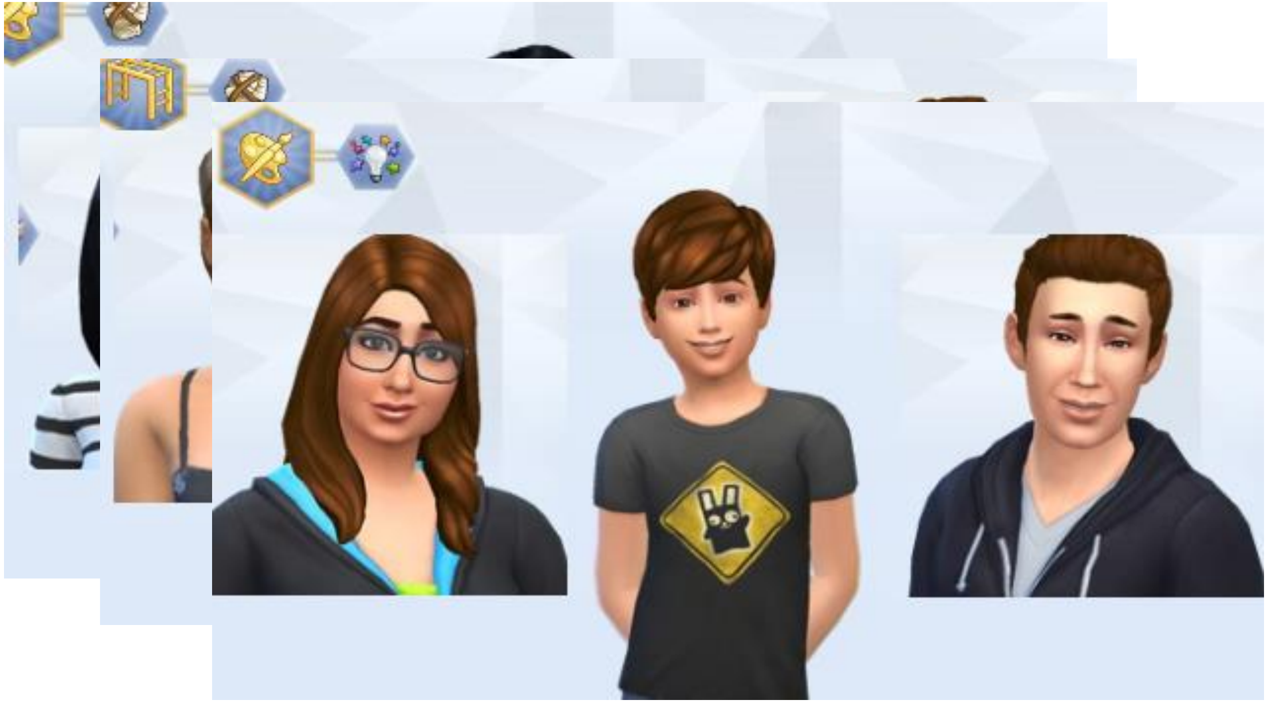

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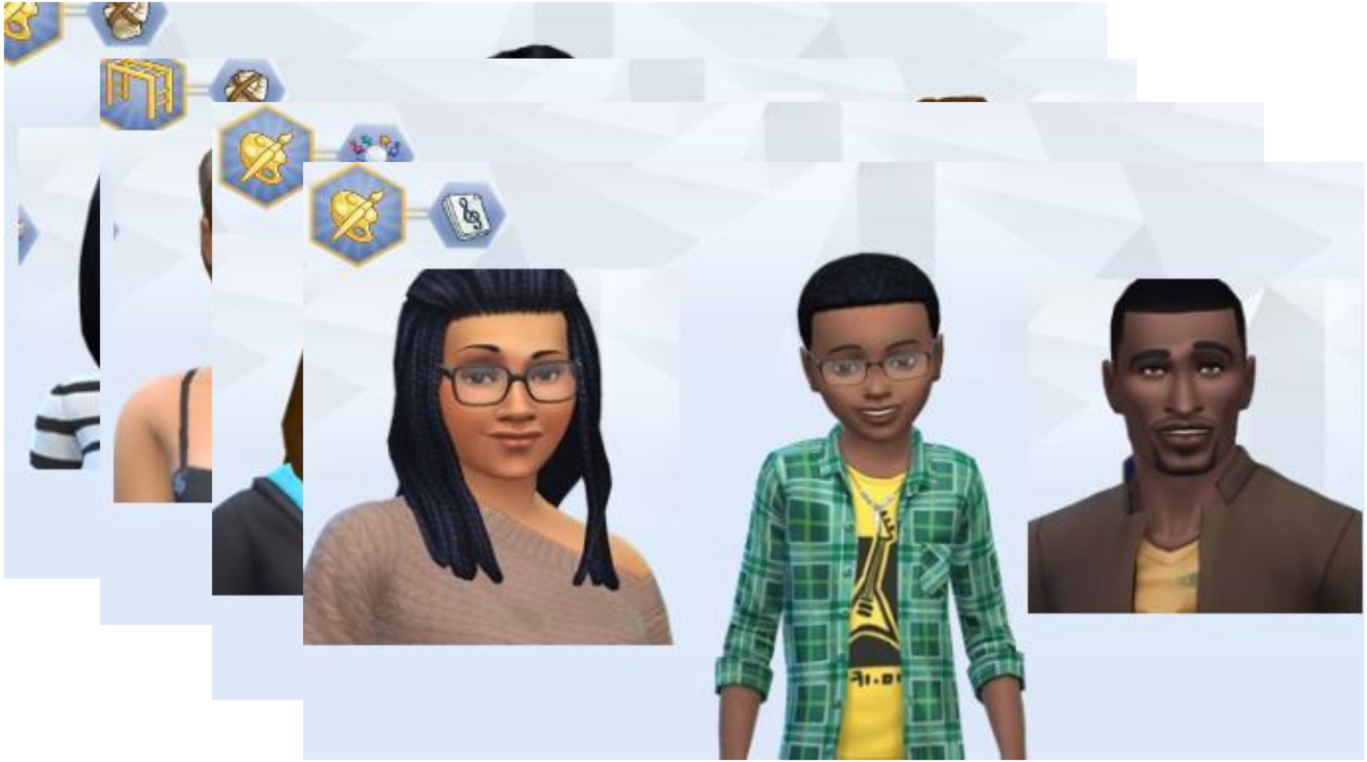

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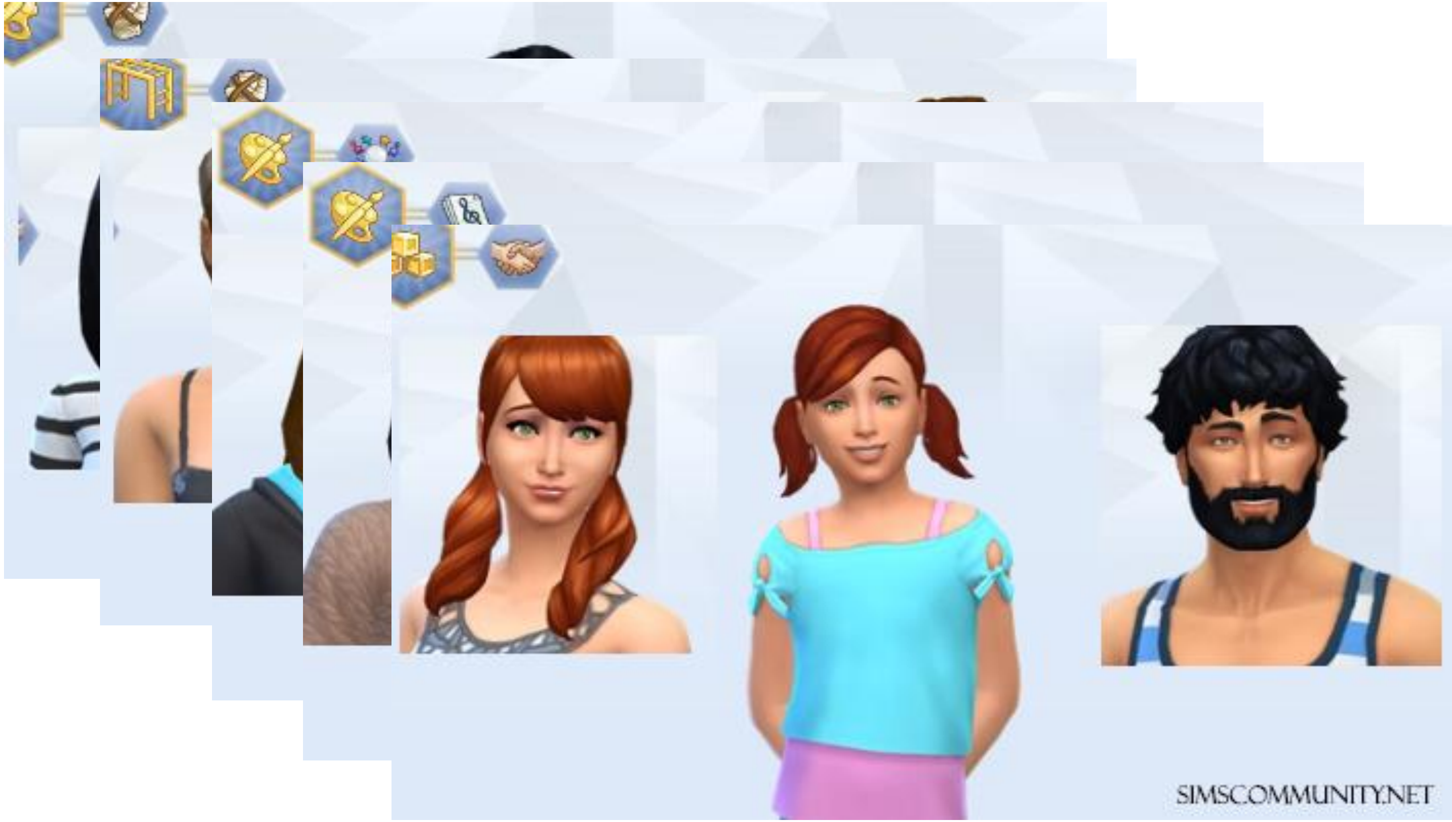

Character Creator – Core X

- Accessible & Fun
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  - Fast response

Fast Response

- Performance is important for interactivity
- Part instances preloaded and organized by age, gender and type
- Heavier resources loaded on demand
- D-maps are preloaded due to high re-use
- Texture compositing happens in CPU
- Textures are DXT and RLE compressed

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  - Asset Pairing
  - Great variety of faces
  - Many levels of body deformations

Character Creator – Core X

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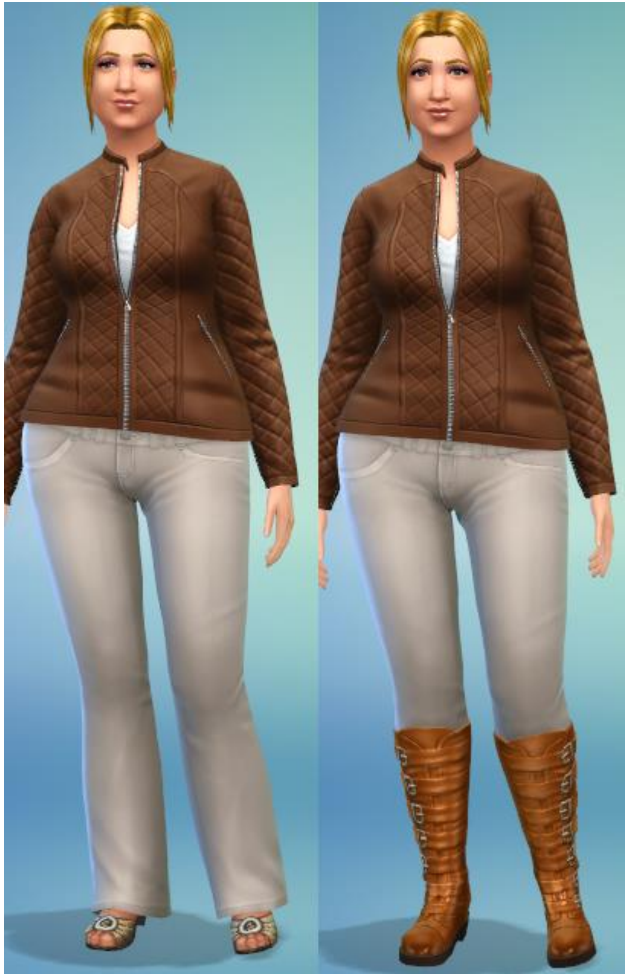
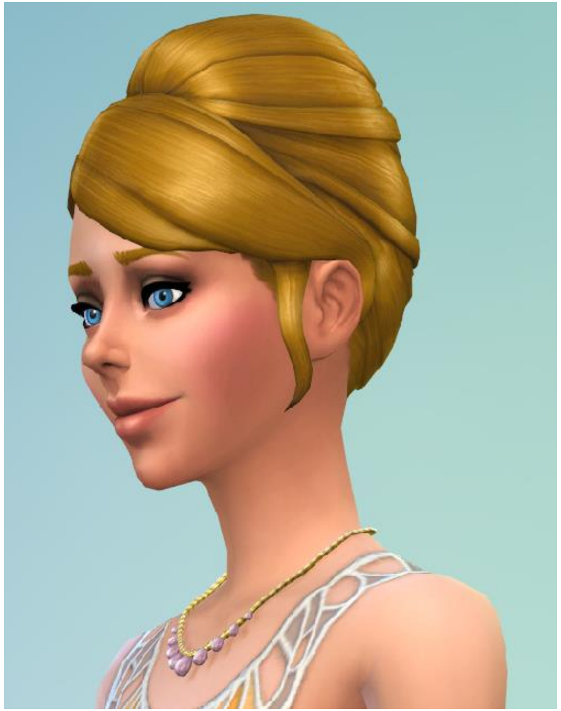
Asset Pairing – Contd.

- Boots & Pants



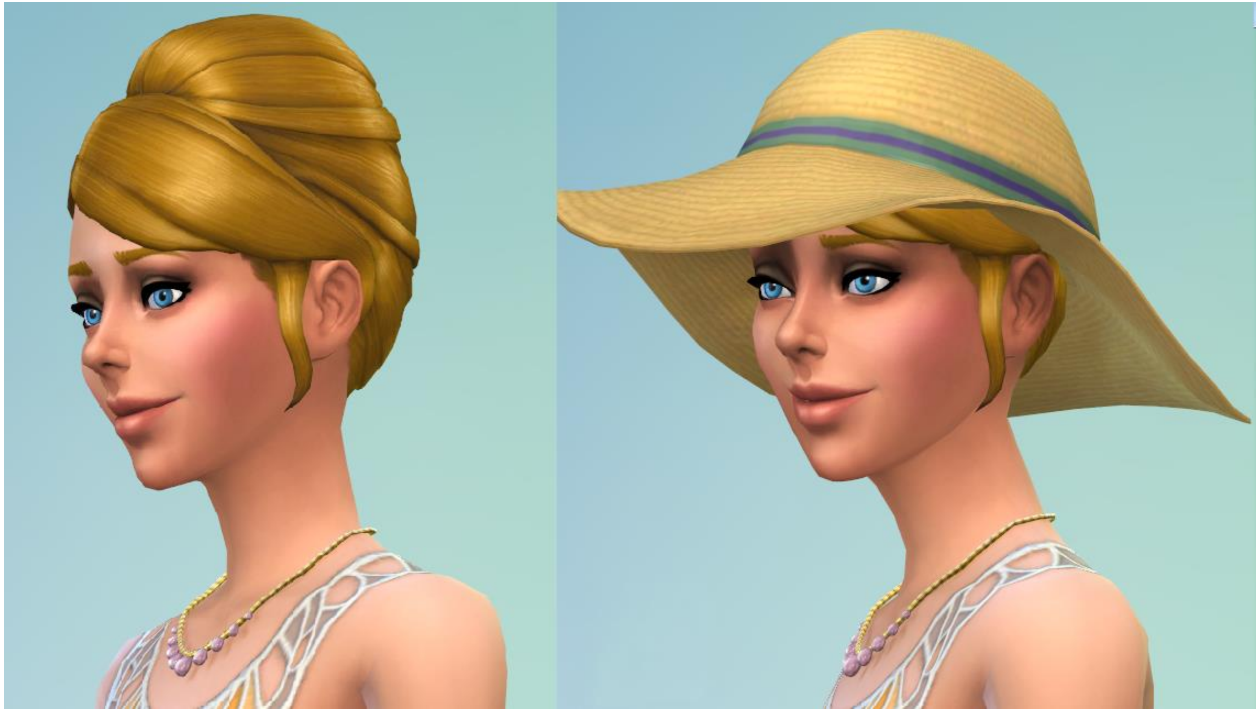
Asset Pairing – Contd.

- Hair & Hat



Asset Pairing – Contd.

- Hair & Hat

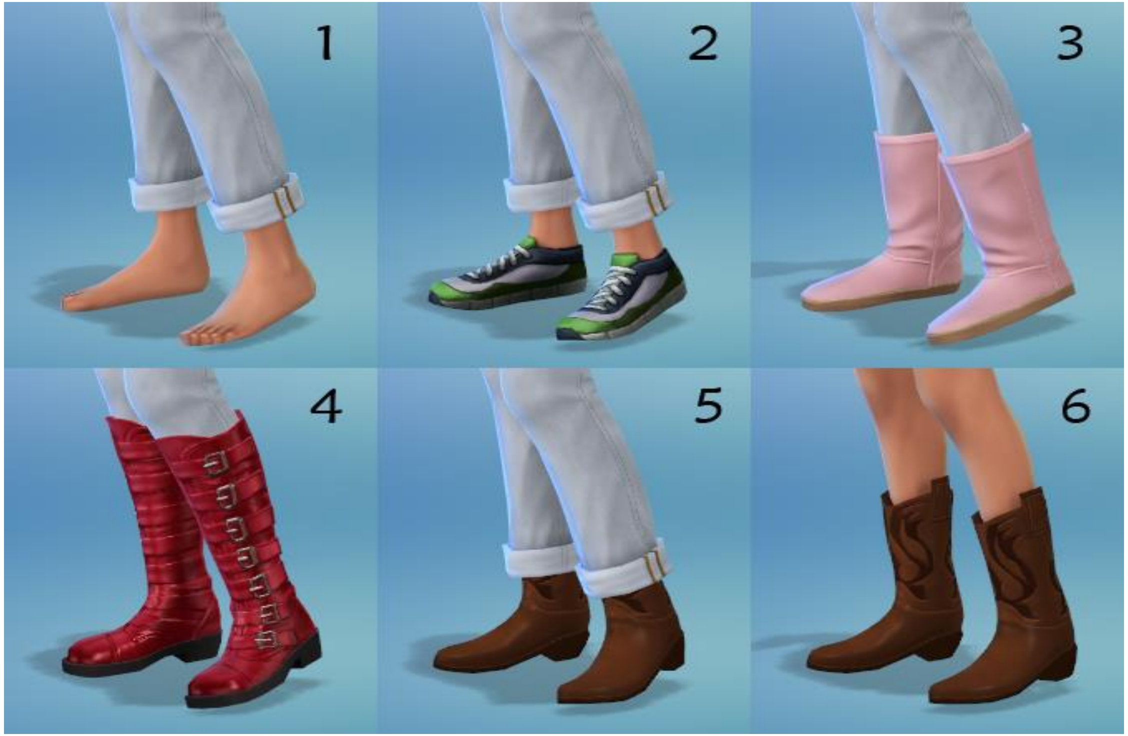


Asset Pairing

- A generalized system to resolve between assets that share the same physical area
- Avoids clipping
- Greater mixing and matching of parts
- Used for character customization but can be extended to other systems.

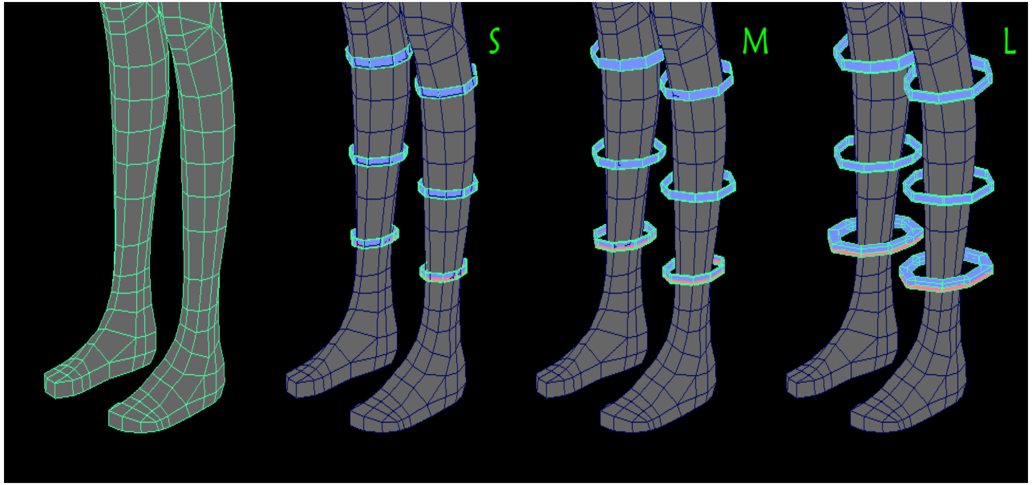
Asset Pairing – Contd.

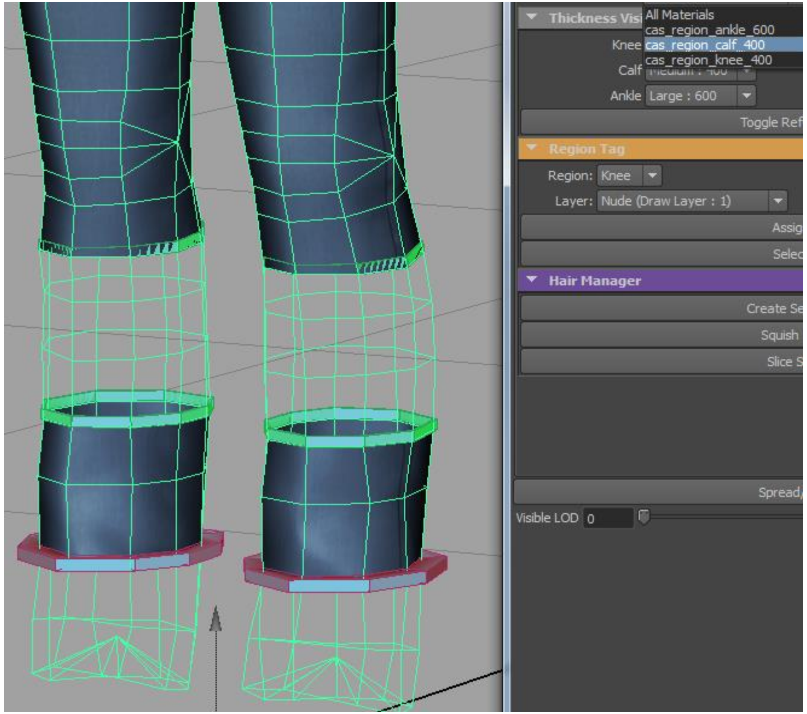
Pants
vs.
Boots



Asset Pairing – Contd.

- Region spec





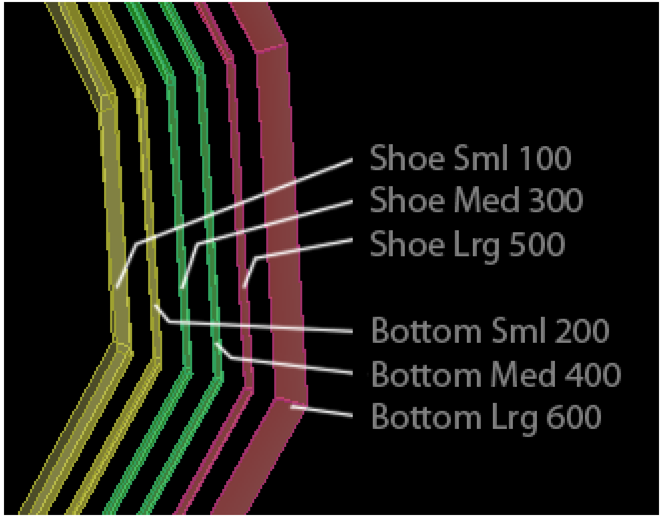
Knee
Calf Medium : 400
Ankle Large : 600

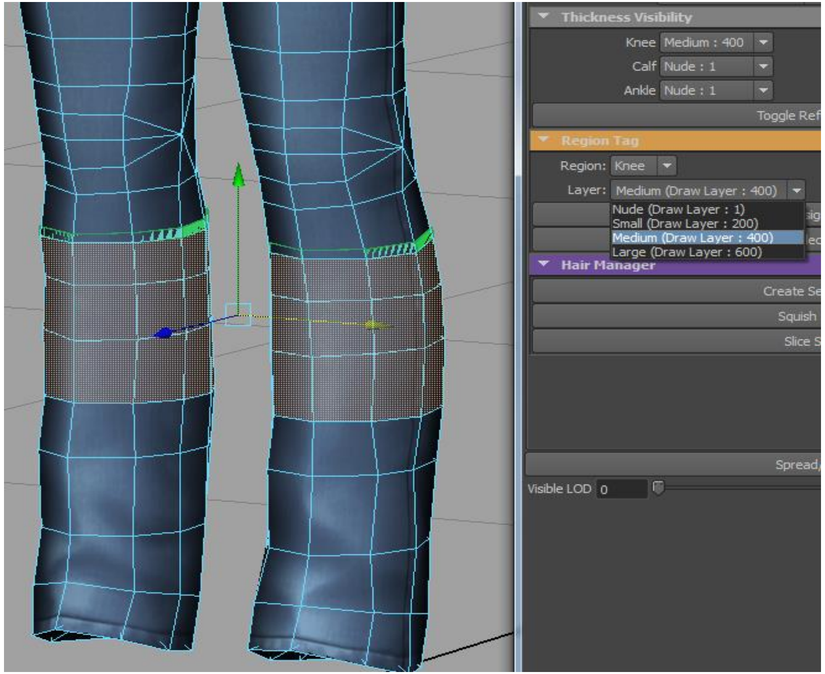
Region: Knee
Layer: Nude (Draw Layer : 1)

Visible LOD 0

Asset Pairing – Contd.

- Layer spec




Thickness Visibility

Knee Medium : 400
Calf Nude : 1
Ankle Nude : 1

Region Tag

Region: Knee
Layer: Medium (Draw Layer : 400)

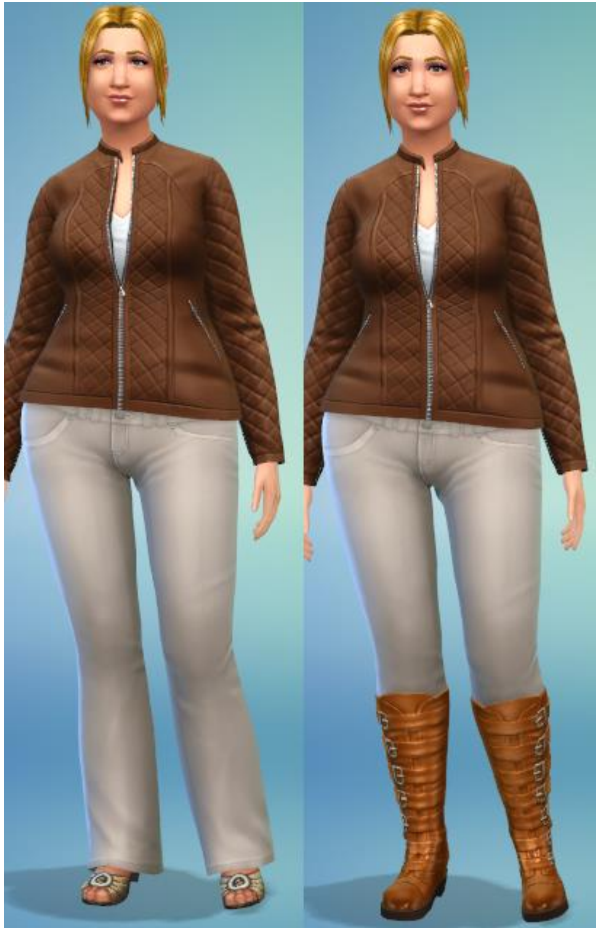
Visible LOD 0

Asset Pairing – Contd.

- The system partitions the character space into regions and layers
- Subparts are assigned a region and layer
- For every region, the subpart with the highest layer value wins

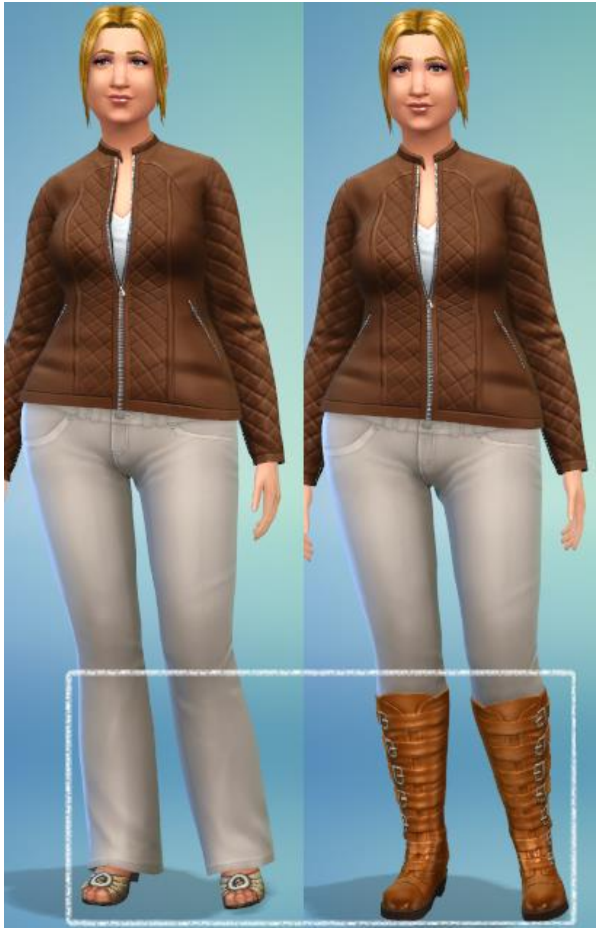
Asset Pairing – Contd.

- Brute force method issue



Asset Pairing – Contd.

- Brute force method issue



Asset Pairing – Contd.

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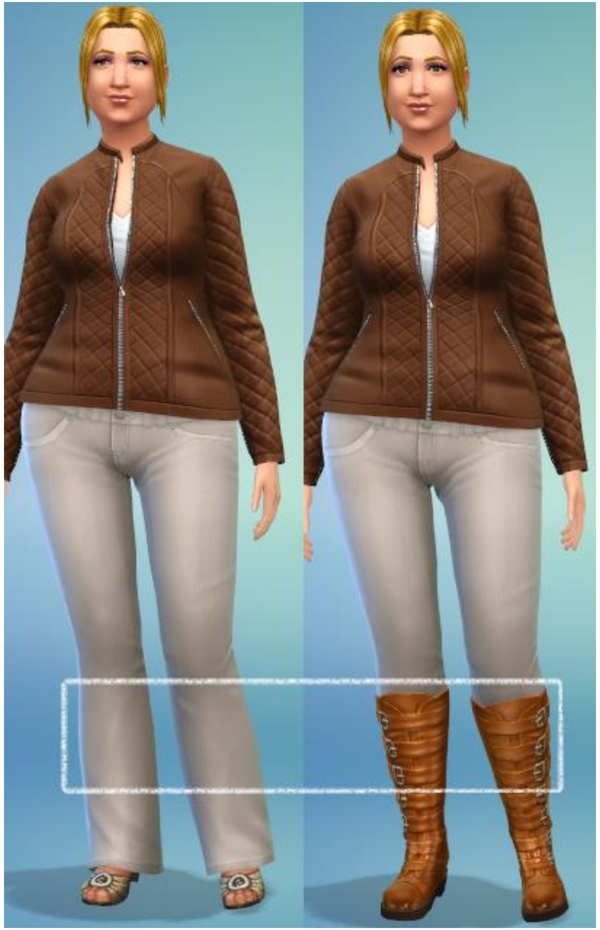
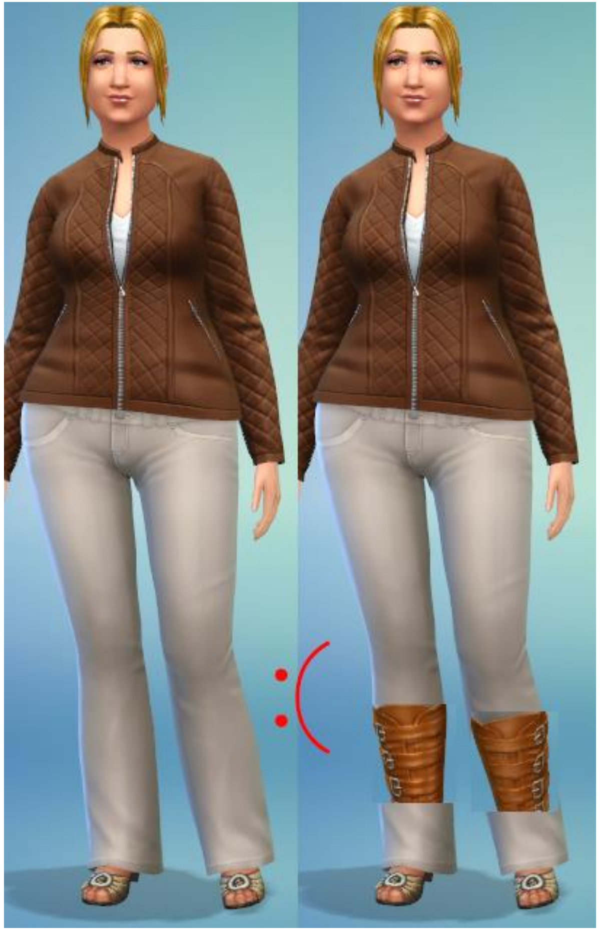


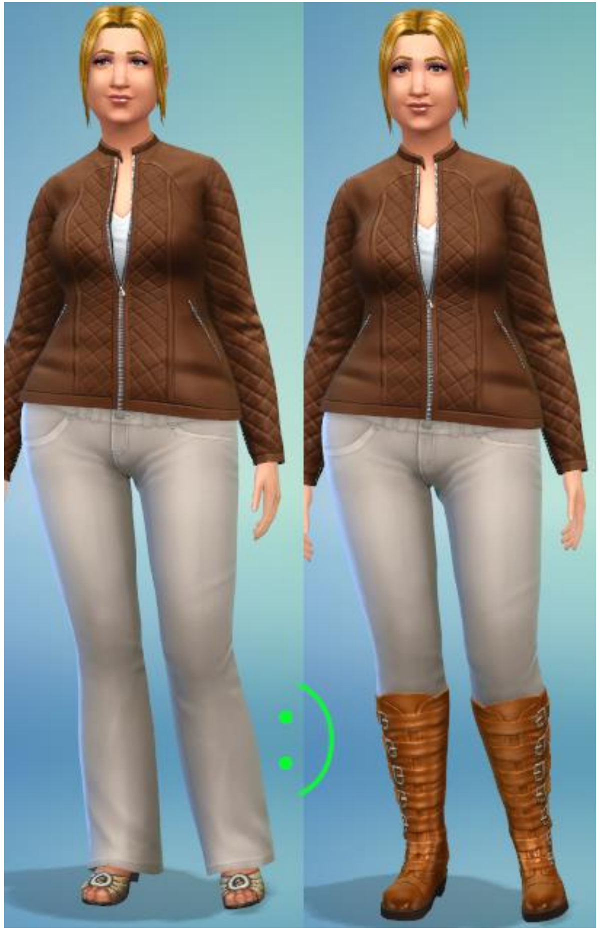
Asset Pairing – Contd.

- Bad



Asset Pairing – Contd.

- Solution…Ripple effect



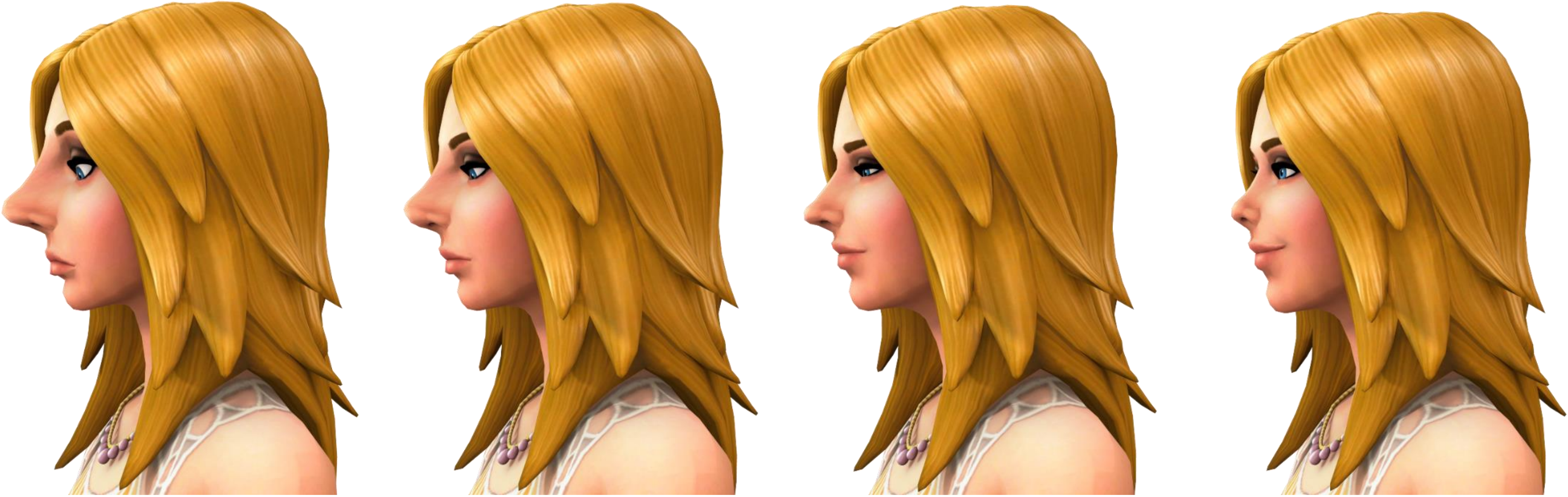
Character Creator – Core X

- Deep customization
  - Asset Pairing – Great mix & match
  - Great variety of faces
  - Many levels of body deformations

Facial Customization

- Greater ethnic variety of faces

Facial Customization – Contd.

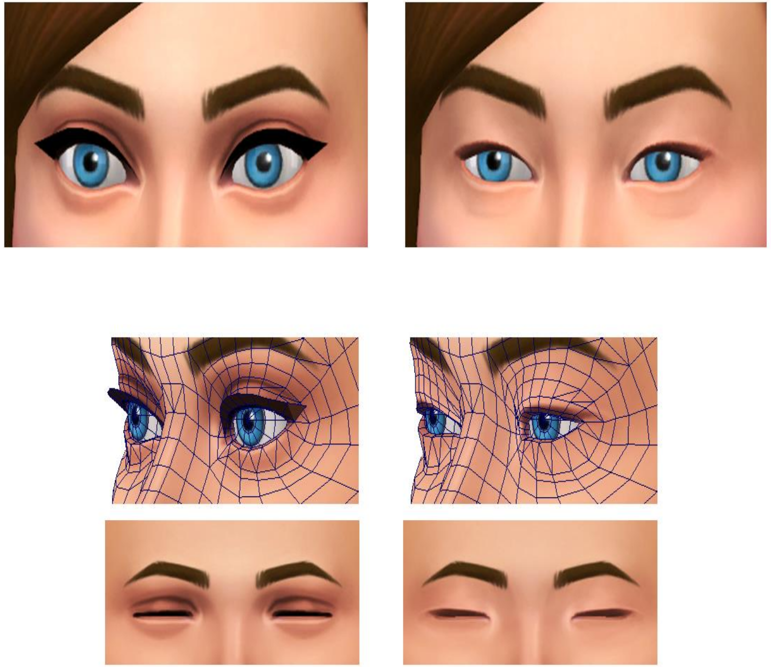


Facial Customization – Contd.

- Face = Archetypes + Modifiers
- Archetype = static mesh + texture wingman
- Modifier = Blend Shape or Bone Pose

Facial Customization – Contd.

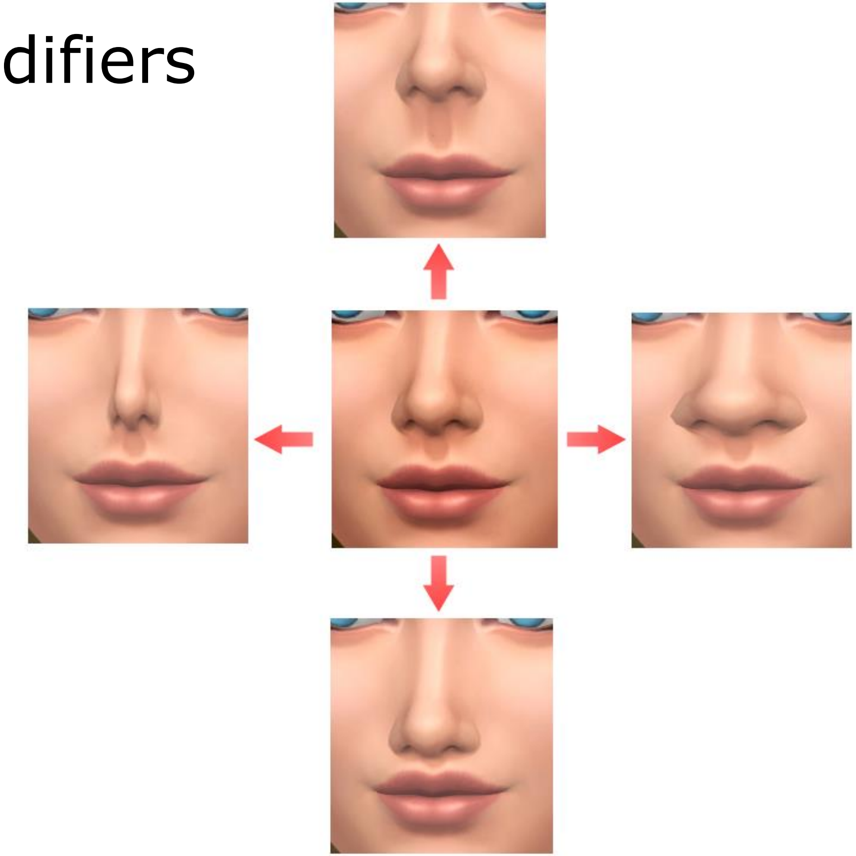
Archetypes



Two Face Archetype (left and right) with corresponding eye texture wingmen

Facial Customization – Contd.

Modifiers

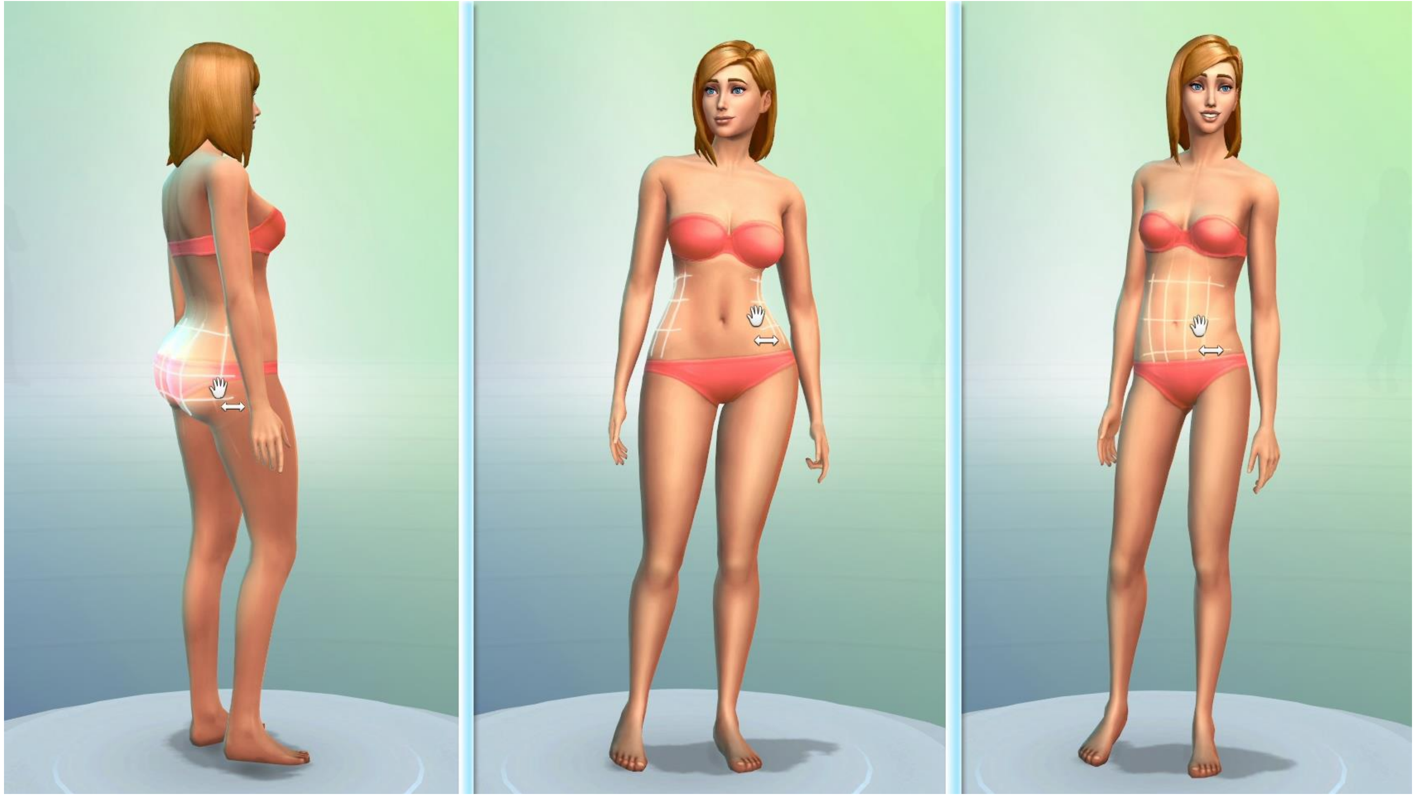


Nose modifier applied on the archetype face

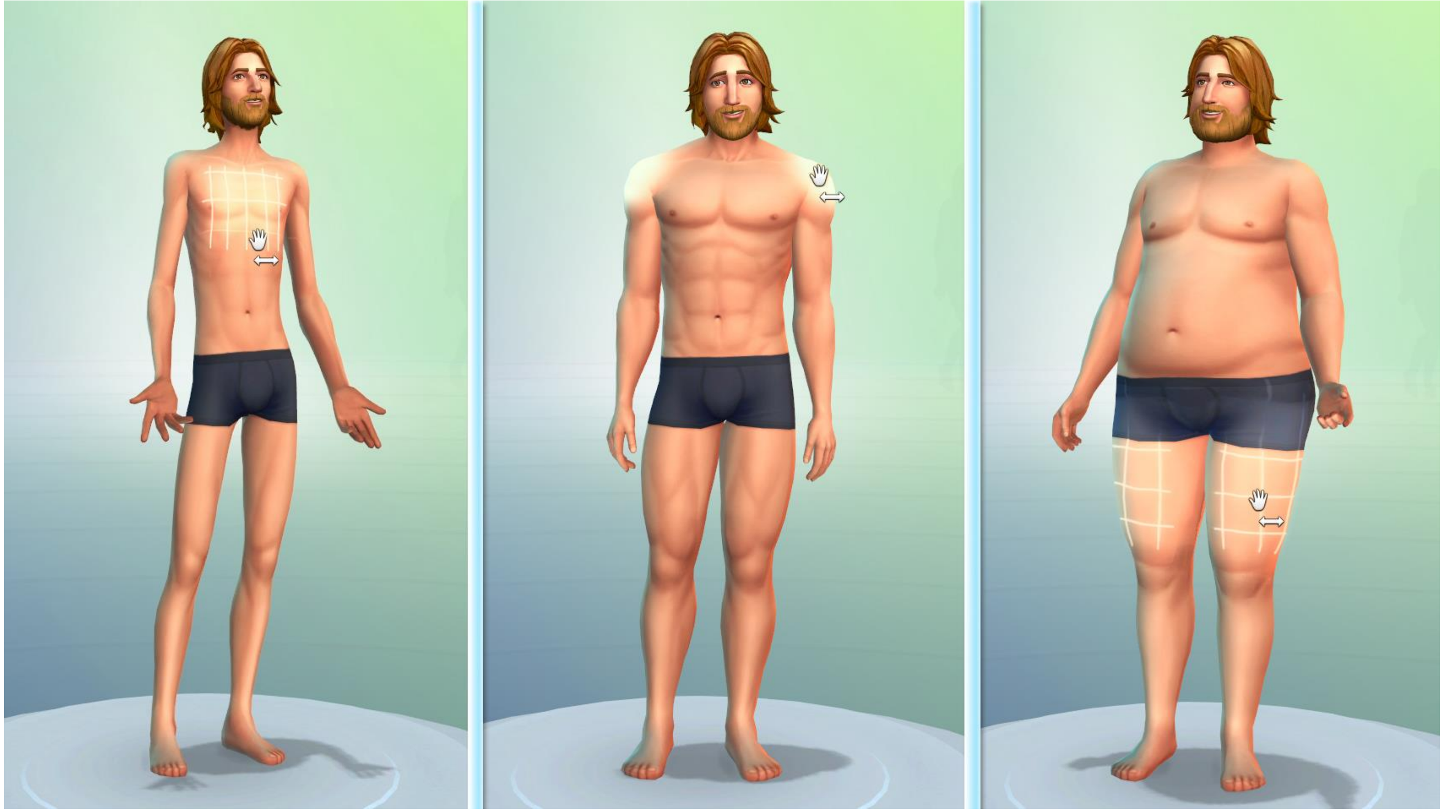
Character Creator – Core X

- Deep customization
  - Asset Pairing – Great mix & match
  - Great variety of faces
  - Many levels of body deformations
    - helped by deformation maps

Body Customization



Body Customization



Body Customization

- 18 touch points to allow customization
- Primarily uses Deformation Maps
- Some of them use bone poses

Why not Blend Shapes?

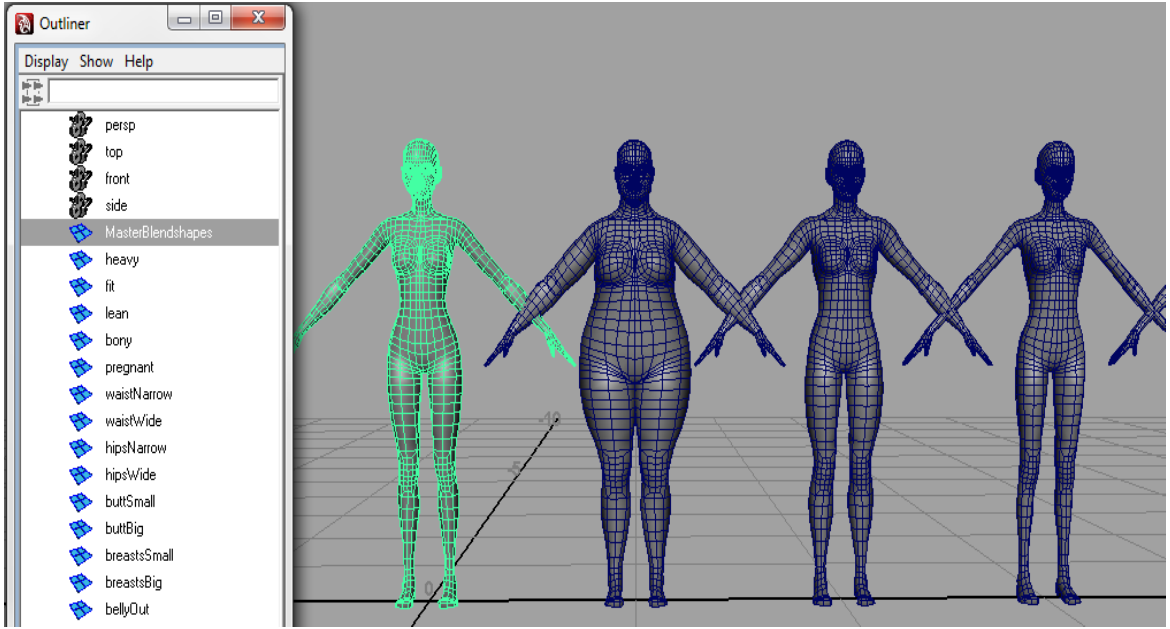
- Blend Shapes are strictly topology dependent thus required per part
- This causes asset, disc/memory explosion
- Hardware limitation of 4 per vertex if older GPU need to be supported.
- Limited extensibility

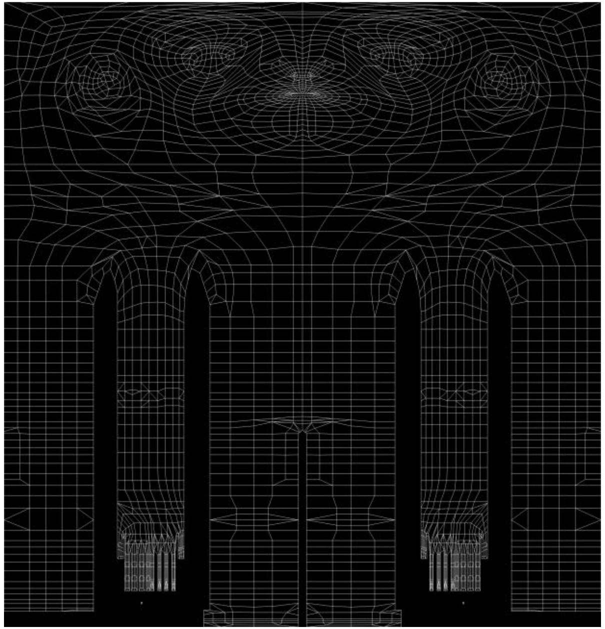
Deformation maps

- Store the delta mesh in bitmaps
- Inspired by wrap deformers & displacement maps, but done in CPU
- Largely topology independent
- Extensible

Deformation maps

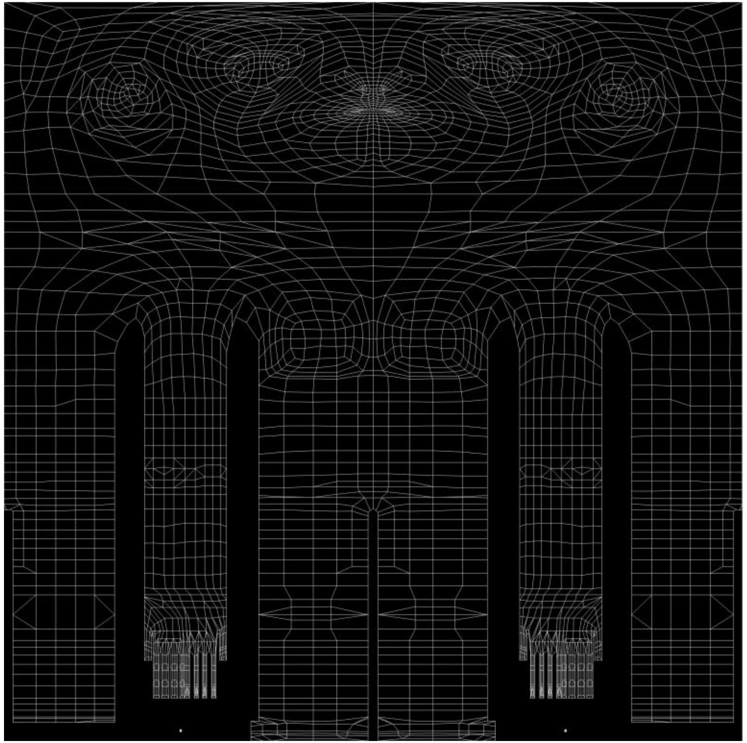
- Authoring – neutral and target shapes

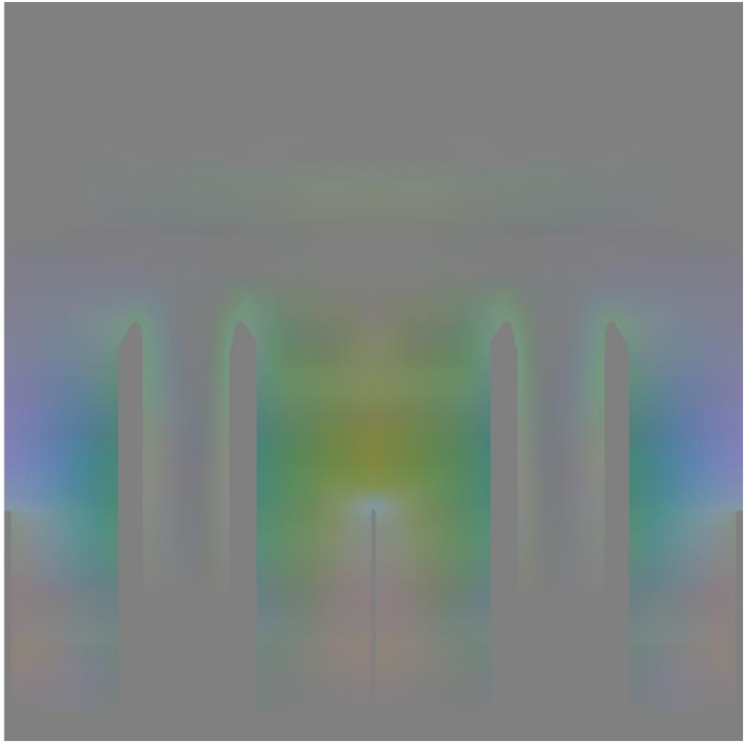




Deformation maps

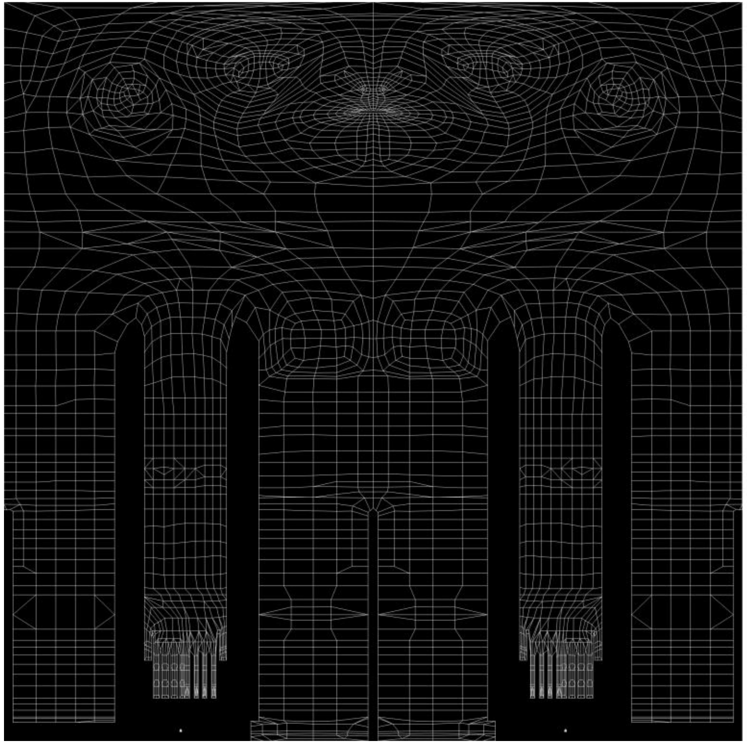
- The delta mesh is computed and stored in a bitmap





Deformation maps

- Shoulder widening d-map

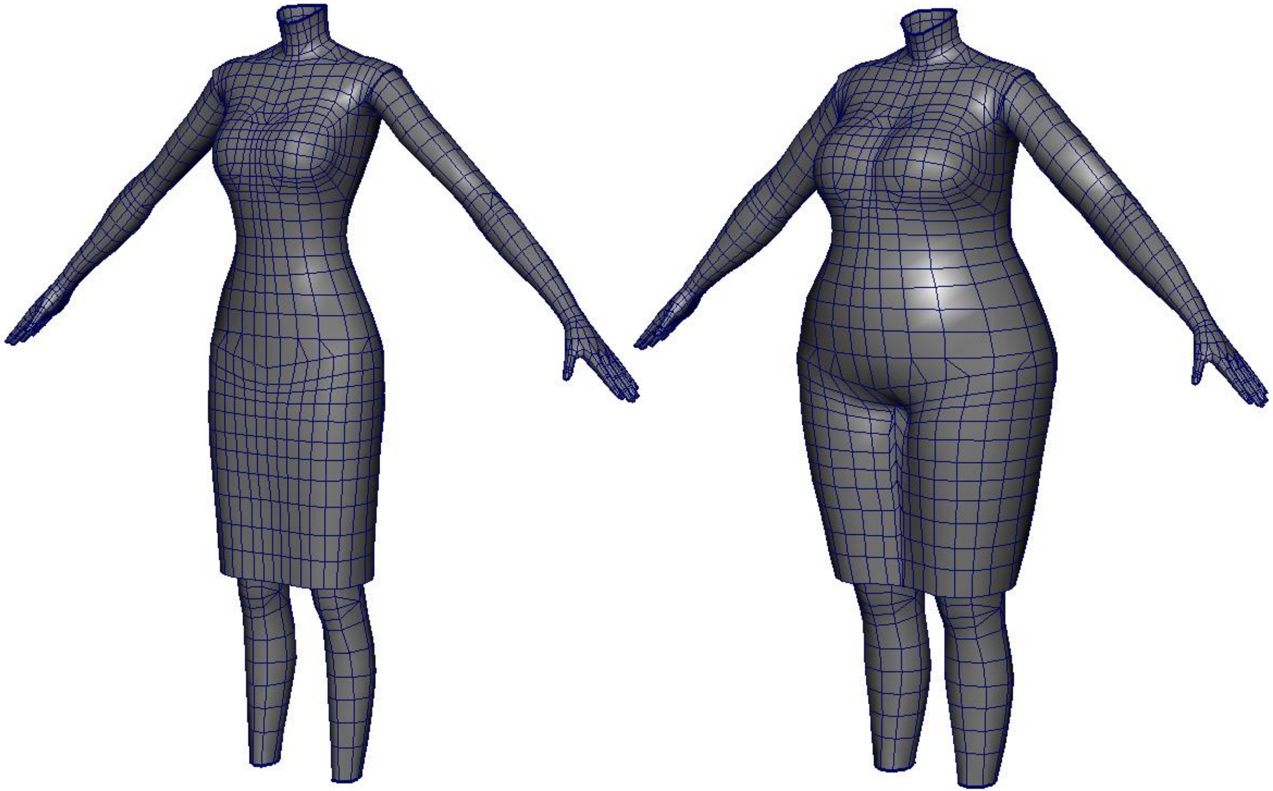


Deformation maps

Optimizations – Part I

- Bounding box to ignore zero delta
- RLE compression
- Vertical symmetry

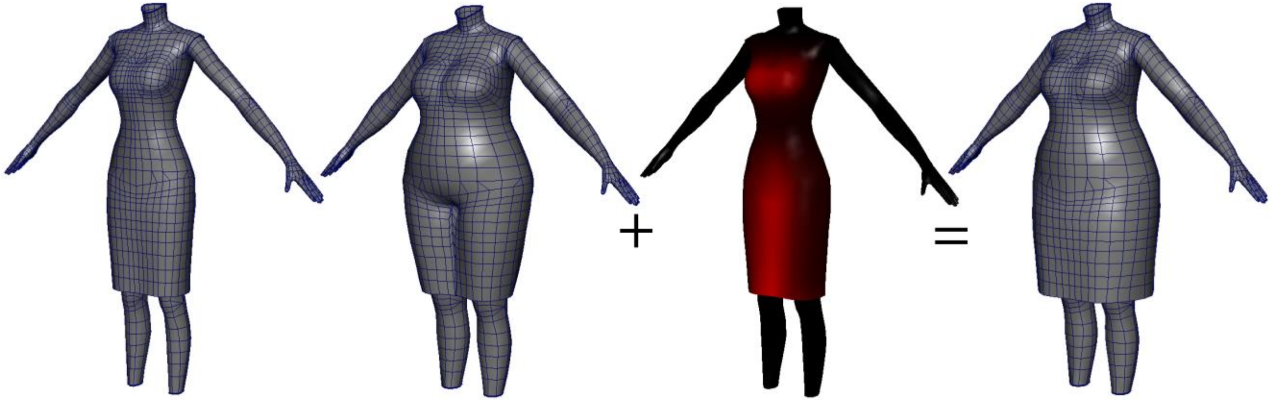
D-maps - Caveat

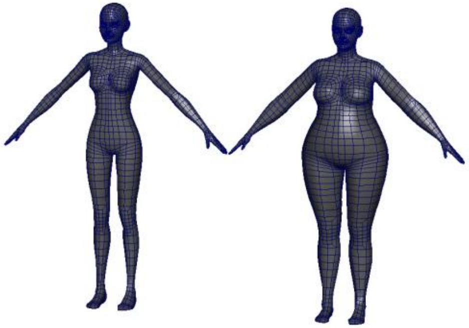


D-maps – Caveat & Solution

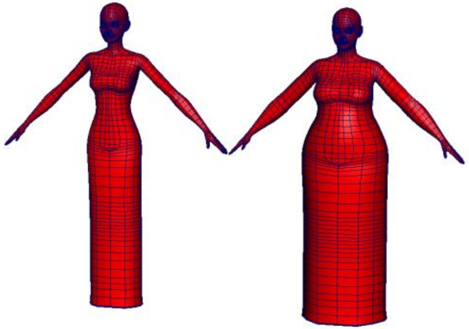
Heavy Shape

+ Painted areas of Robe influence





Skintight Dmap Source Shape



Robe Dmap Source Shape

Deformation maps

Additional Requirements:

- Additional UV set
- Custom compression for efficiently packing redundant data
- Robe vs. Skintight – Drastically different mesh topology, mainly below waist, required two maps per deformation

Recap

- Goals - Accessible & Customizable
- Accessible & Fun - Minimalist UI, Direct Manipulation, Smart Randomization, Fast response
- Customizable – Asset pairing, Face & Body customization.

Thanks!

The Sims 4™

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Q & A

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