

# modflows

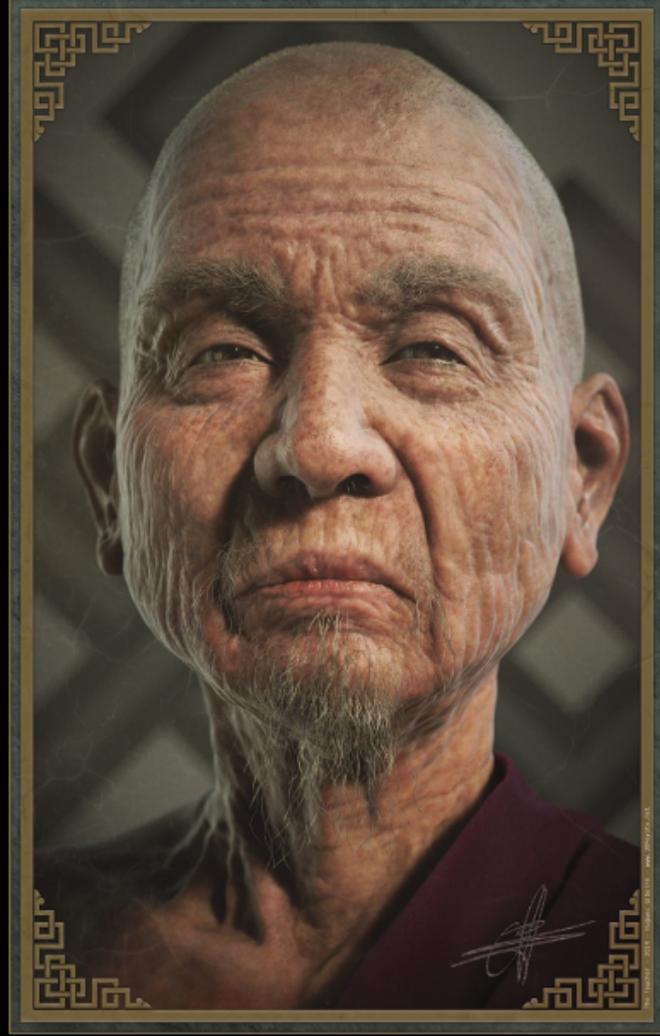


methods for studying and managing mesh editing workflows

[ jonathan d. denning  
dartmouth college ]



[tyler bolyard, 2014]



[hugues gibboire, 2014]



April, 2014



HoseinDiba61@yahoo.com

[hossein diba, 2012]





File Add Render Window Help Default Scene Blender Render v2.68 | Verts:98306 | Faces:98304 | Tris:196608 | Objects:1/3 | Lamps:0/1 | Mem:32.3

▼ Brush

Grab Z F + X

Radius: 77

Autosmo: 0.000

Normal Weig: 0.000

Area Plane

Front Faces Only

Overlay: Alpha: 1%

▼ Sculpt Mode

View Sculpt Brush Hide/Mask Sculpt Mode

Scene

View

Lens: 35.000

Lock to Object:

Lock to Cursor

Lock Camera to View

Clip: Start: 0.100 End: 1000.000

Local Camera: Camera

Render Border

▼ 3D Cursor

Location: X: -0.0215 Y: 0.1614 Z: -0.0874

▼ Item

Icosphere

▼ Display

Only Render

Outline Selected

All Object Origins

Relationship Lines

Grid Floor X Y Z

Scene

RenderLayer

World

metal putty

wax red

wax red F + X

Type Image or Movie

▼ Preview

Texture Material Both

Show Alpha

Colors

Image

stone.jpg F + X

Source: Single Image

tcaps/wax\_red.JPG

Start: 1 End: 250 1

No Sync

study creation and editing of polygonal meshes

lots of workflows

zbrush sculpting - YouTube - Google Chrome

zbrush sculpting - YouTube

www.youtube.com/results?search\_query=zbrush%20sculpting&sm=

YouTube zbrush sculpting About 75,400 results

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**Zbrush Lesson: Head Sculpting Basics p1**  
by **truedeja** · 3 years ago · 131,104 views  
This is part 1 of 2 videos. Part 2: [http://www.youtube.com/watch?v=gU8rtjH\\_wA&NR=1](http://www.youtube.com/watch?v=gU8rtjH_wA&NR=1) This video is a time-lapse of me sculpting ...  
HD

**Daydreamer sculpt timelapse**  
by **SupremePark** · 5 months ago · 37,402 views  
I wanted to test some users for Microdash, so I thought I'd give it a shot to this song. I didn't have much of a plan other than I ...  
HD

**Tywin Lannister Sculpt Timelapse**  
by **Adam Fisher** · 4 months ago · 28,886 views  
Timelapse of a Zbrush sculpt I did of Tywin Lannister. The final image can be seen at: <http://www.afisher.com.au> or ...  
HD

**How to sculpt a head using Zbrush 4 R2**  
by **Duyfih Nguyen** · 1 year ago · 87,615 views  
This video covers how to model a head using Zbrush 4 R2.  
HD

**zBrush Time Lapse - Speed Sculpting Anatomy**  
by **Joshua Morley** · 1 year ago · 12,453 views  
Taking time to do anatomy sculpts. Did this to the best of my knowledge, and even after more studies, do an after version.  
HD

**Venom ZBRUSH Speed Sculpt**  
by **Ben Shukrallah** · 1 year ago · 72,436 views  
My official site: [www.benshukrallah.com](http://www.benshukrallah.com) Learn how to make characters like this! [www.characterrealisationseries.com](http://www.characterrealisationseries.com) This is my ...  
HD

**Dragon ZBrush Sculpt HD**  
by **Andreas Mayer** · 1 year ago · 18,344 views  
Hey friends I have a new live!aps Sculpting Demo. Real Sculpt & Composite Time was ca. 3 Hours. I hope you like it, and See ...  
HD

"zbrush sculpting"  
yields 75k results

blender sculpting - YouTube - Google Chrome

blender sculpting - YouTube

www.youtube.com/results?search\_query=blender%20sculpting&sm=3

blender sculpting

About 114,000 results

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**Blender Tutorial - Sculpting in Blender Part 1 of 2**  
by **Alex Cordebar** · 10 months ago · 79,124 views  
In this 2 part tutorial you will learn how to start sculpting, the difference with dynamic topology and multires sculpting, the different ...

**Sculpting a Human Head in Blender**  
by **Blender Cookie** · 1 year ago · 159,215 views  
See more tutorials at <http://blendercookie.com> Hello and welcome to this tutorial on sculpting a human head in Blender! This

**Introduction to Dynamic Topology Sculpting in Blender**  
by **Blender Cookie** · 8 months ago · 62,071 views  
Learn how to use Dynamic Topology Sculpting in Blender ...

**Sculpting Timelapse in Blender**  
by **Tony Step** · 2 months ago · 595 views  
Реша с колом творится что то нездоровое, было время грешил майкой и ставил на нее планы, ну и подкавал варушки, ...

**Remesh and Boolean. Evangelion unit concept timelapse**  
by **Roberto Roch** · 1 year ago · 41,626 views  
Test sculpt with Blender 2.64 first test build. Also using remesh and boolean union operators. Sculpt tools ...

**Sculpting a Male Human Bust in Blender**  
by **Blender Cookie** · 1 year ago · 45,379 views  
View more tutorials on <http://blendercookie.com> Hello and welcome to this video tutorial on Sculpting a Human Bust in Blender!

**Blender Tutorial Sculpting (1) Set Up by VscorpianC**  
by **VscorpianC** · 2 years ago · 23,230 views  
This Blender tutorial shows how to set up user preferences for Sculpting Mode. VscorpianC Blender 3d is free to download and ...

"blender sculpting"  
yields 114k results

maya modeling - YouTube - Google Chrome

maya modeling - YouTube

www.youtube.com/results?search\_query=maya%20modeling&sm=3

YouTube

maya modeling

Upload

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Filters

About 180,000 results

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- YouTube Spotlight
- nganga
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**Speed Modeling Maya- A street**  
by David Herod · 1 year ago · 39,992 views  
just a quick look of how to model a street easy and quick, iam sure there is a lot more to this that can be added , but its just demo ...  
14:44 (HD)

**Autodesk Maya 2013 Tutorial - Character Modeling - body/arms/legs Part 1**  
by Irvin390 · 9 months ago · 55,778 views  
Download concept : <http://irvin390.weebly.com/download-files.html> Eduardo Vieira Artist : <http://eduardovieira.deviantart.com/> ...  
17:56 (HD)

**Autodesk Maya 2013 Tutorial - Treasure Chest Modeling, Texturing, lighting Part 1**  
by Irvin390 · 11 months ago · 45,510 views  
Autodesk Maya 2013 Intermediate Tutorial - Low Polygon Treasure Chest Modeling, Texturing, lighting Part 1 Get textures ...  
11:26 (HD)

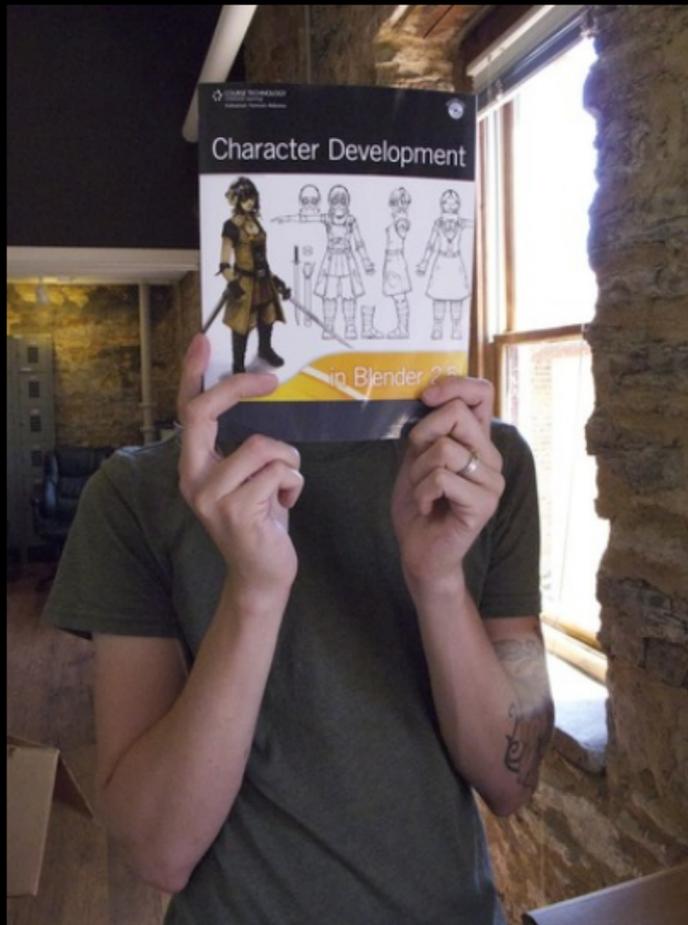
**Maya Modeling Tutorial- modeling a living room part-1**  
by David Herod · 8 months ago · 8,895 views  
in this Tutorial you will get to learn how to model a living room with maya, this first part we will model a sofa, meet me at my ...  
24:17 (HD)

**Autodesk Maya 2013 Modeling Tutorial - Dinosaur (brachiosaurus) Modeling Part 1**  
by Irvin390 · 1 year ago · 50,308 views  
Download Files : <http://irvin390.weebly.com/download-files.html> Support Timesplitters 4 ...  
11:41 (HD)

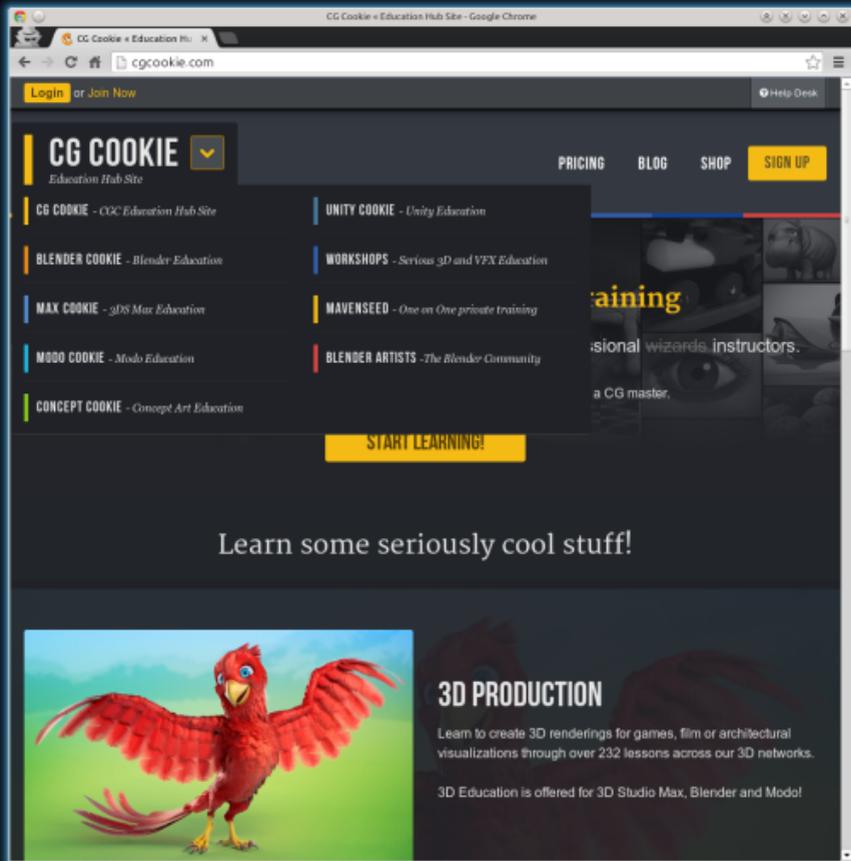
**Minion Modeling [TUTORIAL - Part 1A]**  
by John Aurthur Mercader · 6 months ago · 17,432 views  
So here is a step-by-step walkthrough on how i modeled my minion in maya, rate comment and subscribe for the shading and ...  
15:09 (HD)

**Autodesk Maya: Sackboy Modeling Tutorial [part 1]**  
by AaronM78 · 2 years ago · 102,084 views  
Here is the site with the image <http://www.threespeech.com/blog/step-by-step-how-to-model-sackboy-in-maya/> ...  
17:26 (HD)

"maya modeling"  
yields 180k results



hundreds to thousands of  
books teaching modeling



websites dedicated to  
modeling and sculpting

medium is challenging

one-on-one / limited

tutorial / interrupt, practice

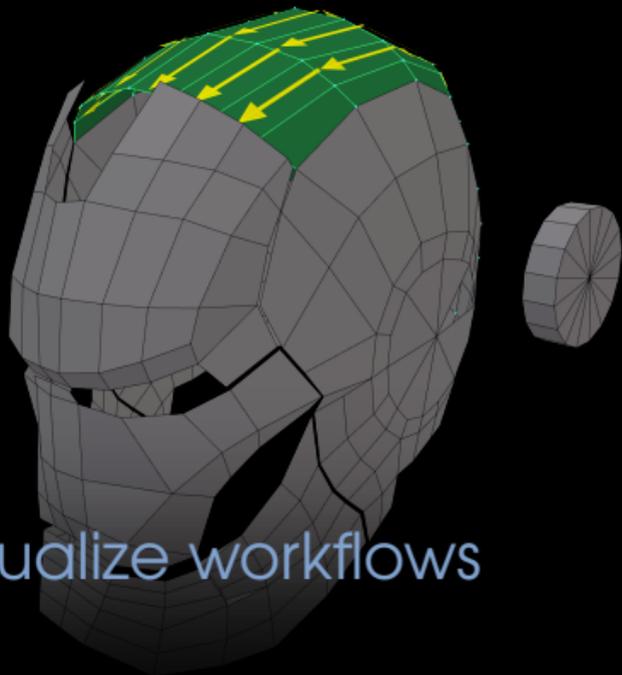
time-lapse / lost in details

## outline

1. summarize workflows
2. workflows from meshes
3. compare workflows
4. other future work

# summarize

summarize and interactively visualize workflows



[ meshflow      3dflow\* ]  
[ siggraph11   sigasia14 ]

\*to be submitted

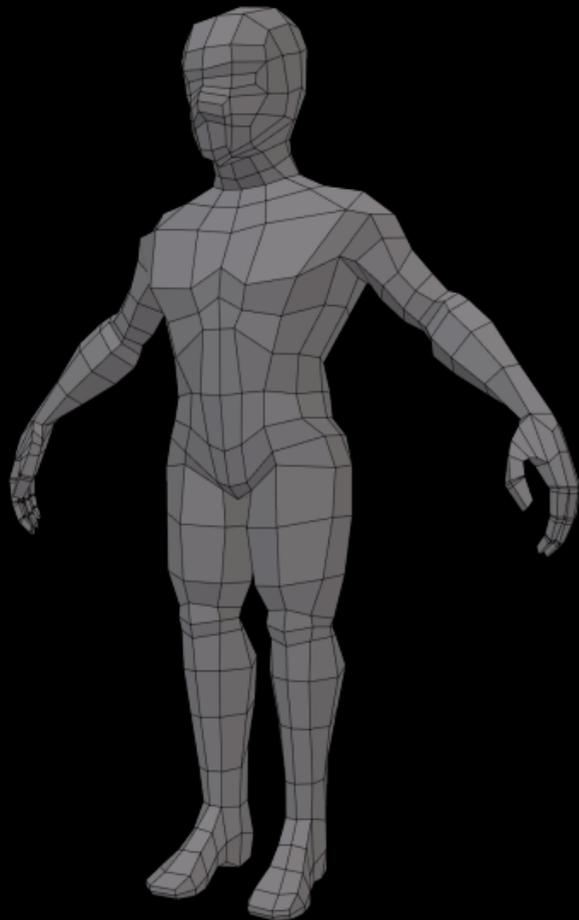
## biped

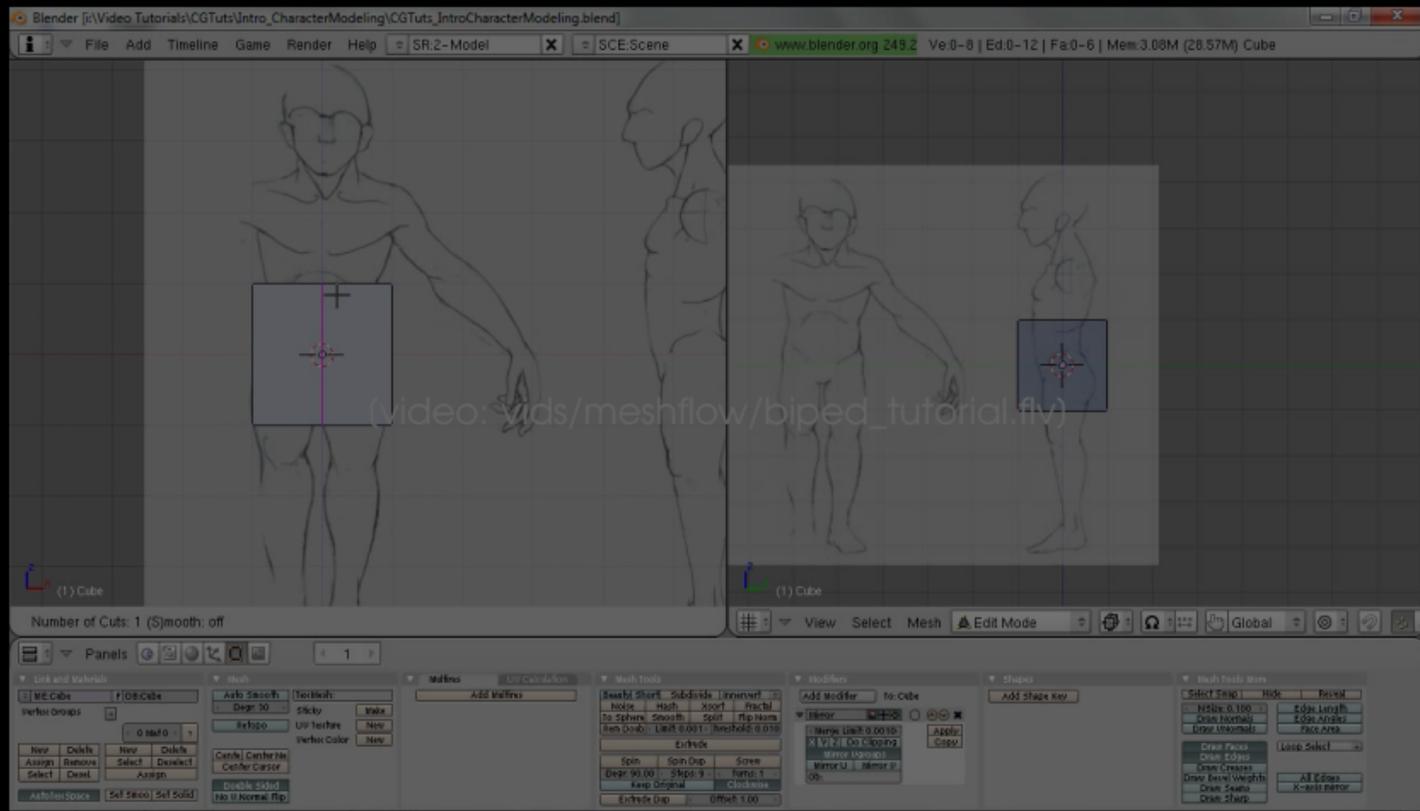
1012 faces

3:10 hrs

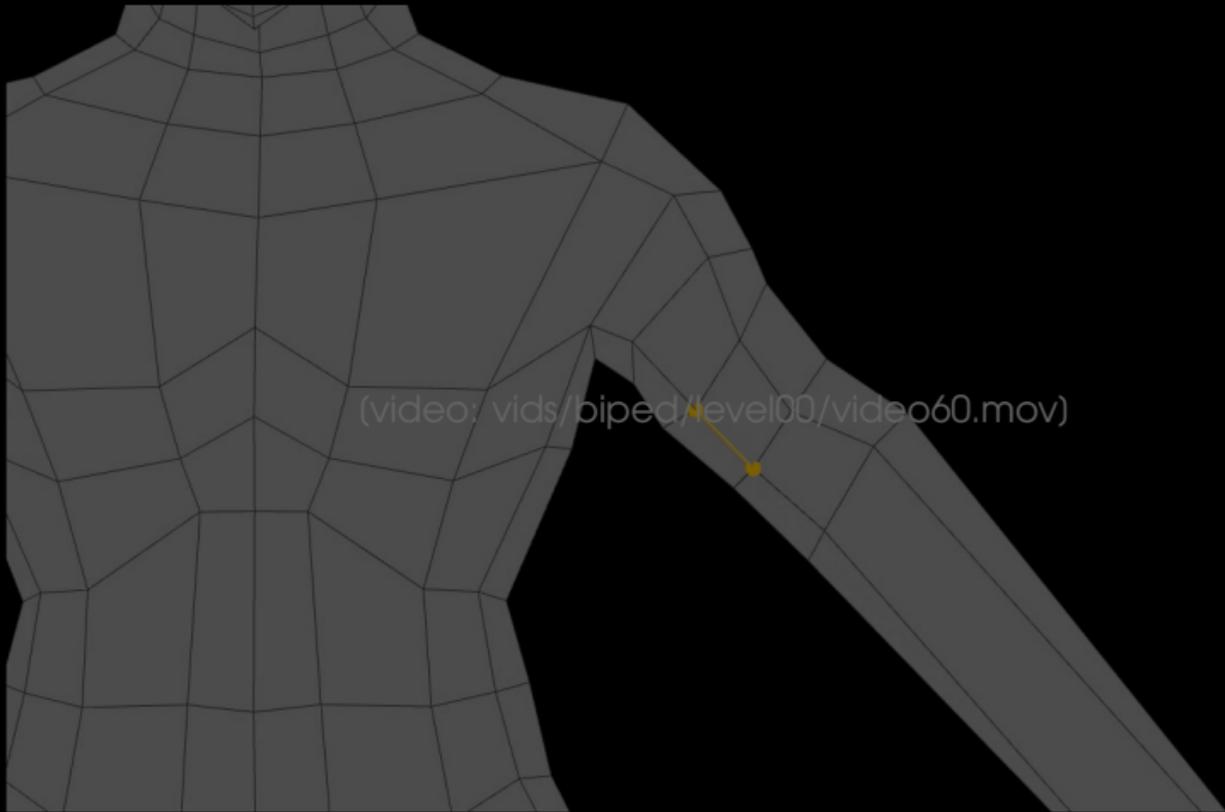
5759 ops

1267 edits



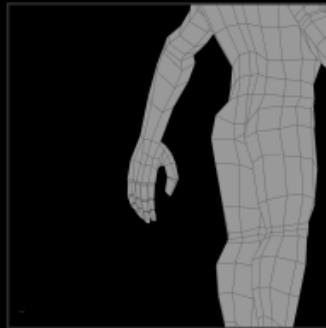
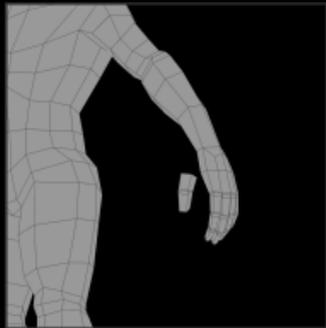
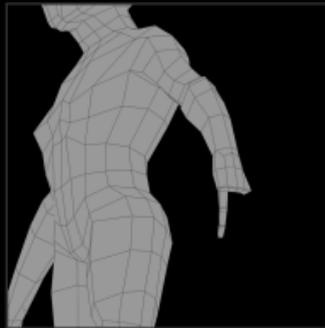
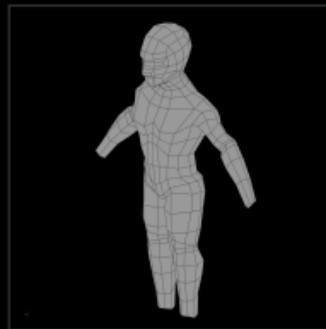
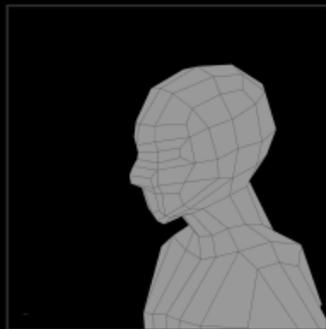
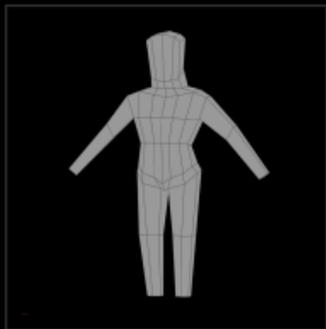
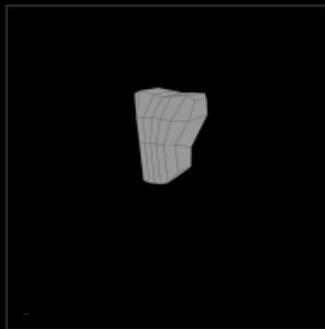


(video: [7ids/meshflow/biped\\_tutorial.flv](https://www.youtube.com/watch?v=7ids/meshflow/biped_tutorial.flv))



(video: vids/biped/level00/video60.mov)

60x



fully-automated approach to summarizing workflows



(video: vids/meshflow/ver02.mov)

+



▼ Object Tools

Transform:

Translate

Rotate

Scale

Origin

Object:

Duplicate Objects

Delete

Join

Shading:

Smooth

Flat

Keyframes:

Insert Remove

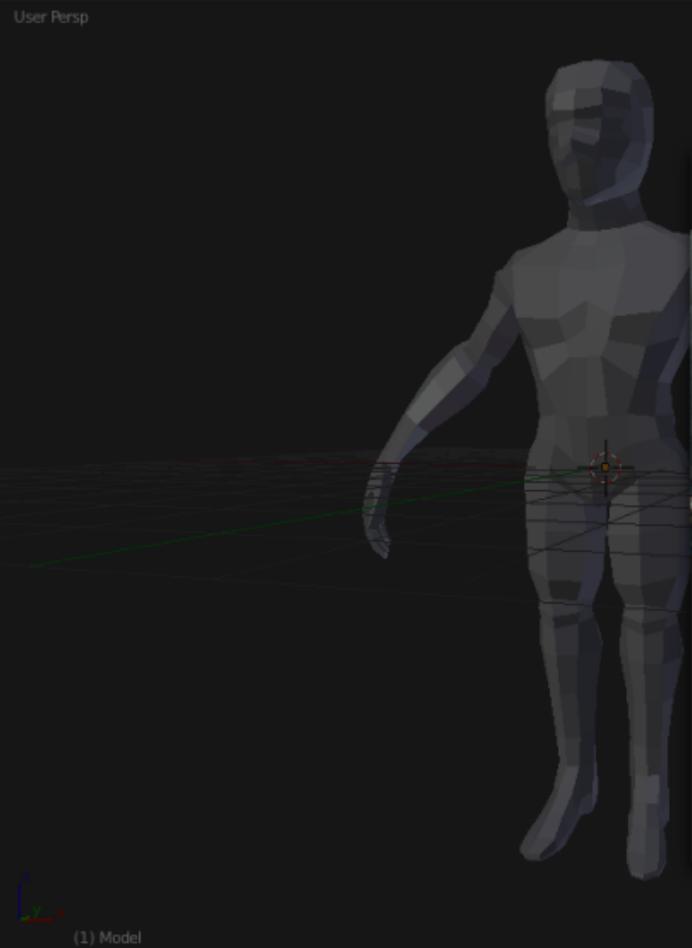
Motion Paths:

Calculate Paths

Clear Paths

Repeat:

Repeat Last



Instrumented  
**Blender 2.5**

2.57.1  
r36798M

www.ring-nation.de

Interaction: Preset

Recent

- step000330.blend Cmd O
- step004284.blend Cmd O
- step004272.blend Cmd O
- step004257.blend Cmd O
- step004243.blend Cmd O

Recover Last Session

Links

- Donations
- Release Log
- Manual
- Blender Website
- User Community
- Python API Reference

Model

▼ Modifiers

Add Modifier

Copy

Textures:

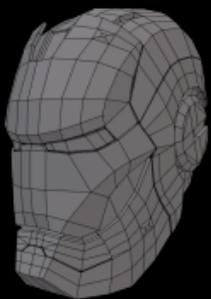
Merg U

Clippi V

Verte

mit: 0.001000

act:

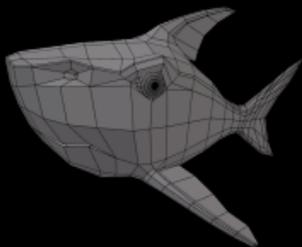


**helmet**

1867 faces

5:05 hrs

8510 ops



**shark**

1796 faces

3:30 hrs

8350 ops

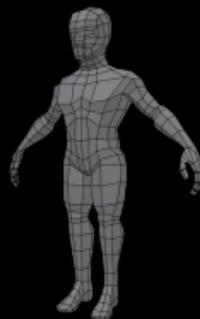


**hydrant**

10808 faces

2:30 hrs

4609 ops

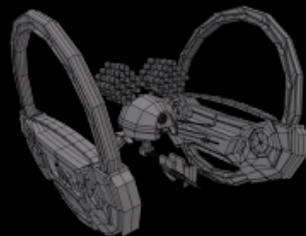


**biped**

1012 faces

3:10 hrs

5759 ops



**robot**

15580 faces

9:40 hrs

13478 ops

## raw seq

⋮  
select  
select  
view  
view  
view  
view  
topo  
trans  
trans  
select  
trans  
trans  
trans  
⋮



## summarized

⋮  
select  
  
view  
topo  
  
trans  
select  
  
trans  
⋮

## top 4 bigrams

	5759		3781		3118		1843		225
cam,cam	.33	select,trans	.22	select,trans	.27	trans,trans	.40	trans,cam	.20
select,trans	.15	trans,select	.16	trans,select	.20	trans,cam	.26	cam,topo <sub>d</sub>	.17
trans,select	.11	cam,select	.13	trans,cam	.15	cam,trans	.25	cam,trans	.16
cam,select	.09	select,select	.13	cam,select	.14	cam,topo <sub>d</sub>	.02	topo <sub>d</sub> ,trans	.12

## summarizing by substitution regexs

2  $(\text{cam})^+ (\text{cam})^\diamond \mapsto (\text{cam})^\diamond$

3  $(\text{view}) (\text{view})^+ \mapsto (\text{view})$

4  $(\text{select}) (\text{view} \mid \text{select})^* (\text{select})^\diamond \mapsto (\text{select})^\diamond$

5  $(\text{select}) (\text{view})^* (\text{topo} \mid \text{trans})^\diamond \mapsto (\cdot)^\diamond$

6  $(\text{trans}) (\text{view} \mid \text{trans})^* (\text{trans})^\diamond \mapsto (\cdot)^\diamond$

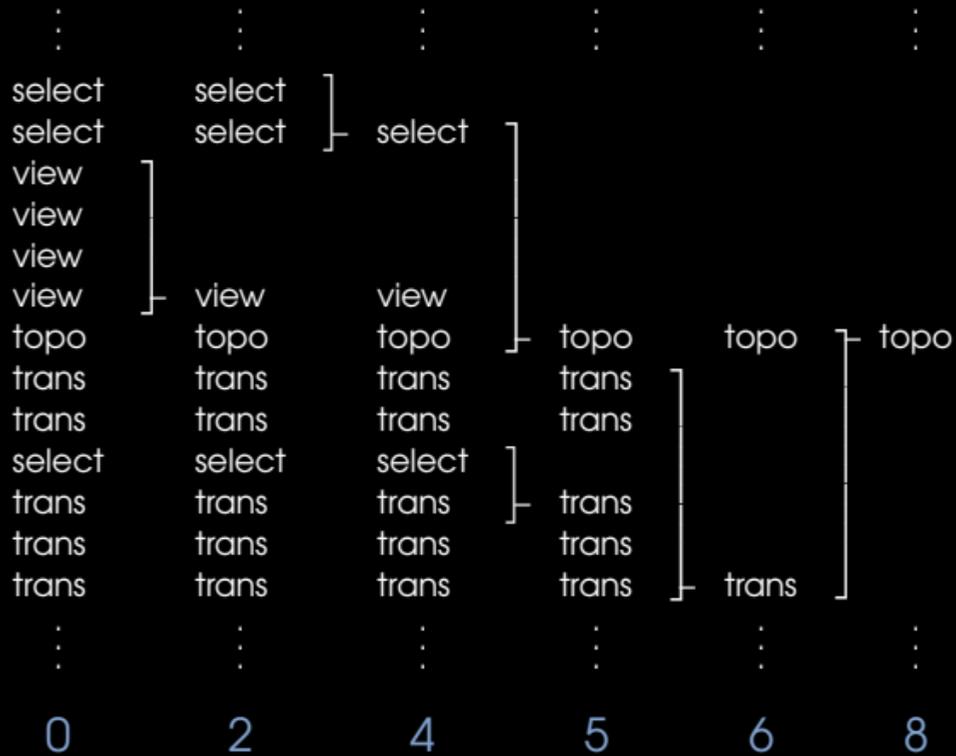
7  $(\cdot)^\diamond (\text{view} \mid (\cdot)^\diamond)^* (\cdot)^\diamond \mapsto (\cdot)^\diamond$

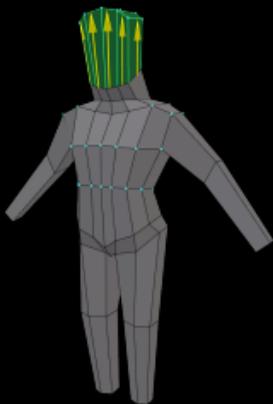
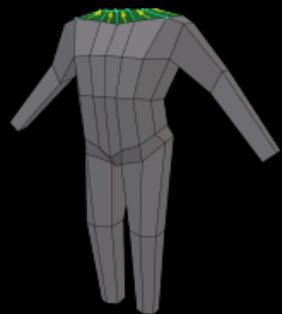
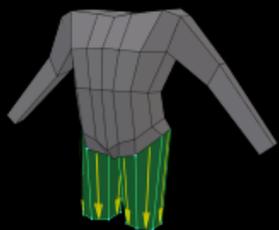
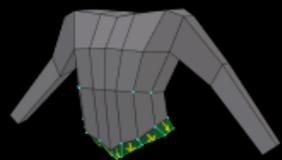
8  $(\text{topo})^\diamond (\text{view} \mid \text{trans})^* (\text{trans}) \mapsto (\cdot)^\diamond$

9  $(\text{topo}_a)^\diamond (\text{view} \mid \text{topo}_b)^* (\text{topo}_b) \mapsto (\cdot)^\diamond$

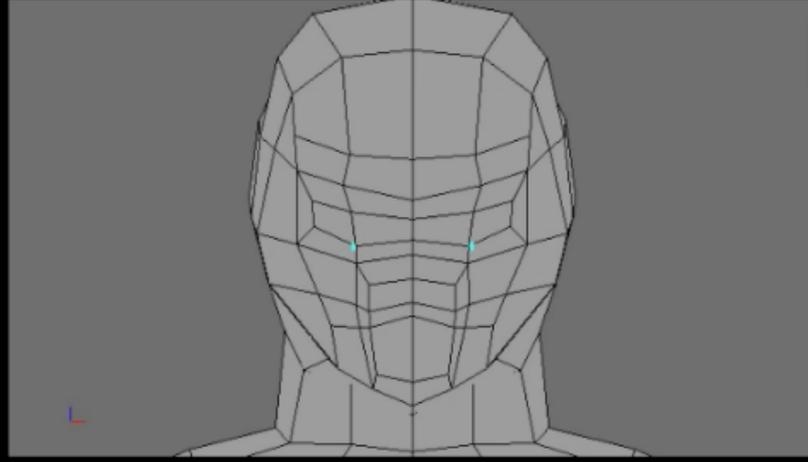
10  $(\cdot)^\diamond (\text{view} \mid (\cdot)^\diamond)^* (\cdot)^\diamond \mapsto (\cdot)^\diamond$

# levels of detail

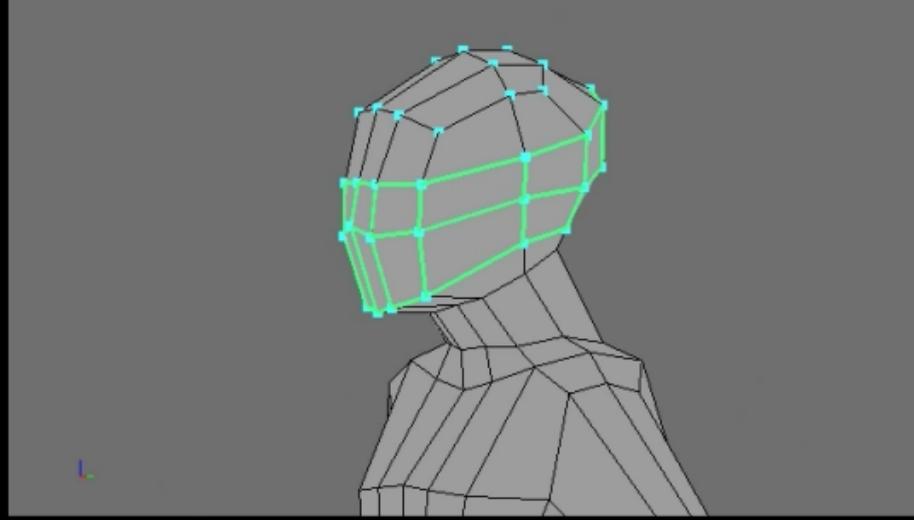




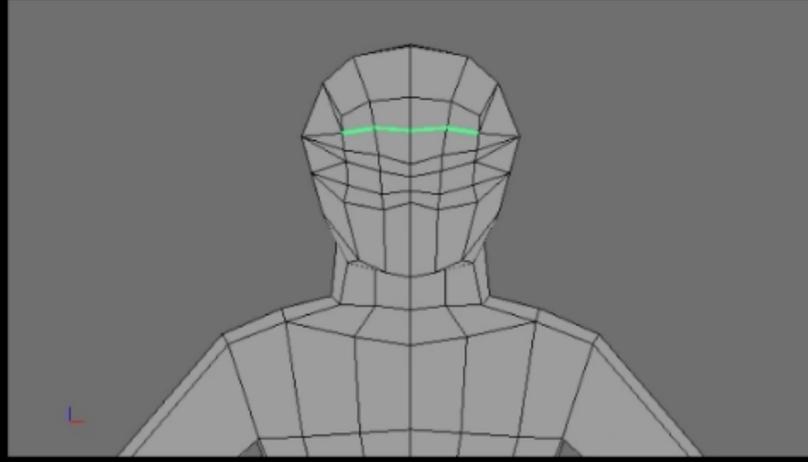
Level 5

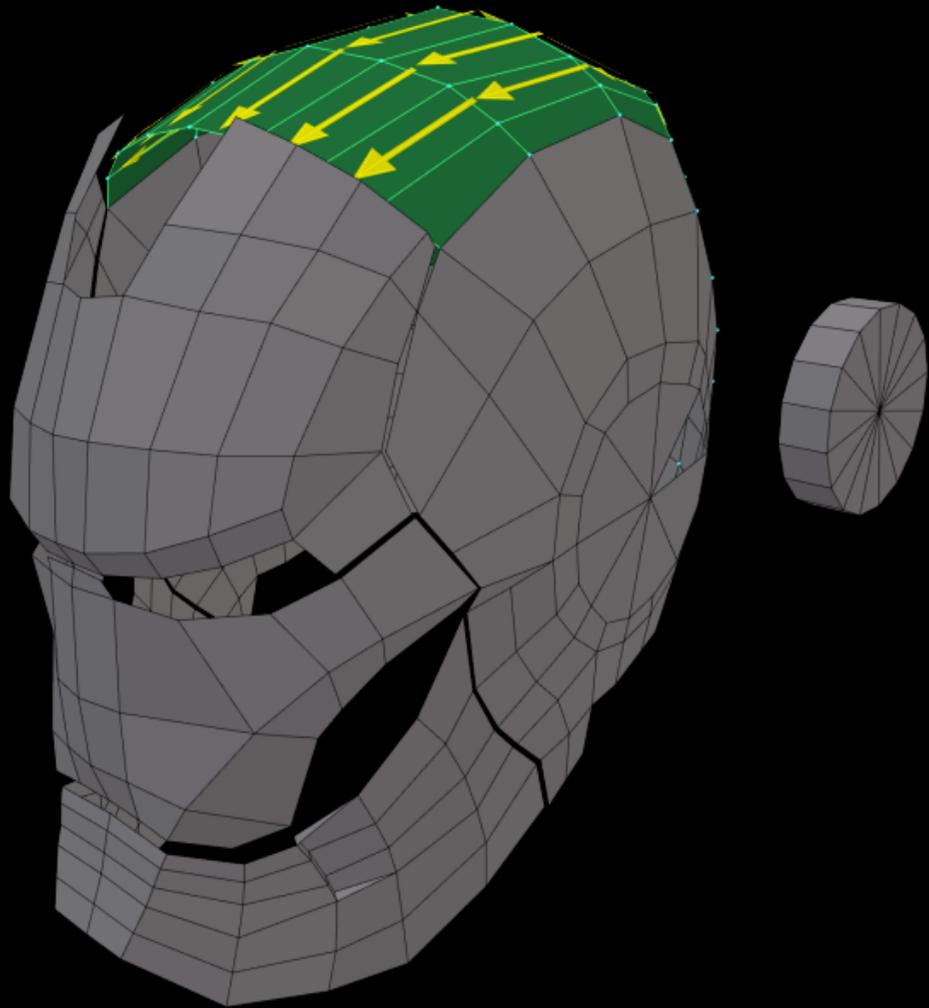


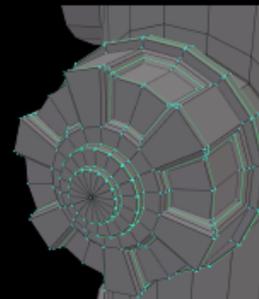
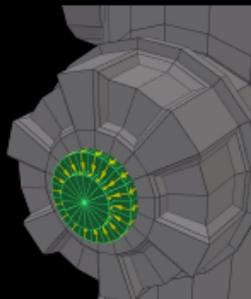
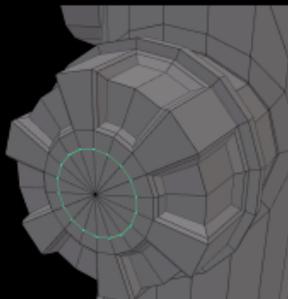
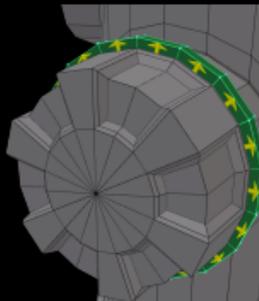
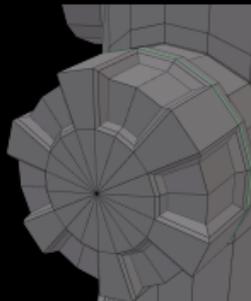
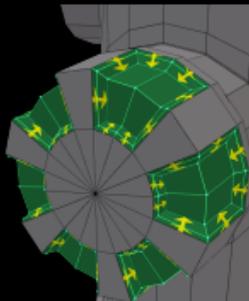
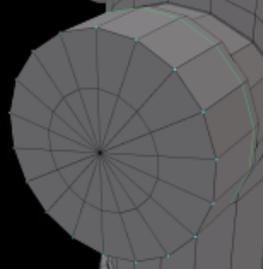
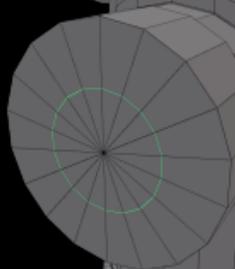
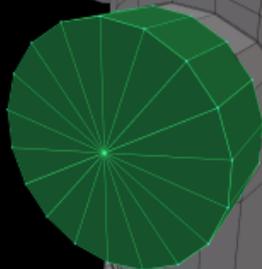
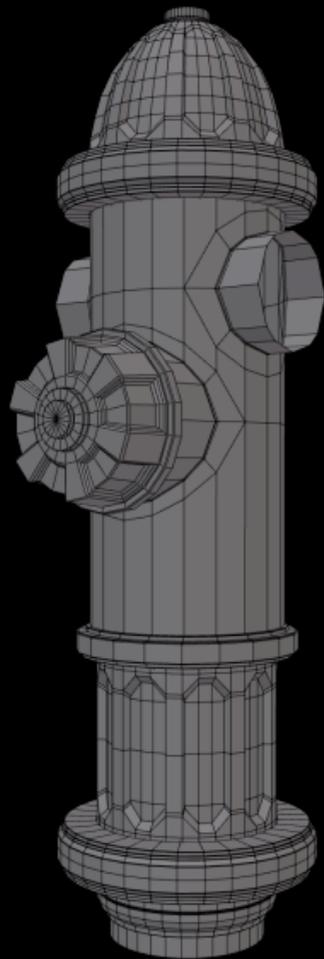
Level 9



Level 7

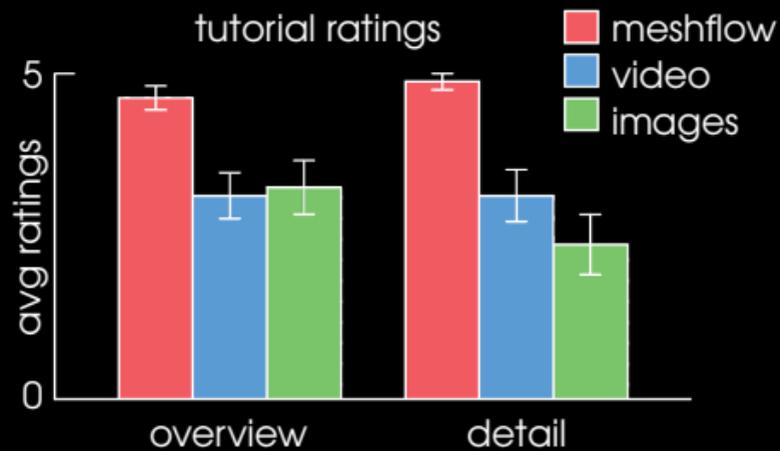
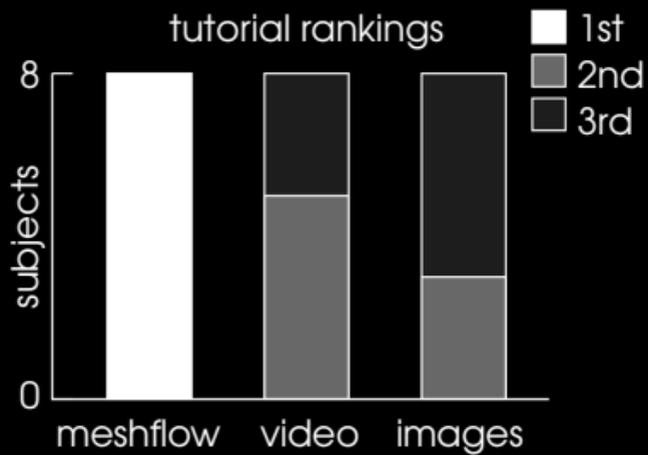






## case study

8 college students  
modeling class  
followed tutorial



I would <sup>have</sup> loved to ~~have~~ <sup>use</sup> this interactive vis tutorial  
in a digital arts modeling class. Though I  
suppose with it, the professor would not need to  
do much.

# summarize

overview / details

automatic

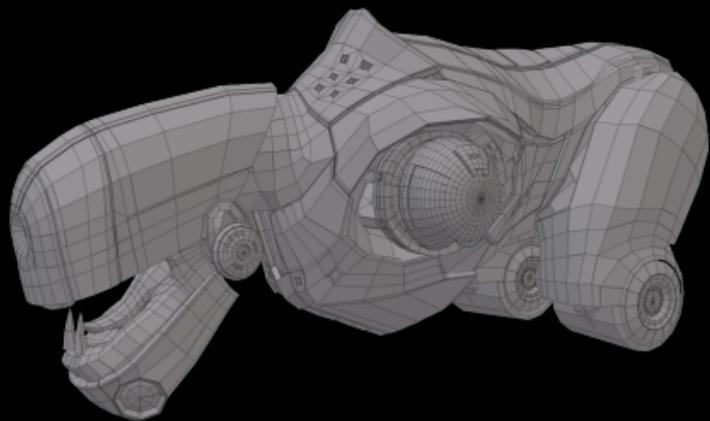
highlights and annotations

# from meshes

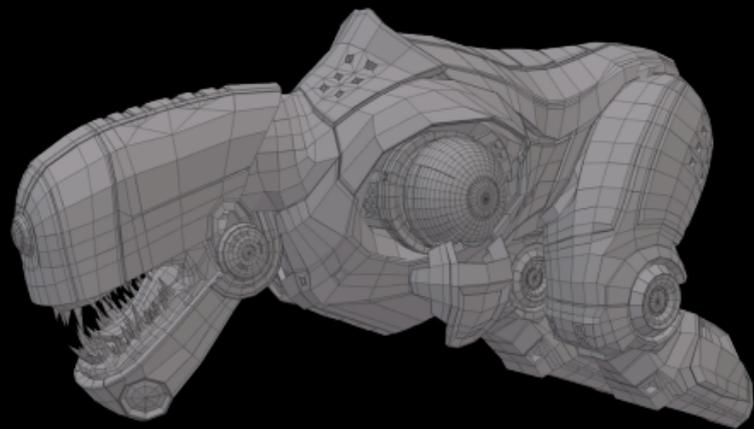
generating workflows from a set of meshes



[ meshgit  
siggraph13 ]



original



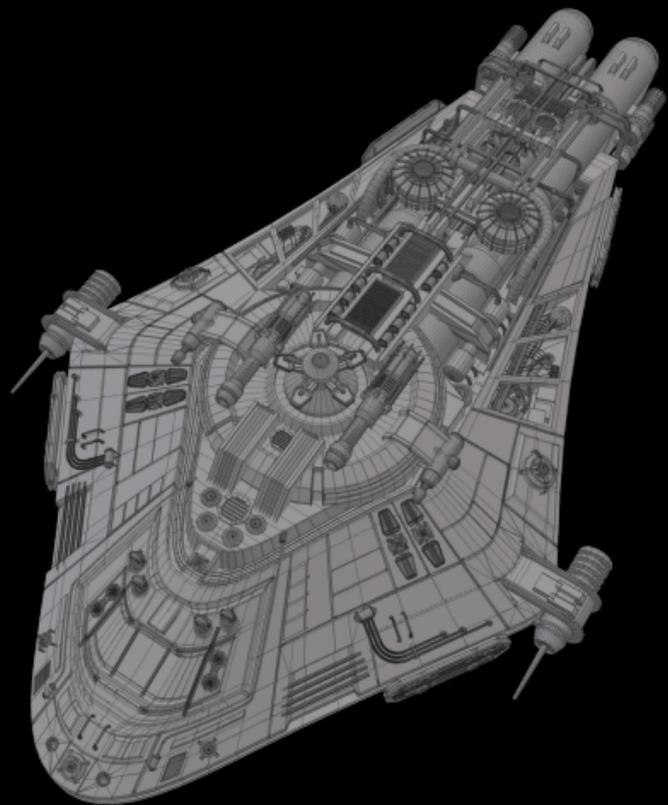
derivative



original



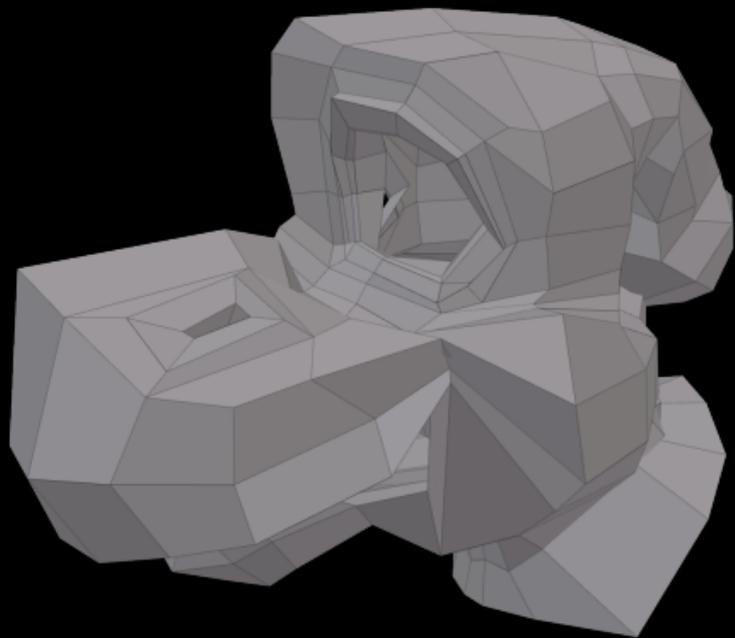
derivative



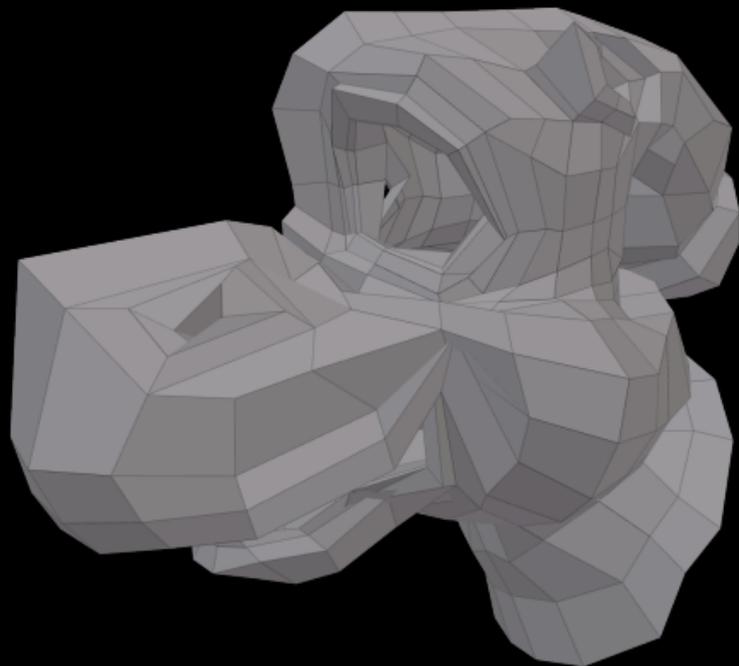
original



derivative

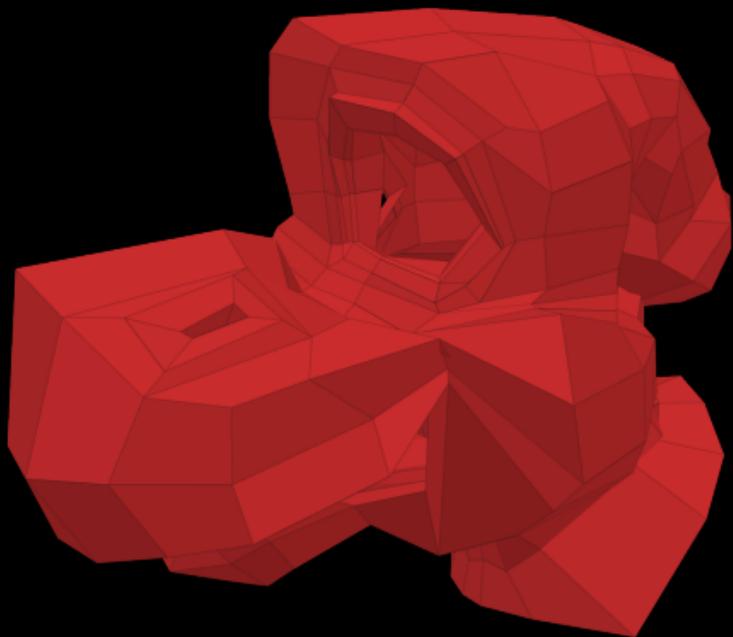


original

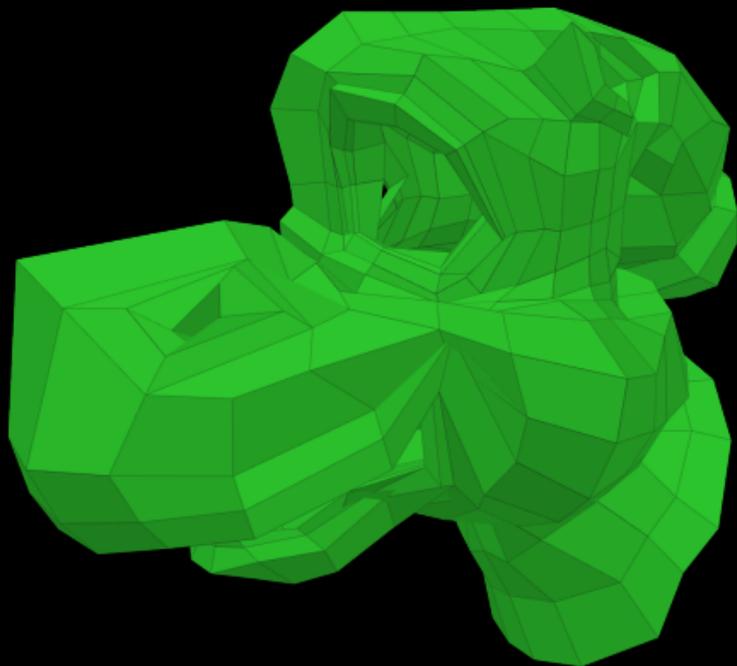


derivative

del, add

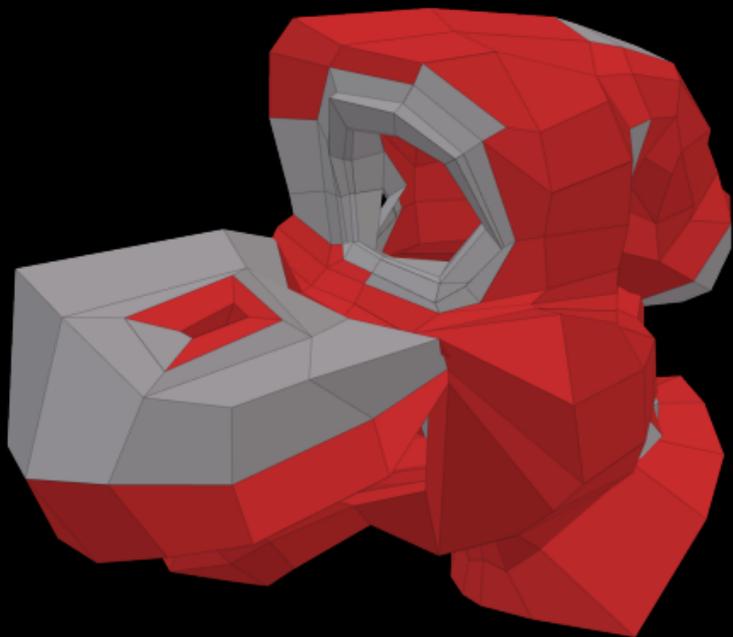


original

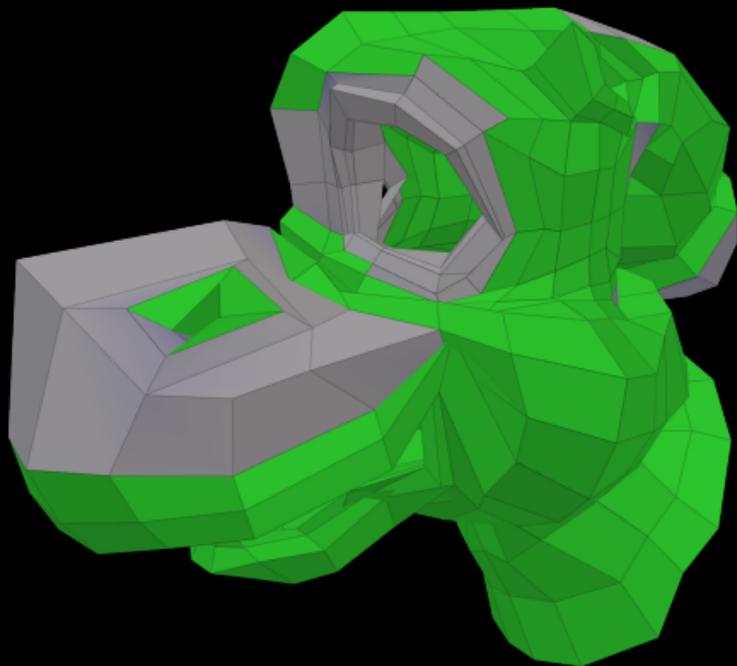


derivative

exact matching

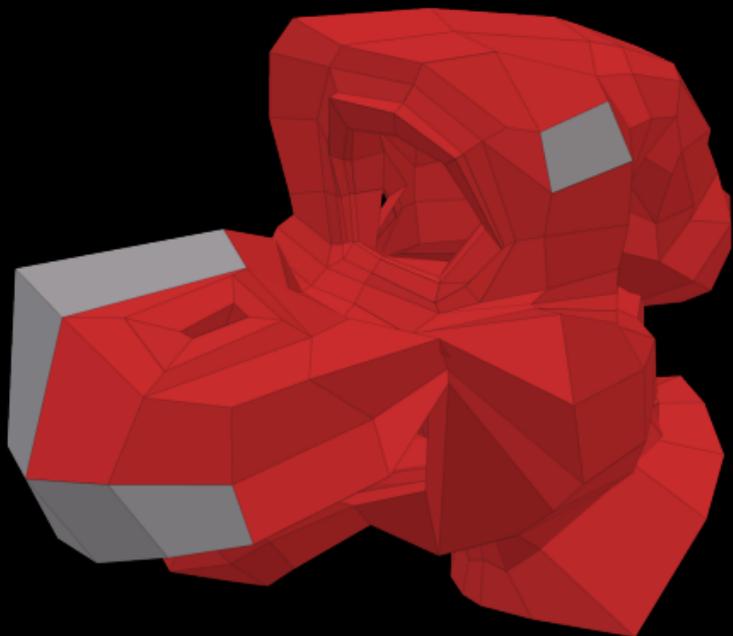


original

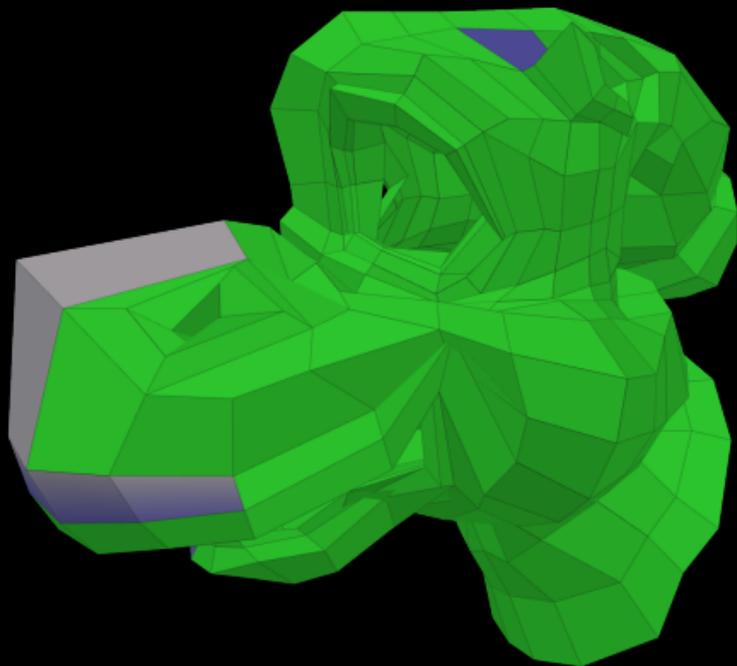


derivative

# surface correspondence

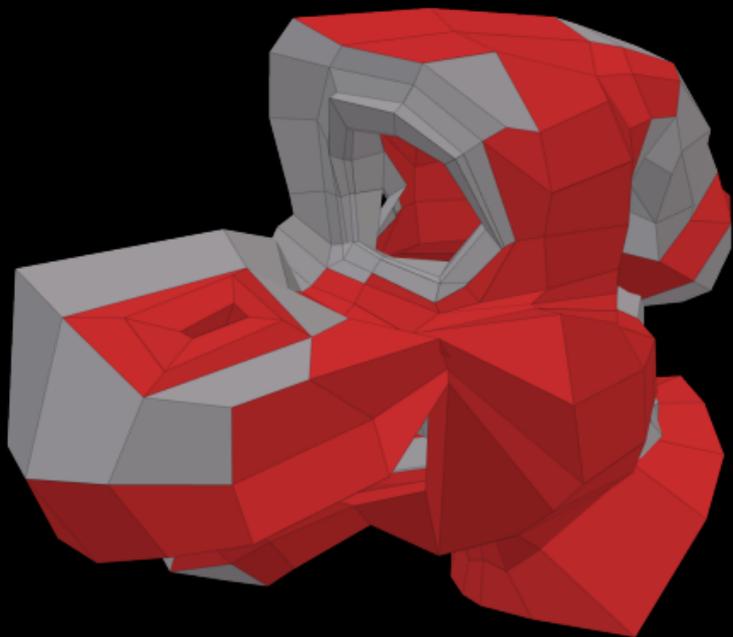


original

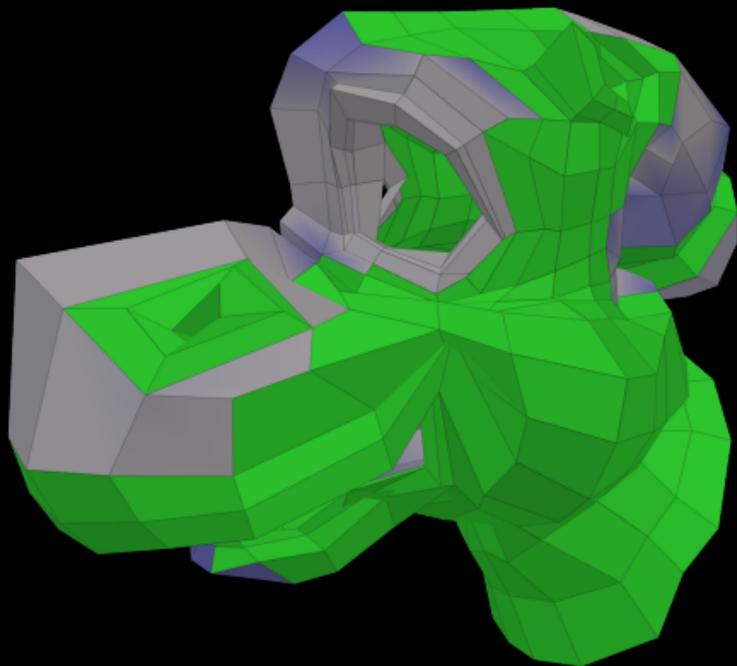


derivative

# graph match

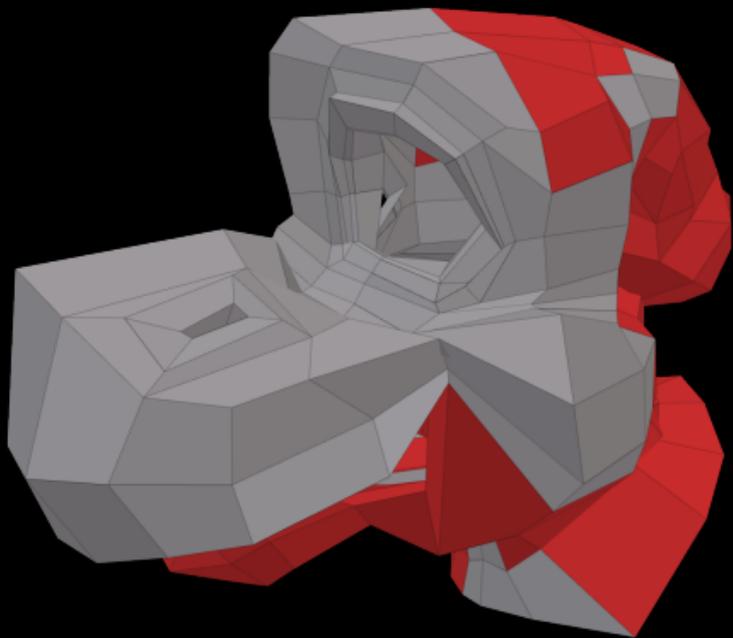


original

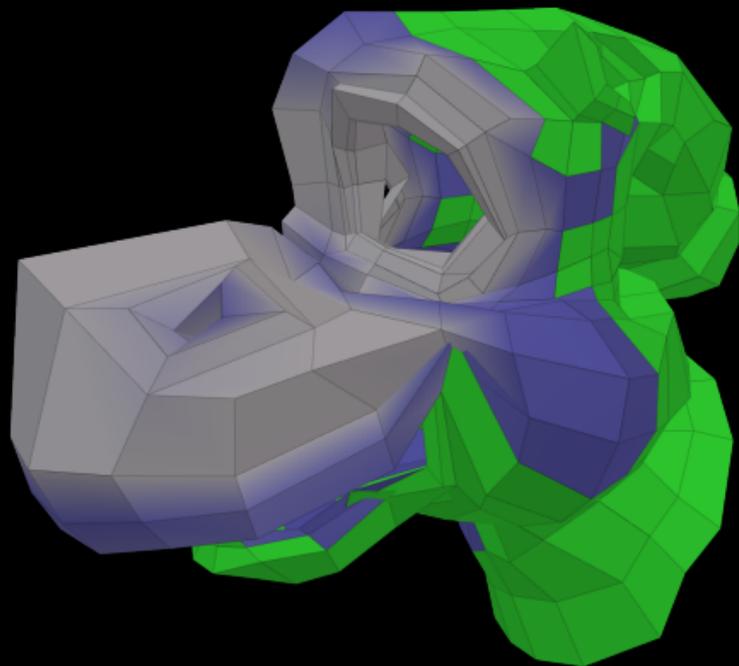


derivative

# adjacency matching

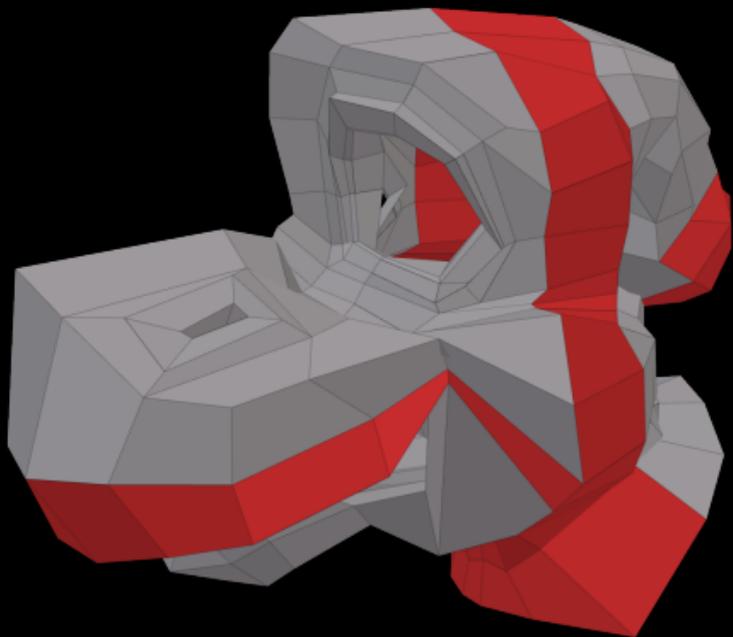


original

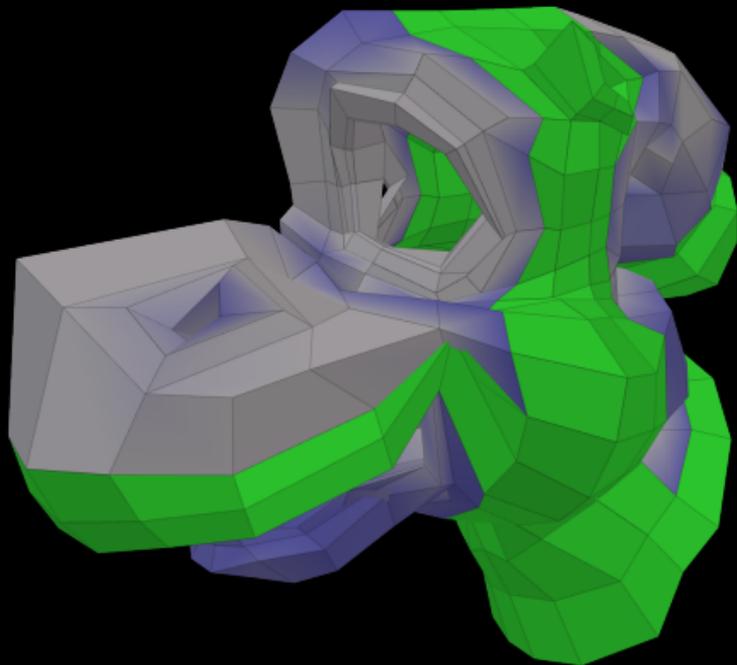


derivative

meshgit



original



derivative

string edit distance / mesh edit distance

## mesh edit distance

min cost of partially matching meshes

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

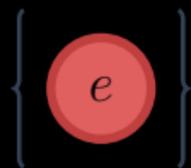
$C_u$  : unmatched faces and verts

$C_g$  : geometric changes

$C_a$  : adjacency changes

$O$  : partial matching of two meshes

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$



original



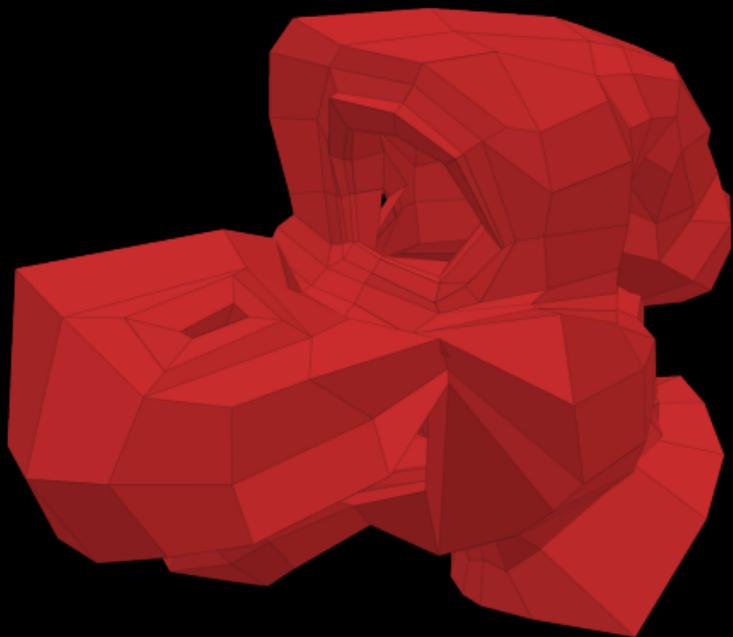
derivative

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

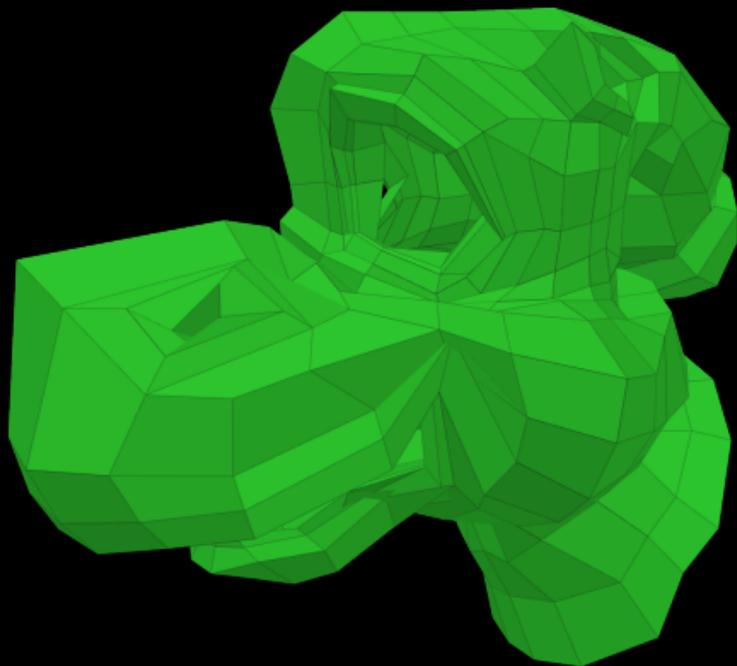
$$C_u(O) = N_u + N'_u$$

$N$  : number of unmatched faces and verts

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

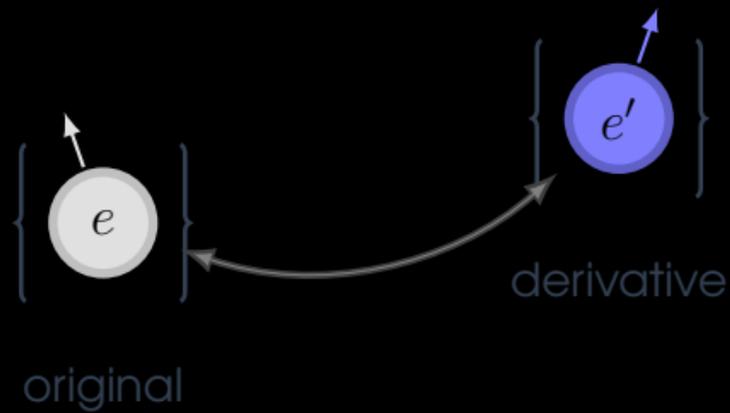


original



derivative

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$



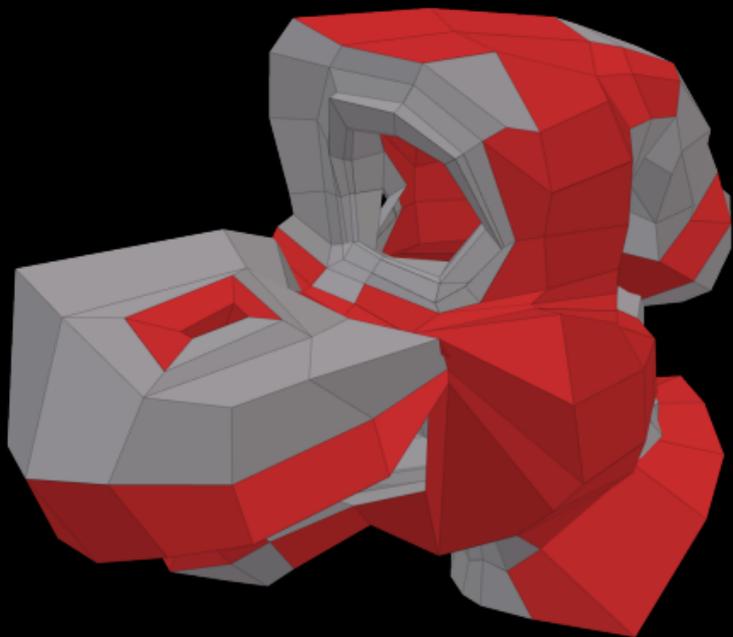
$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

$$C_g(O) = \sum_{e \in E} \left[ \frac{d(\mathbf{x}_e, \mathbf{x}_{e'})}{d(\mathbf{x}_e, \mathbf{x}_{e'}) + 1} + (1 - \mathbf{n}_e \cdot \mathbf{n}_{e'}) \right]$$

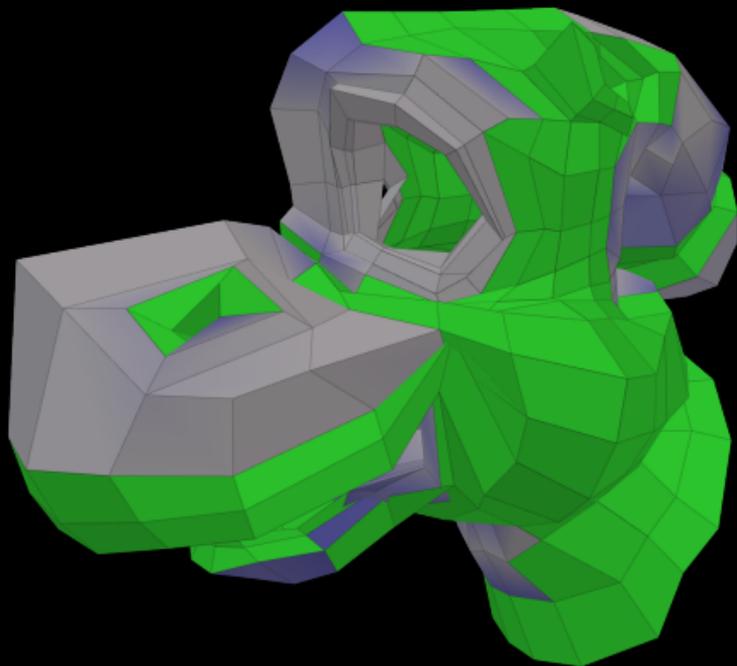
$E$  : matched faces and verts

$\mathbf{x}$  : position       $\mathbf{n}$  : normal       $d(\mathbf{x}_e, \mathbf{x}_{e'}) = |\mathbf{x}_e - \mathbf{x}_{e'}|$

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

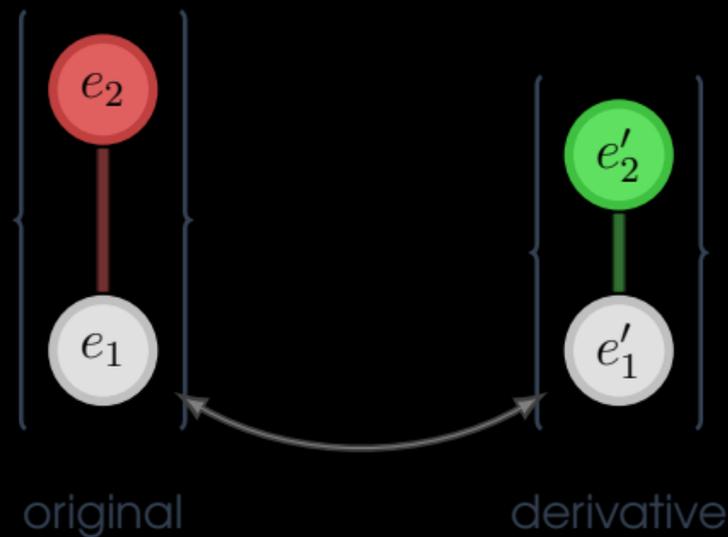


original

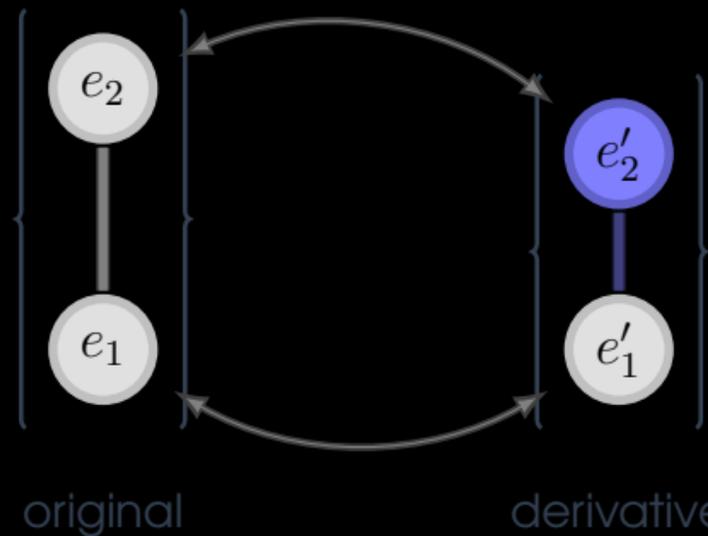


derivative

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$



$$C(O) = C_u(O) + C_g(O) + C_a(O)$$



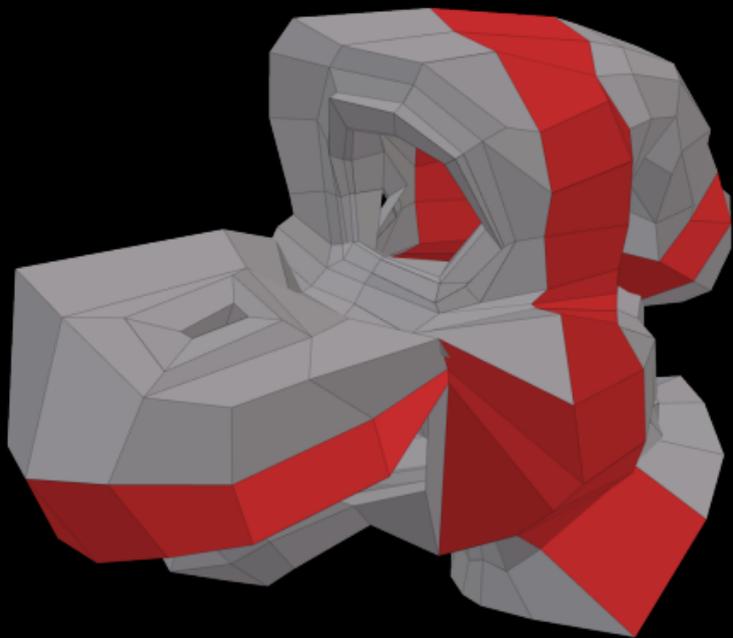
$$C(O) = C_u(O) + C_g(O) + C_a(O)$$

$$C_a(O) = \left\{ \begin{array}{l} \sum_{(e_1, e_2) \in \{U, U'\}} \frac{1}{v(e_1) + v(e_2)} + \\ + \sum_{(e_1, e_2) \in \{A, A'\}} \frac{w(e_1, e_2, e'_1, e'_2)}{v(e_1) + v(e_2)} \end{array} \right.$$

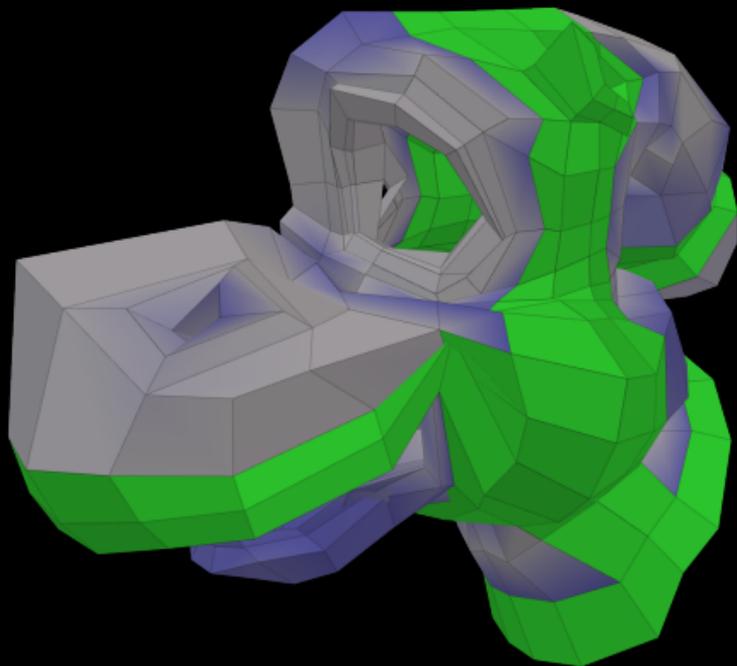
$U, U'$  : unmatched adj pair       $A, A'$  : matched adj pair

$v(\cdot)$  : valence       $w(e_1, e_2, e'_1, e'_2) = \frac{|d(\mathbf{x}_{e_1}, \mathbf{x}_{e_2}) - d(\mathbf{x}_{e'_1}, \mathbf{x}_{e'_2})|}{d(\mathbf{x}_{e_1}, \mathbf{x}_{e_2}) + d(\mathbf{x}_{e'_1}, \mathbf{x}_{e'_2})}$

$$C(O) = C_u(O) + C_g(O) + C_a(O)$$



original



derivative

$\min C(O)$  / max common subgraph isomorphism

NP-Hard

iterative greedy algorithm

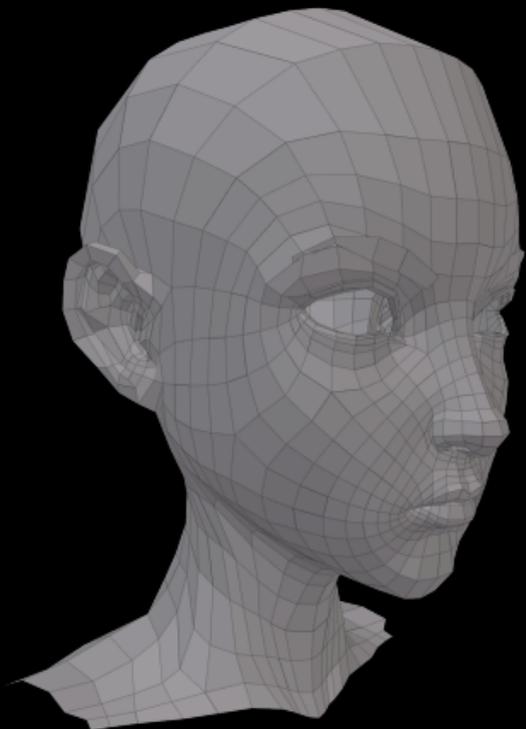
feasibly approximate med

1. init

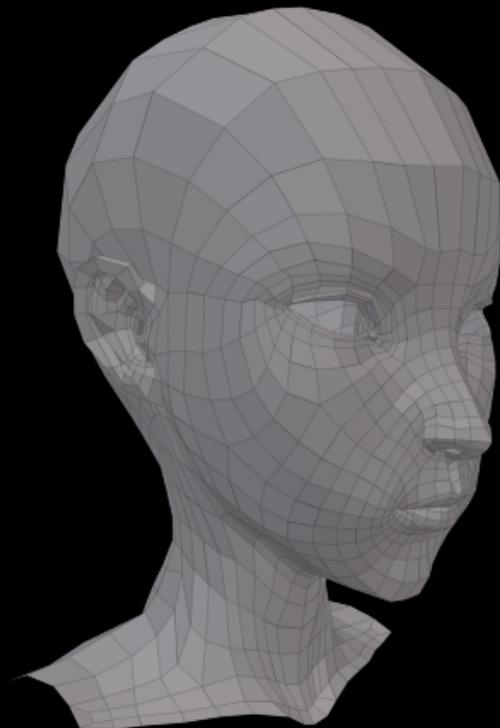
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

1. init

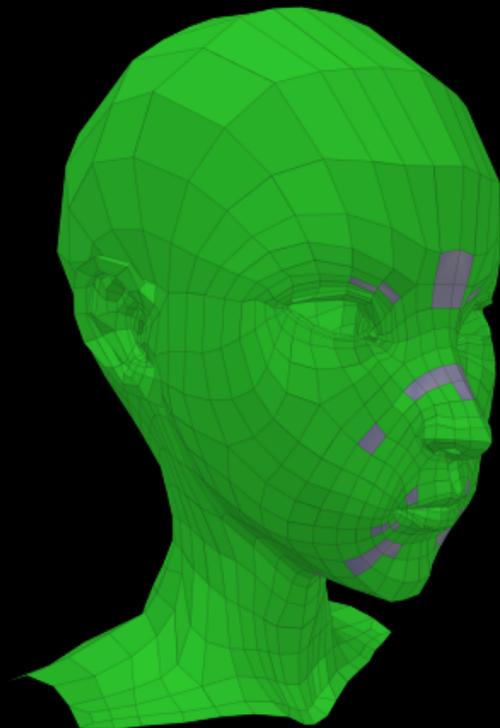
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

1. init

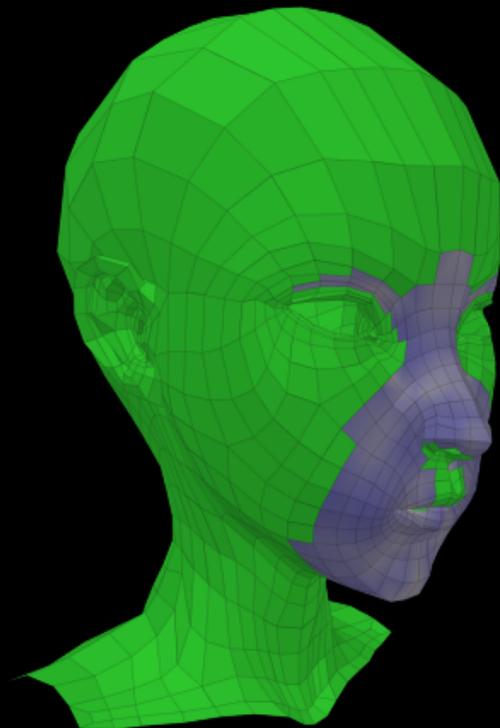
2. greedy

3. backtrack

4. repeat 2,3



original



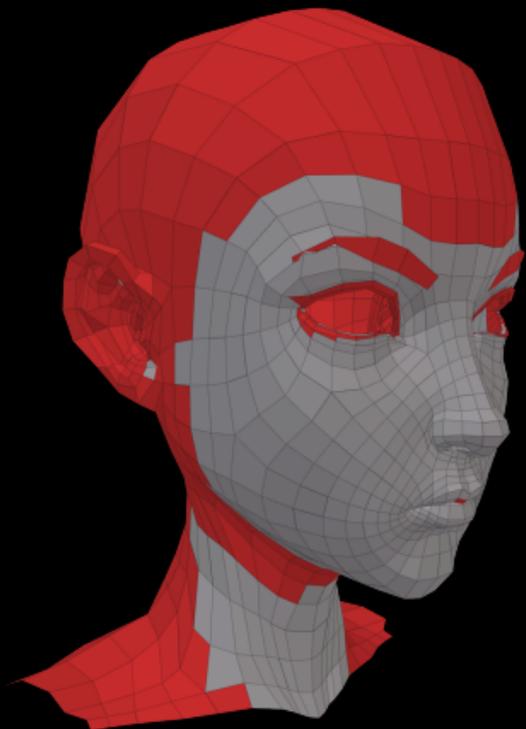
derivative

1. init

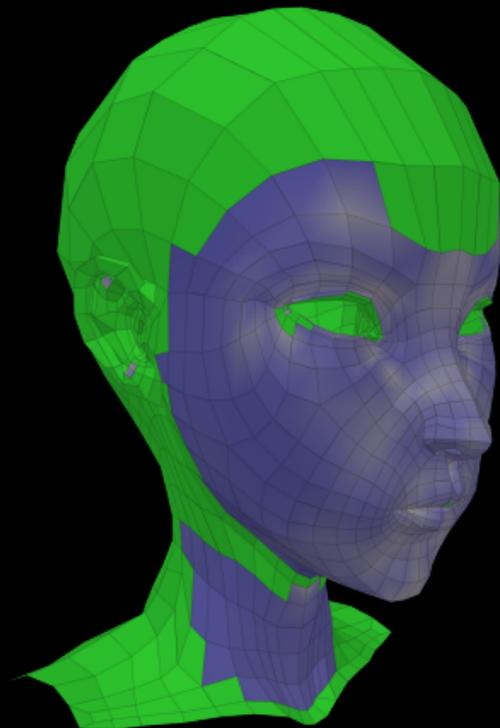
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

1. init

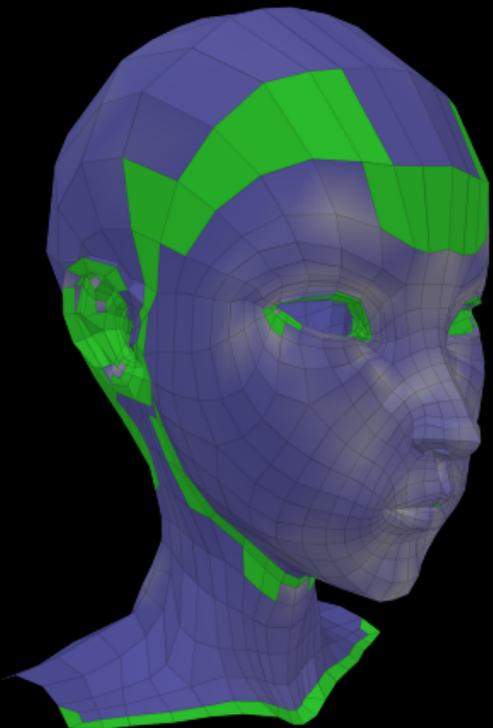
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

1. init

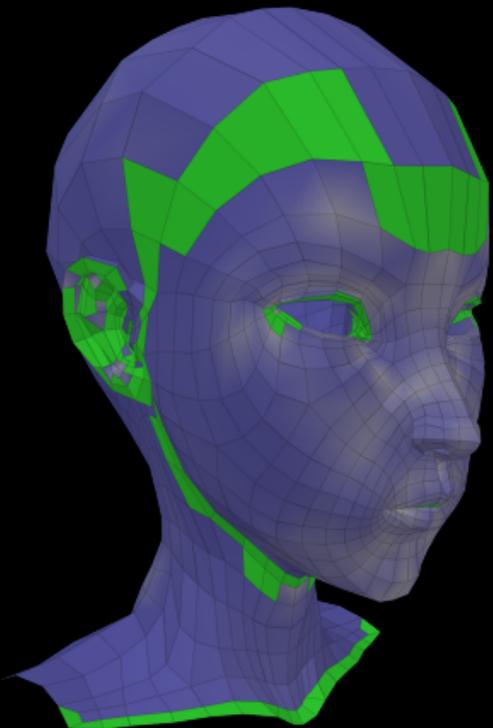
2. greedy

3. backtrack

4. repeat 2,3



original



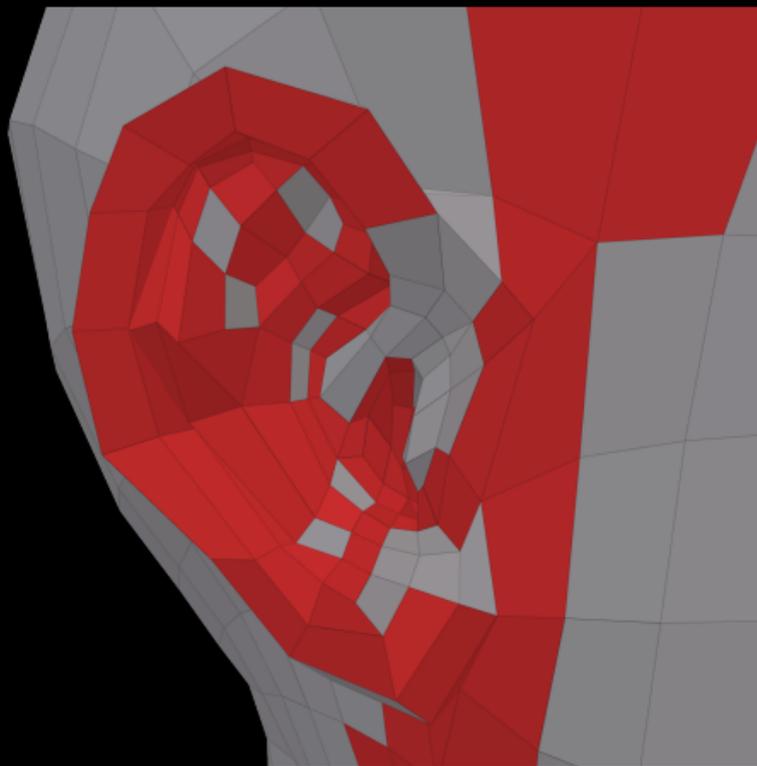
derivative

1. init

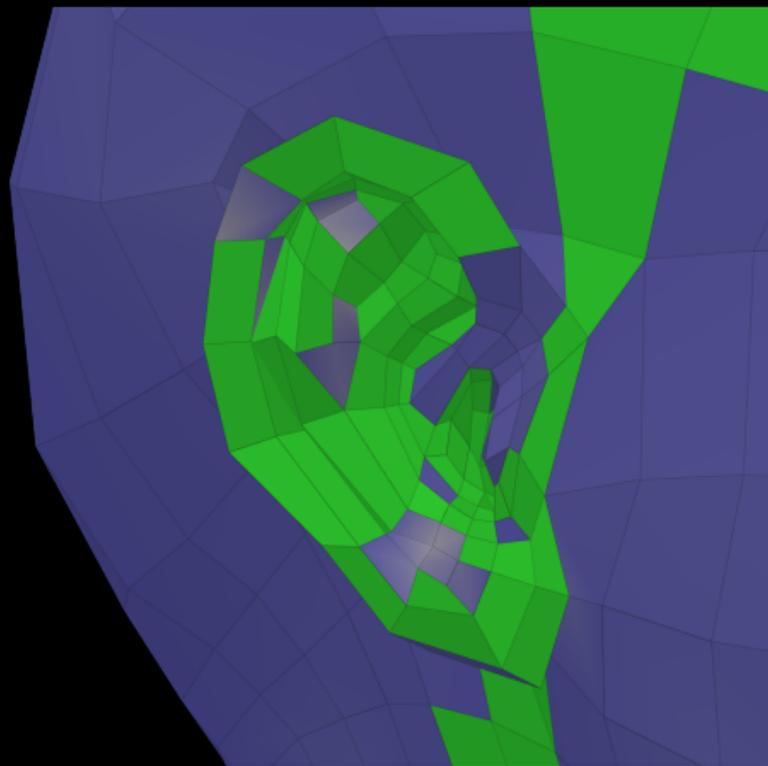
2. greedy

3. backtrack

4. repeat 2,3



original



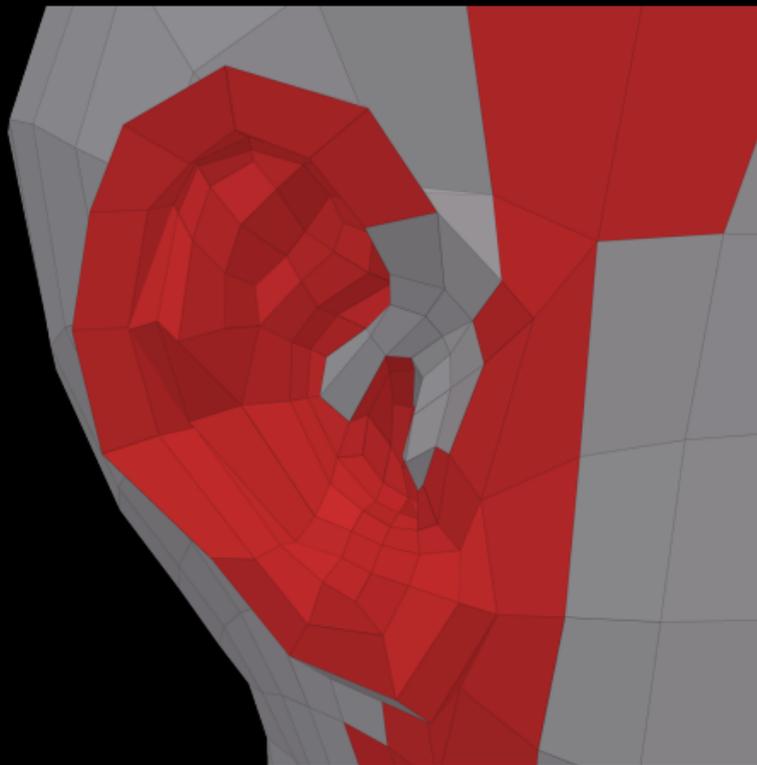
derivative

1. init

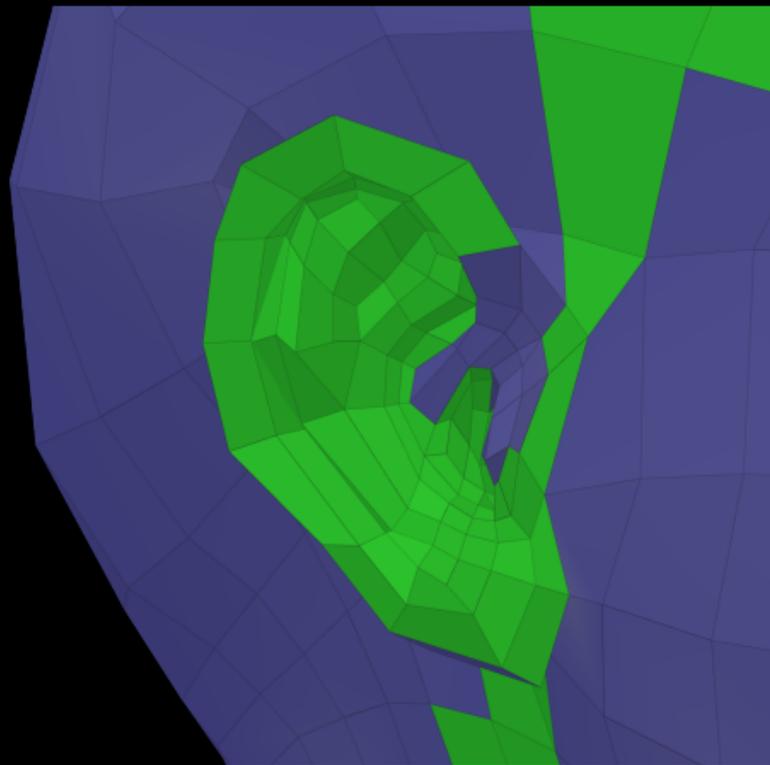
2. greedy

3. backtrack

4. repeat 2,3



original



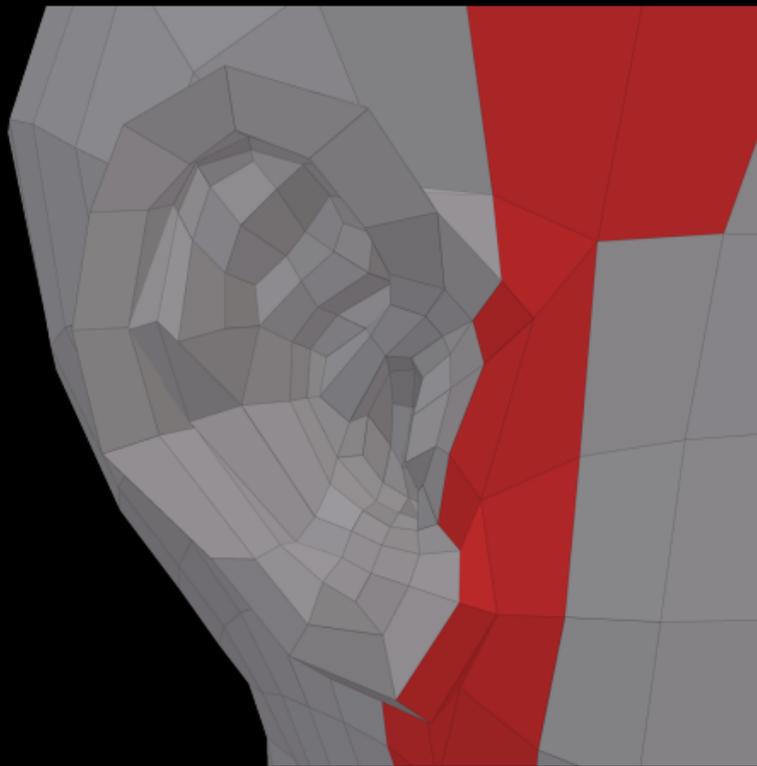
derivative

1. init

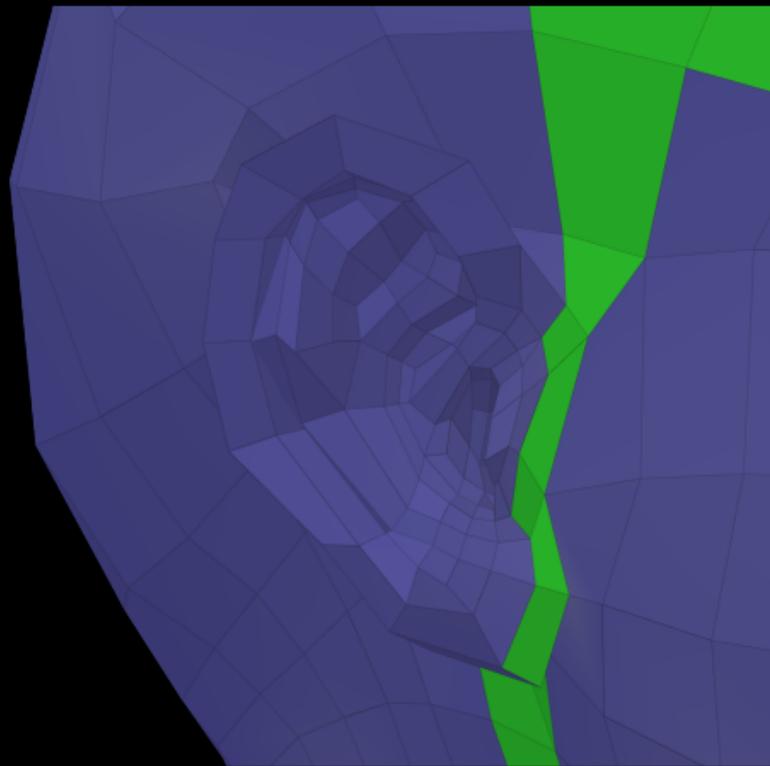
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

1. init

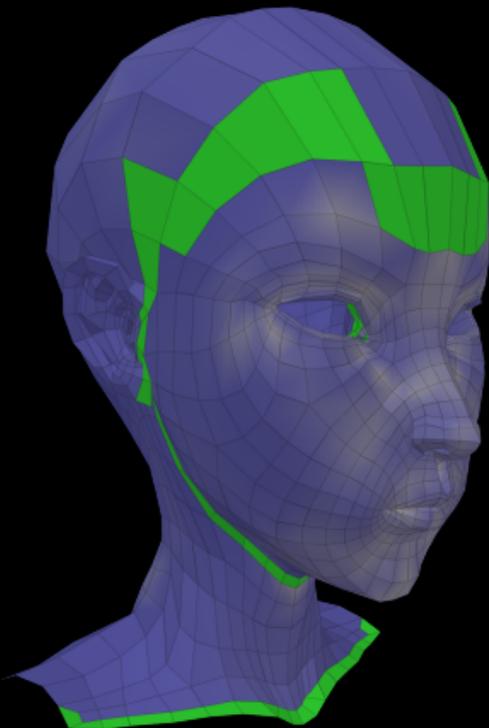
2. greedy

3. backtrack

4. repeat 2,3



original



derivative

## mesh edit operations

low-level workflow to turn one mesh into another

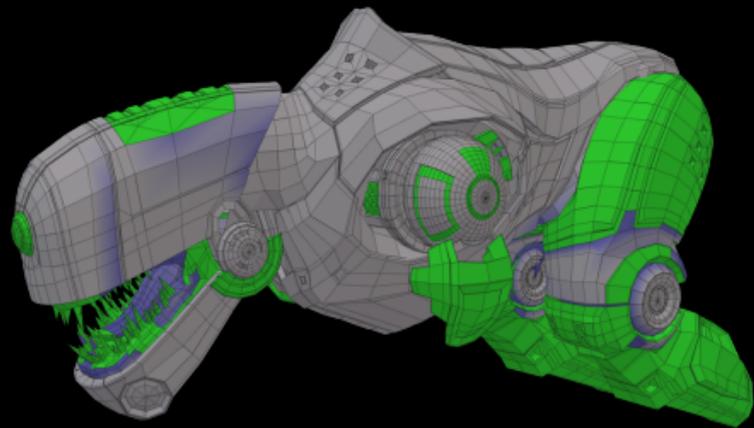
delete : unmatched geometry in original  
add : unmatched geometry in derivative  
transform : matched vertices with geometric cost

## 2-way diff

visualize edits from original to derivative



original



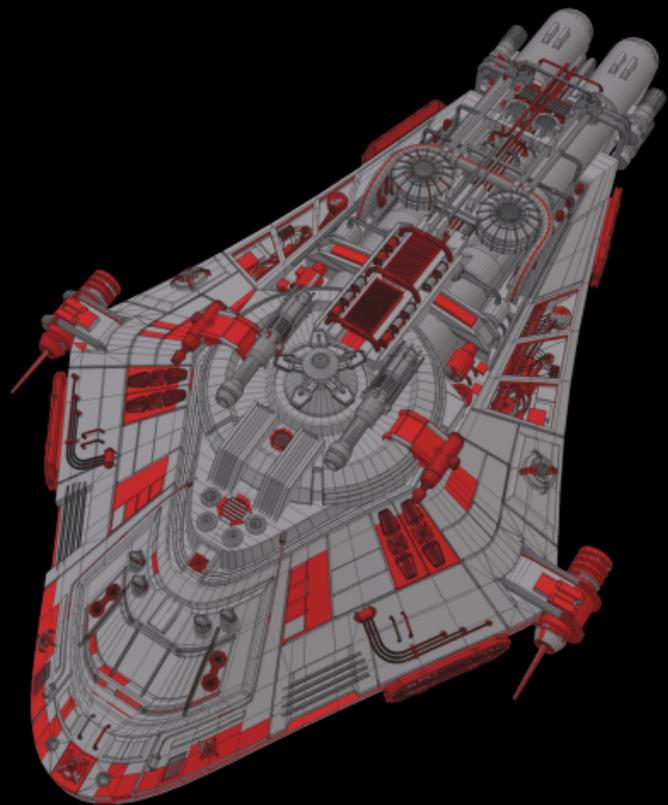
derivative



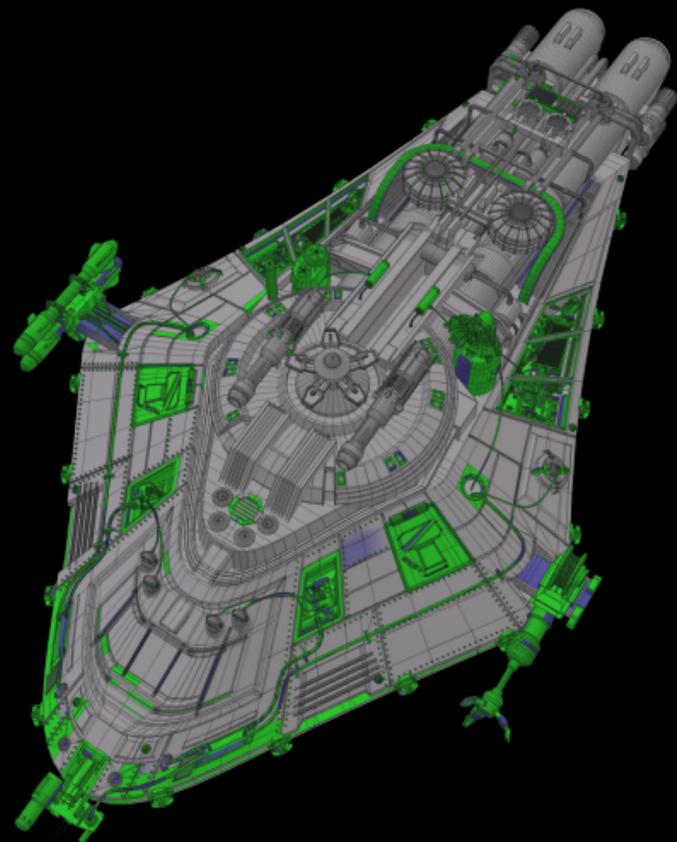
original



derivative



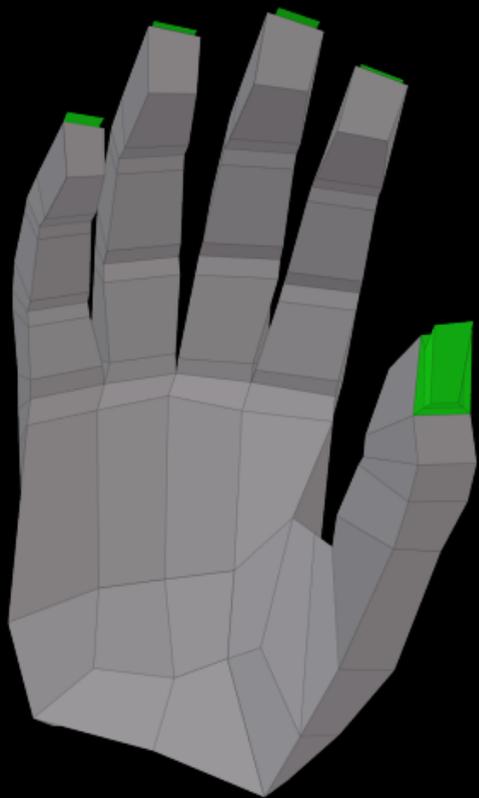
original



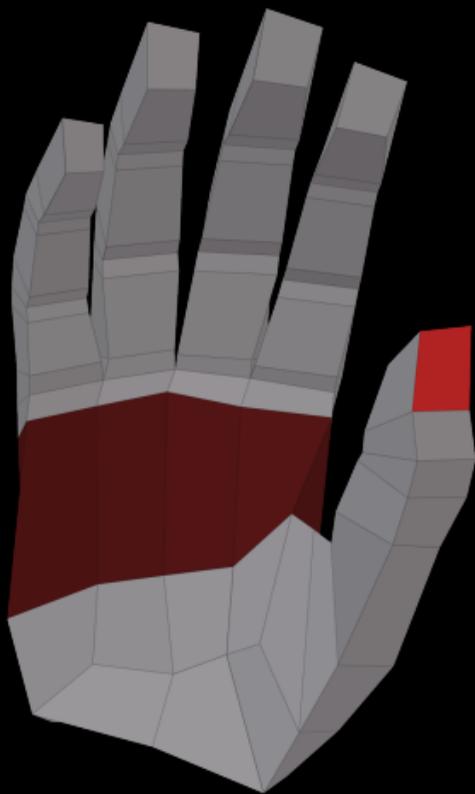
derivative

## 3-way diff

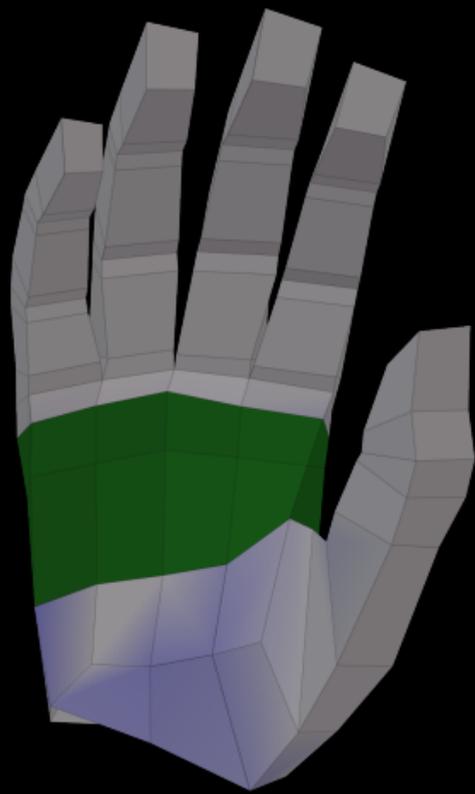
visualize edits from original to two independent derivatives



derivative a



original



derivative b



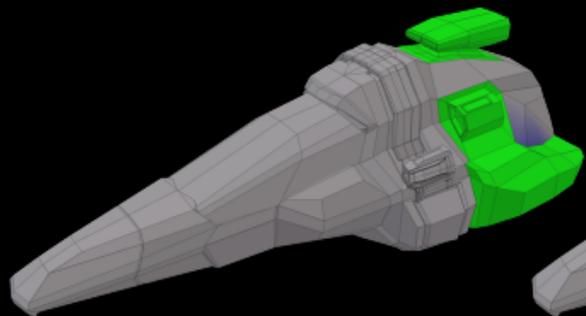
derivative a



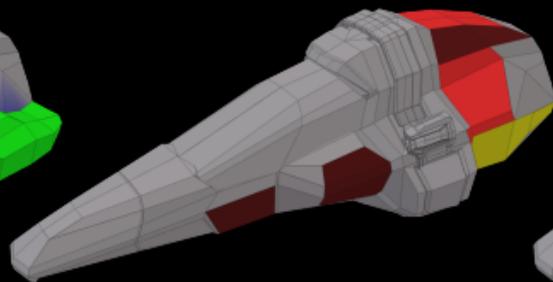
original



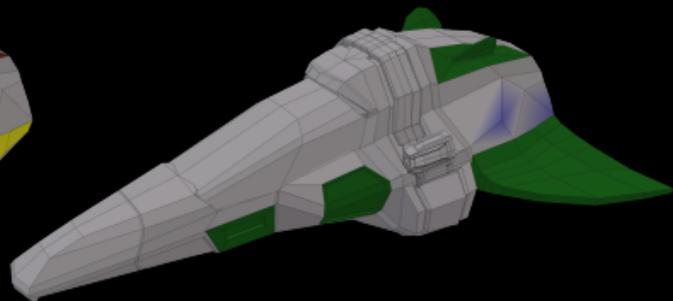
derivative b



derivative a



original



derivative b

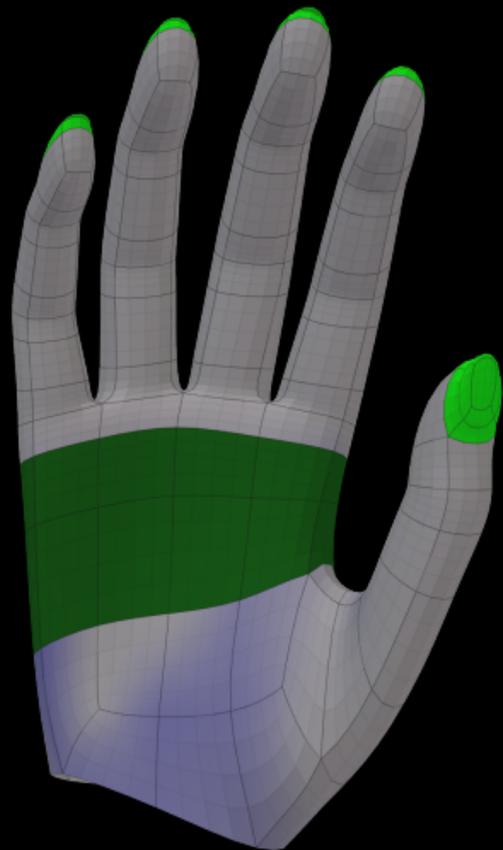
# mesh edit merge

combining independent edits

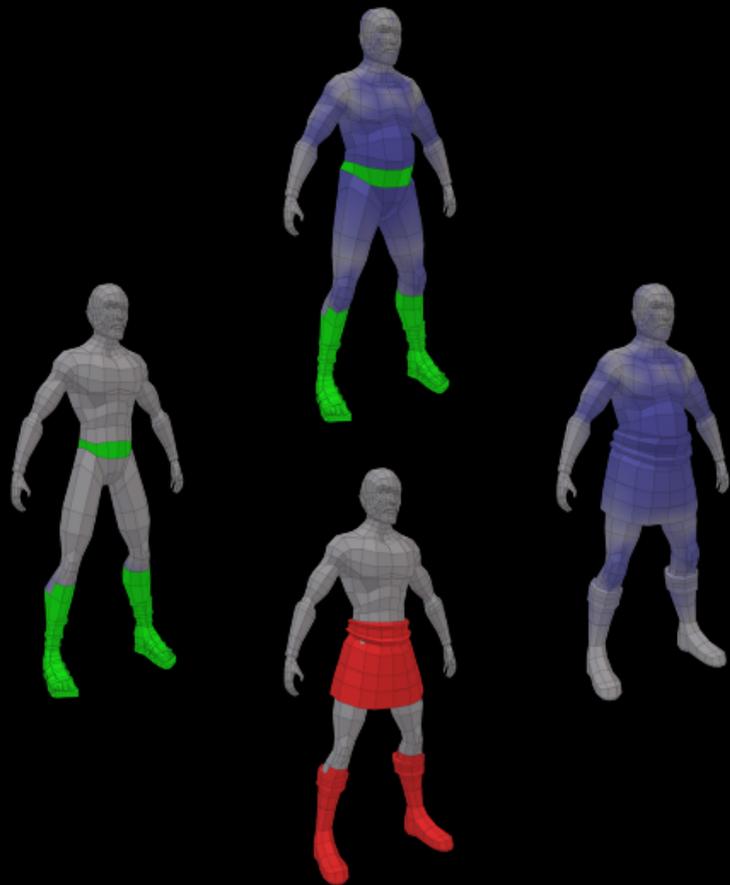
merge is automatic if edits do not overlap on original  
adjacency is maintained; subdivision surfaces



3-way + merge



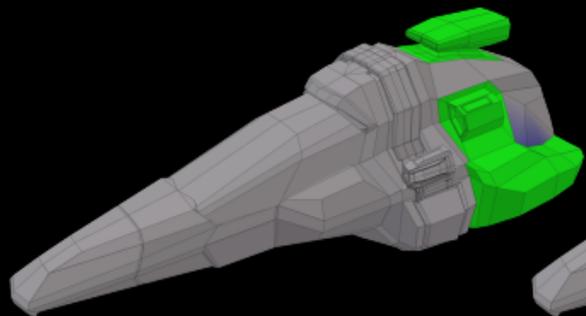
merge subd



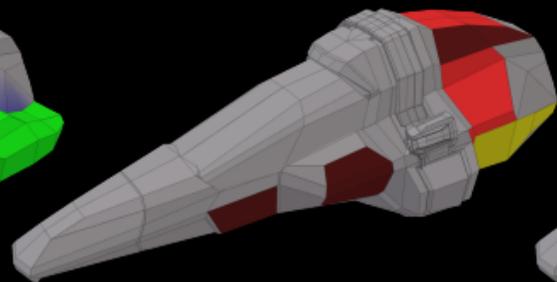
3-way + merge



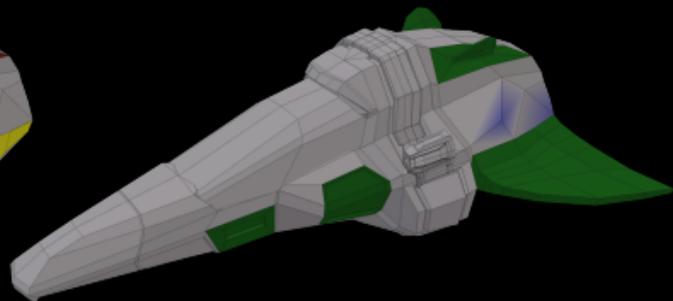
merge subd



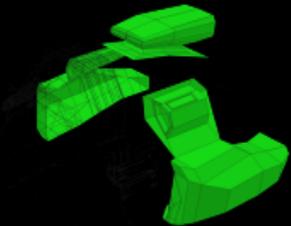
derivative a



original



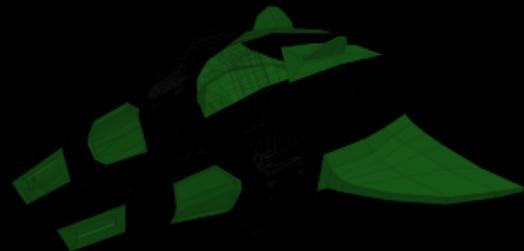
derivative b



derivative a



original

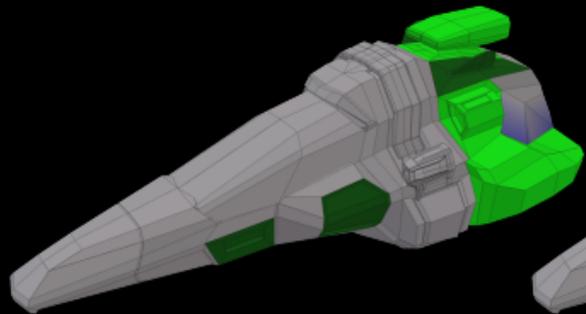


derivative b

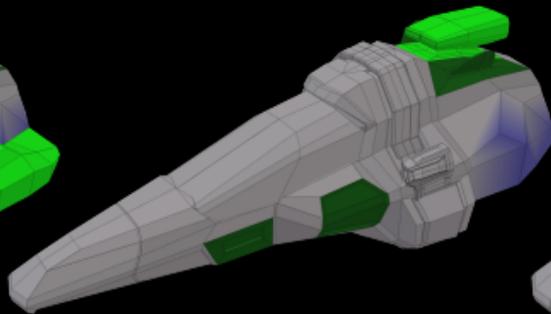
edit partitioning

reduce granularity of conflicts

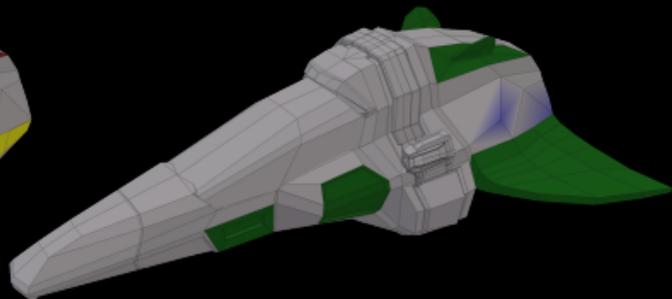
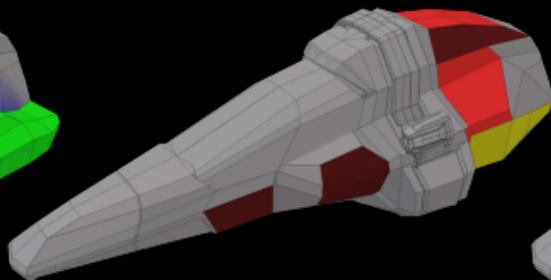
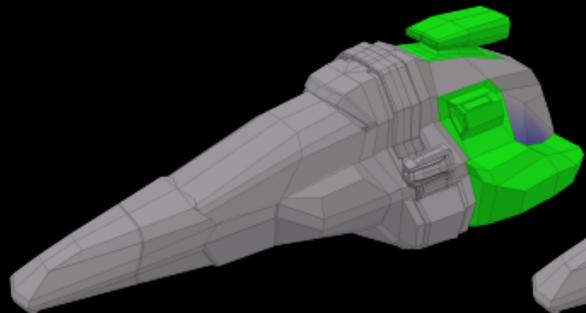
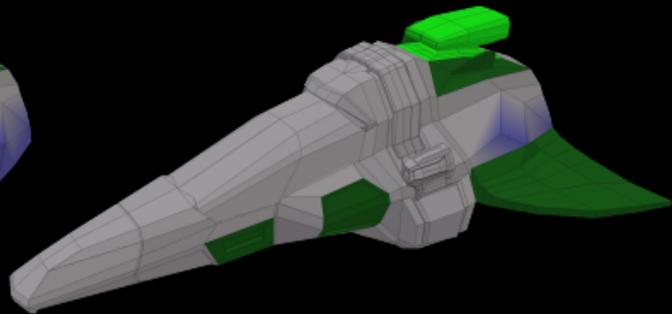
choose a



neither



choose b



derivative a

original

derivative b

## from meshes

partial matching meshes

low-level workflows

diff and merge

# compare

comparing multiple artists performing similar tasks

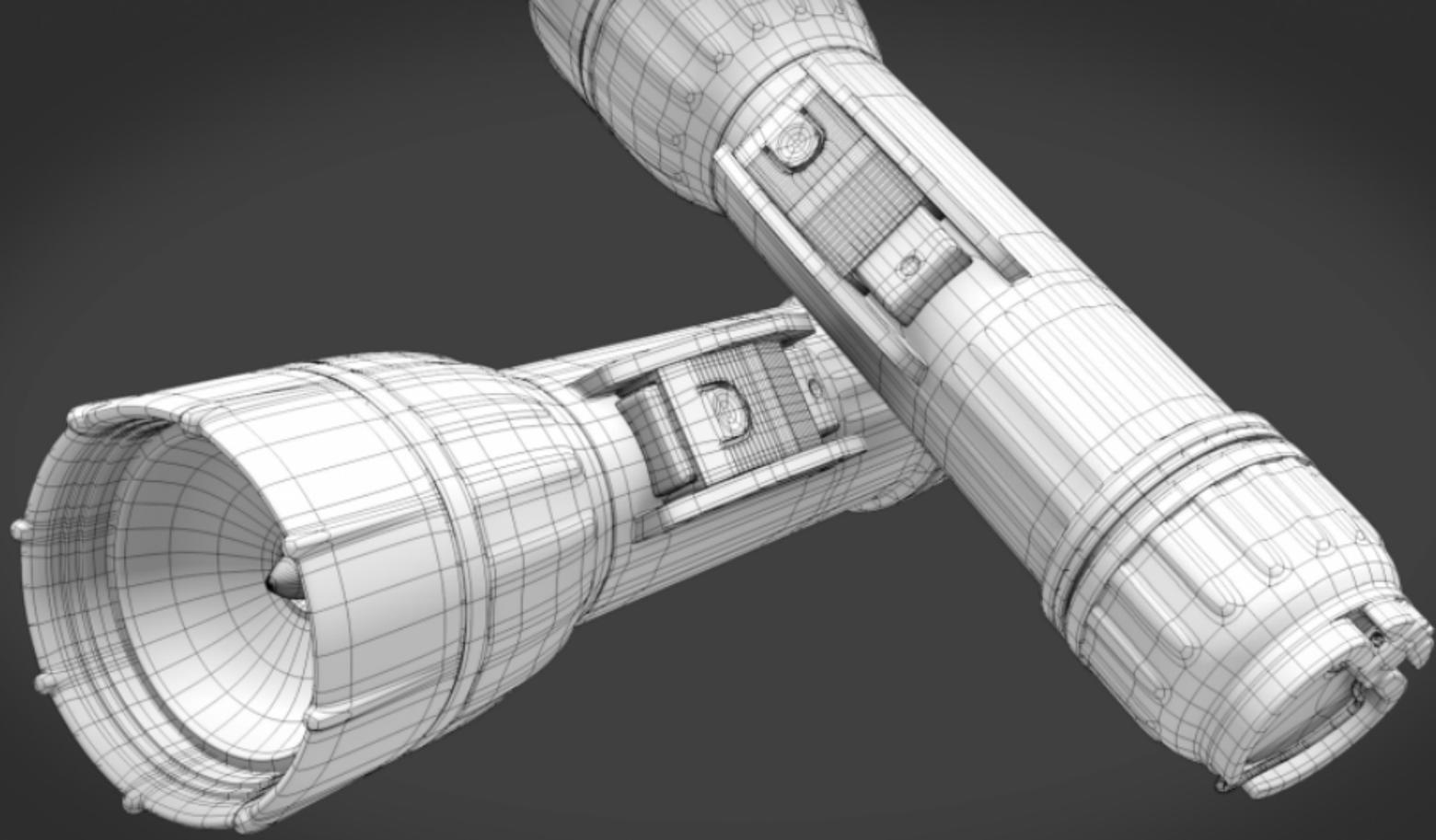


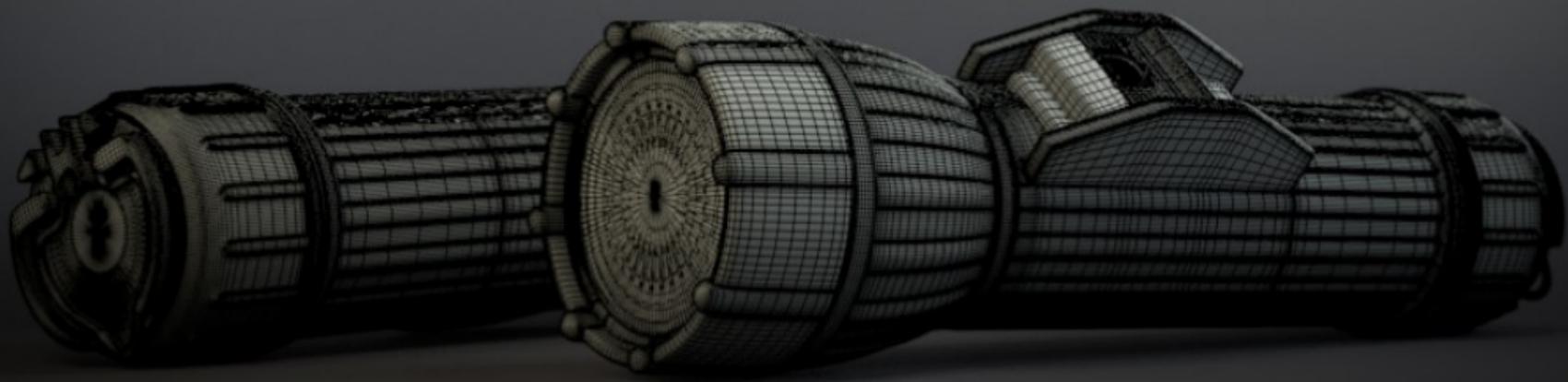
[ crosscomp\*  
sigchi14/siggraph15 ]

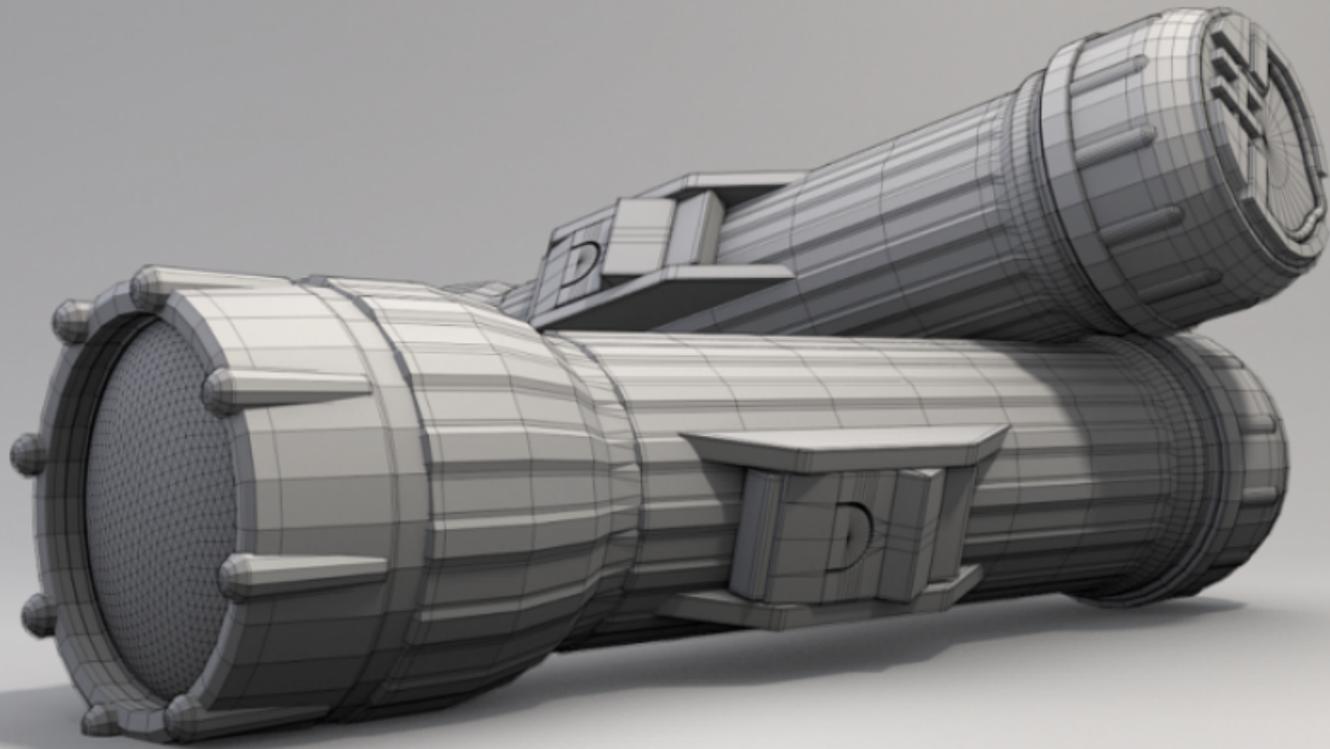
\*to be submitted

digital arts instructor assigns exercise





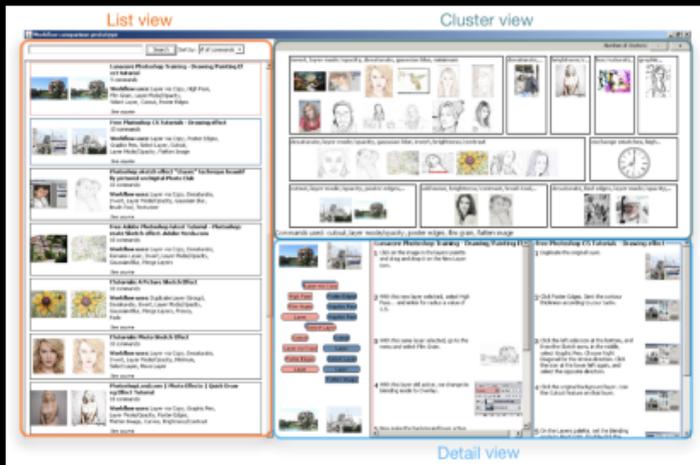




instructor makes video tutorial by reviewing student work

instructor makes video tutorial by reviewing student work

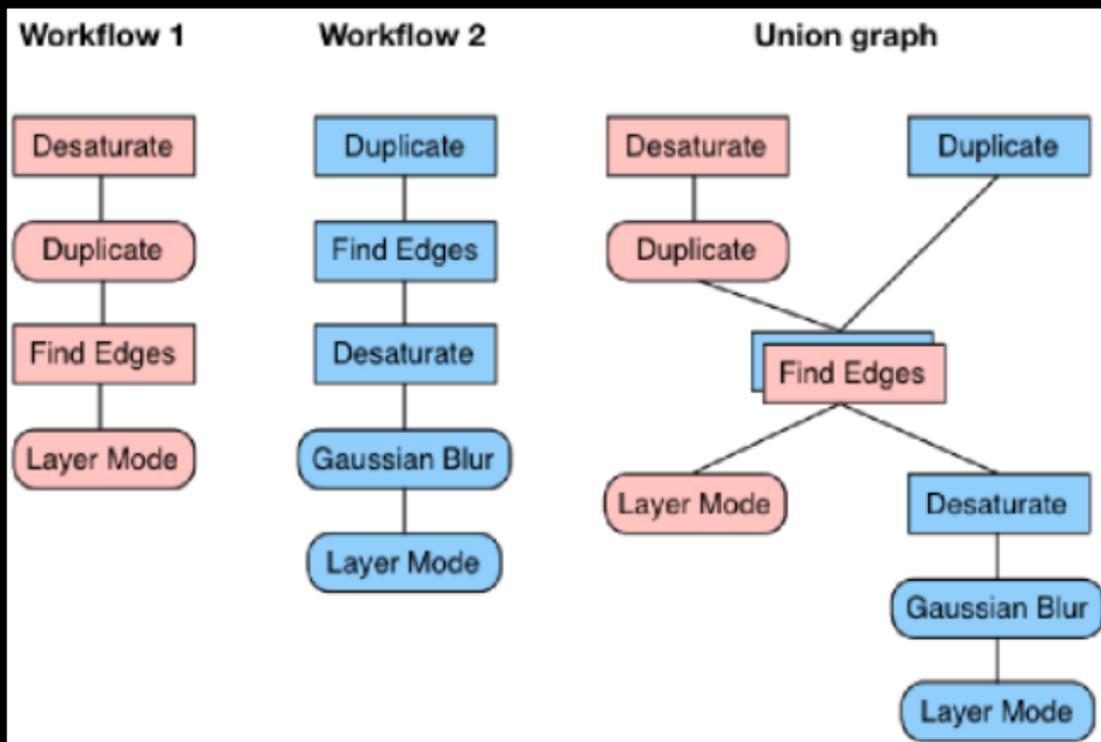
how to help with review process?



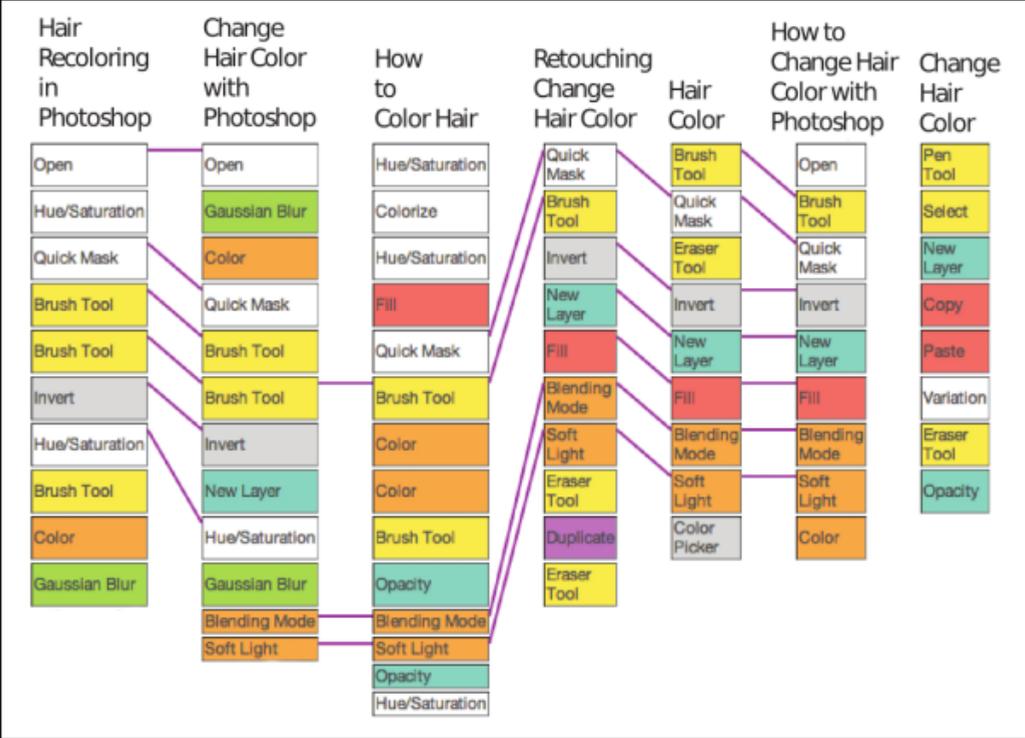
delta (kong et al. 2012)



sifter (pavel et al. 2013)



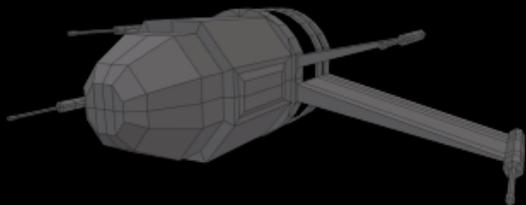
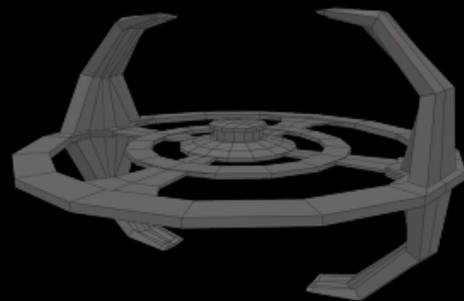
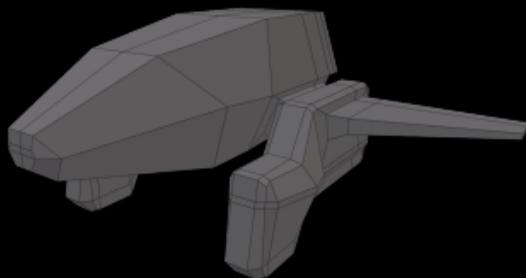
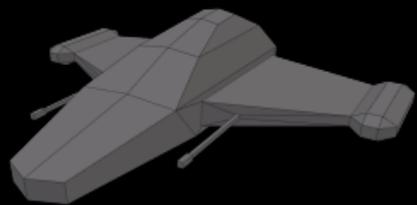
delta: union graph



sifter: alignment view

short sequences / long sequences  
global change / local change  
polished workflows / contain errors  
op + params / edit effect

tasks : 3 vid tutorials, 1 target mesh  
subjects : 4 student modelers

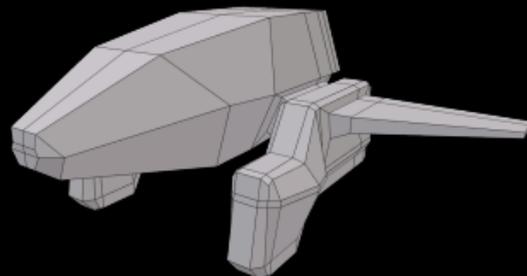
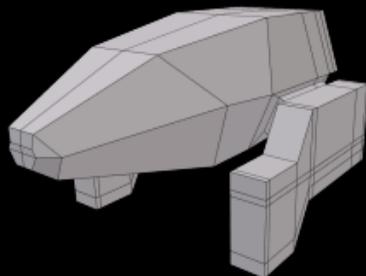
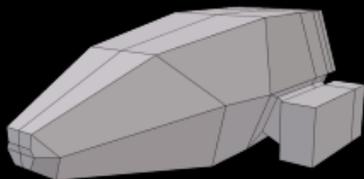
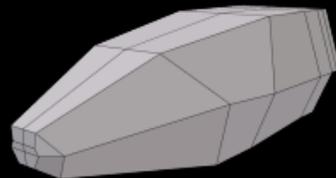
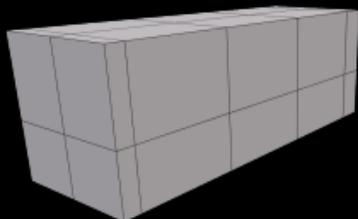
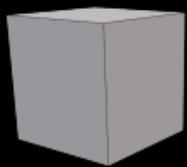


## correspondences

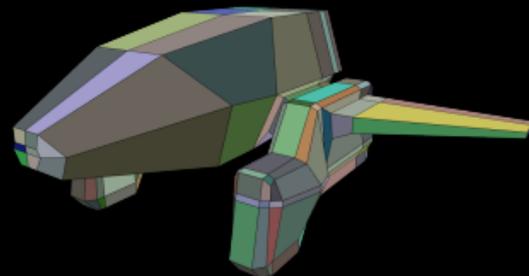
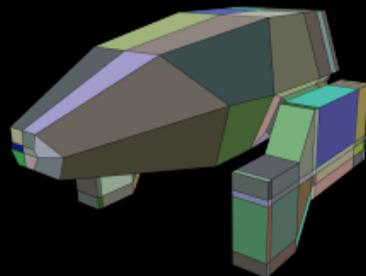
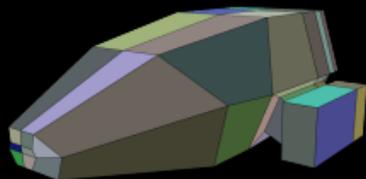
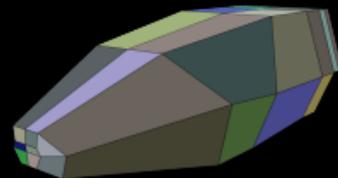
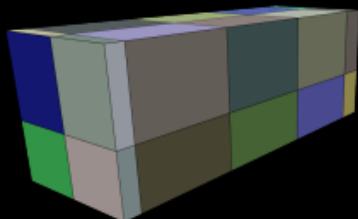
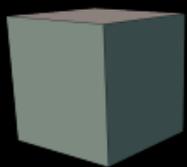
know how regions correspond to compare workflows

intra-correspondences : matching faces within workflow  
inter-correspondences : matching faces between workflows

# intra-correspondence

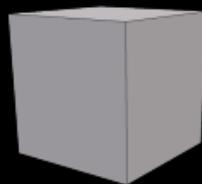
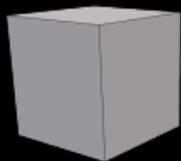
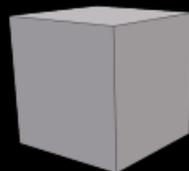
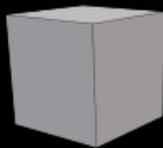
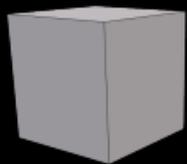


# intra-correspondence



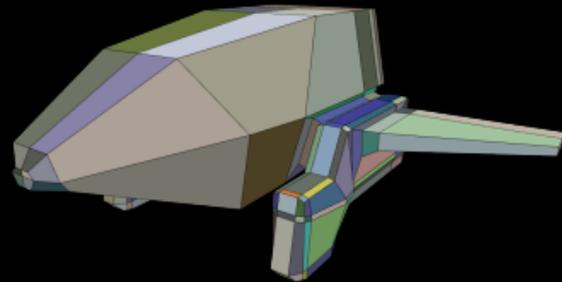
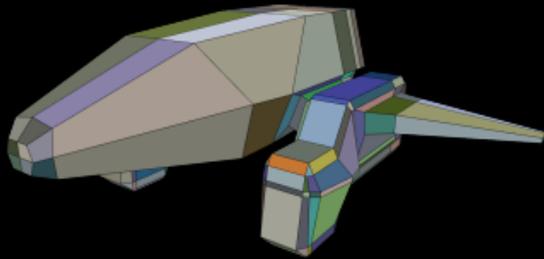
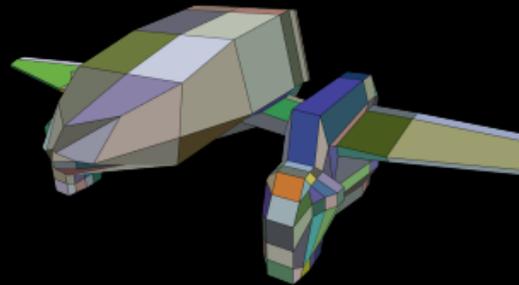
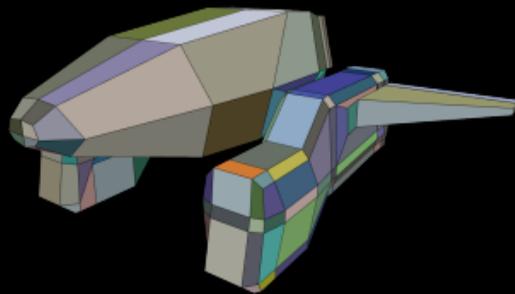
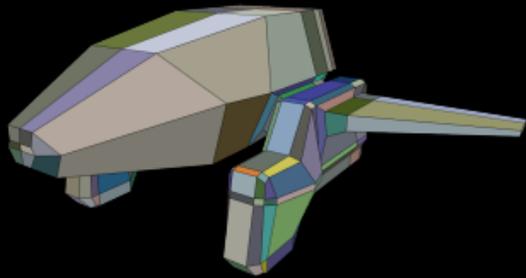
inter-correspondences?

# inter-correspondence



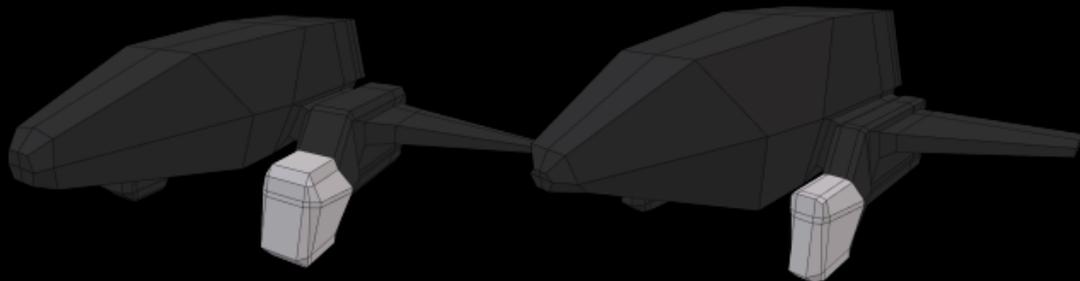
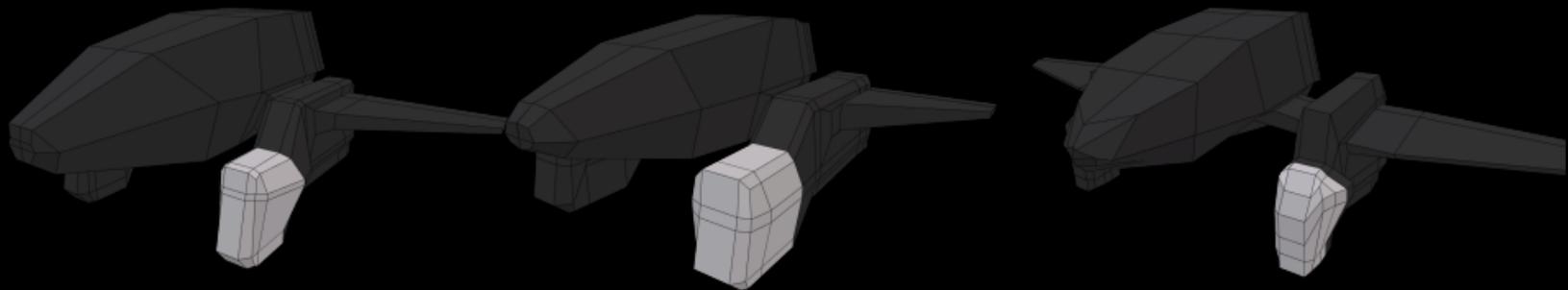
use meshgit to build inter-correspondences for final states  
back-propagate using intra-correspondences

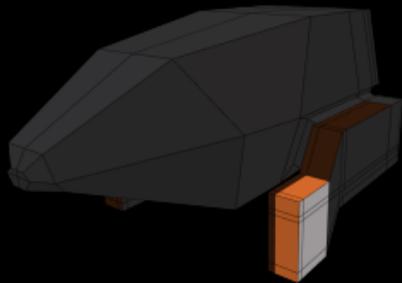
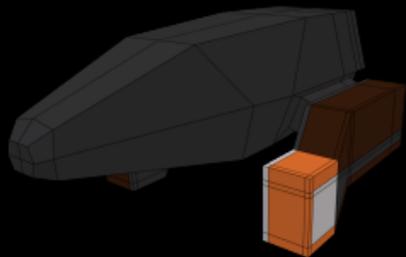
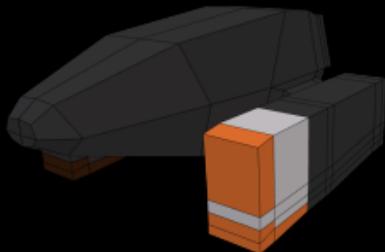
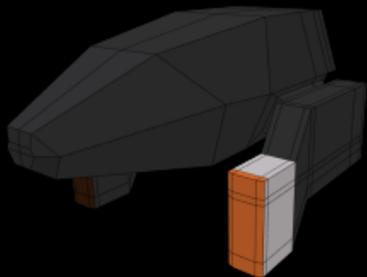
# inter-correspondence



## spatial filtering

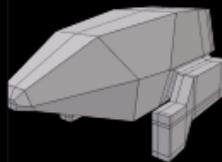
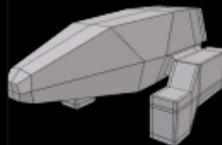
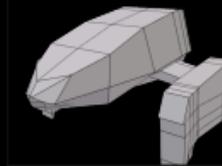
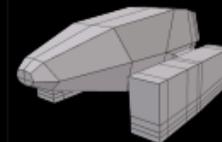
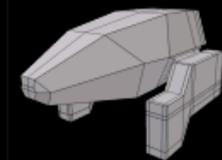
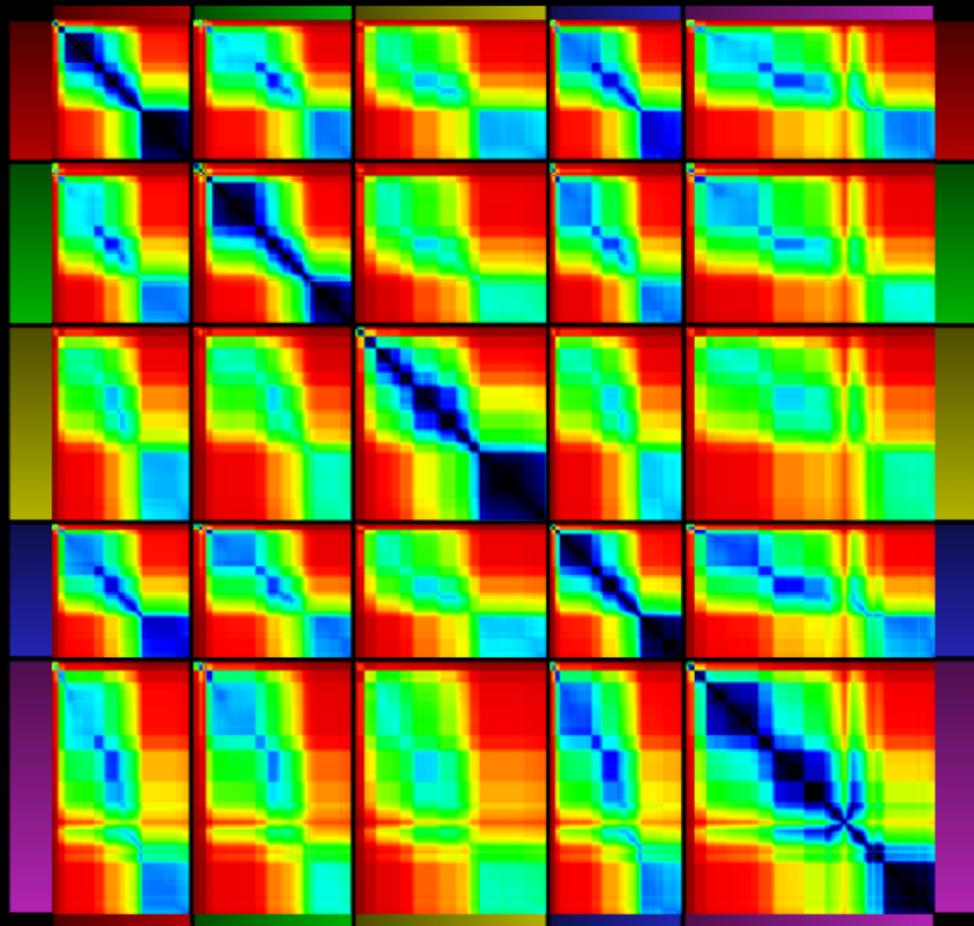
filtering timeline to edits on regions of interest





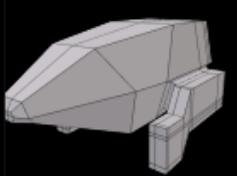
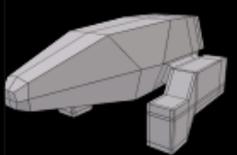
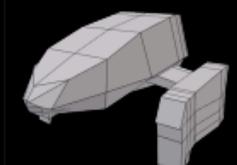
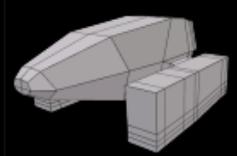
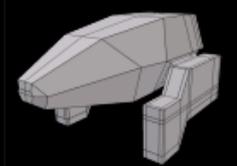
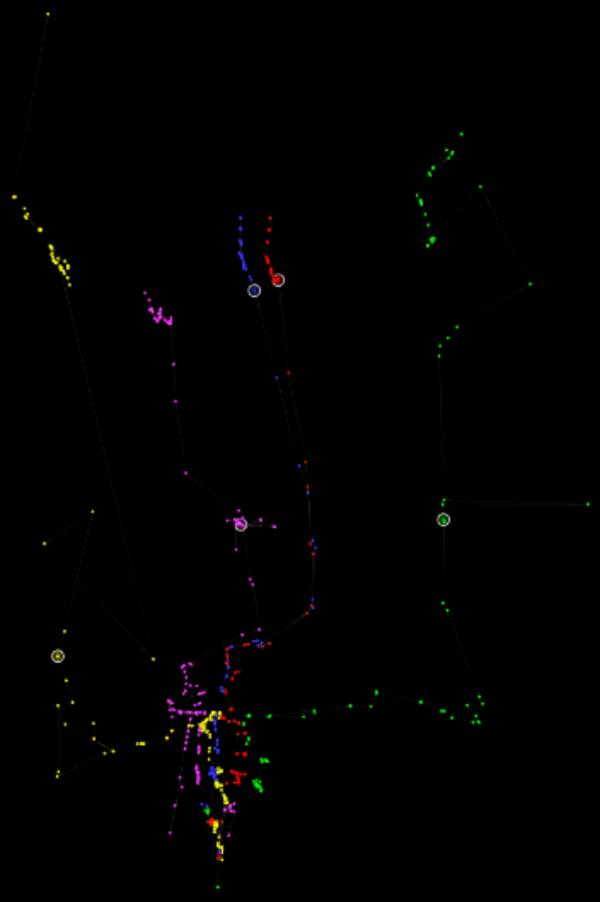
## workflow heat map

visualize pairwise normalized mesh edit distance  
using built inter-correspondences



## workspace

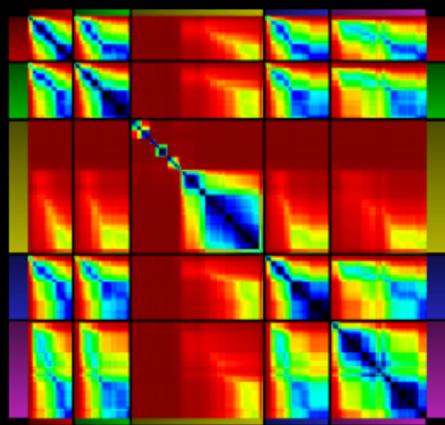
visualize workflows in 3d using isomap on med  
with neighborhood shaping



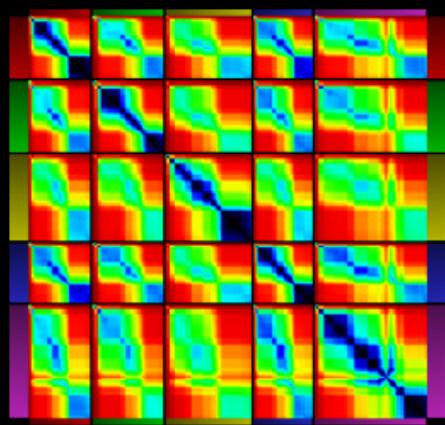
## observations

review student input using  
heat map and workspace

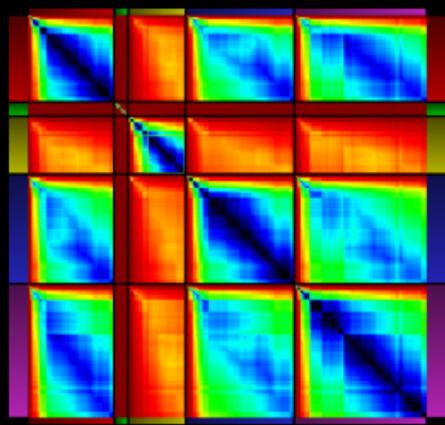
scout



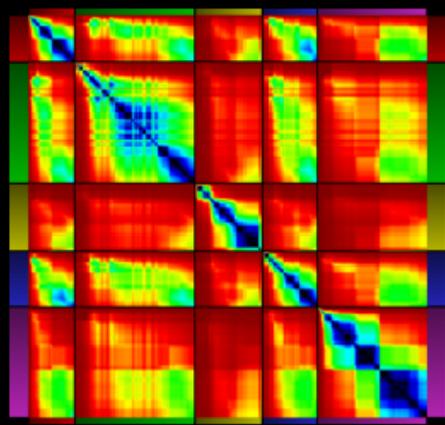
transporter

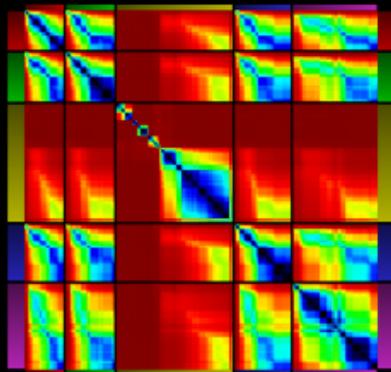
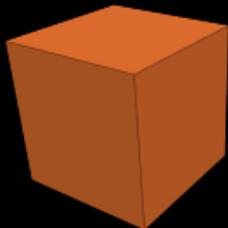
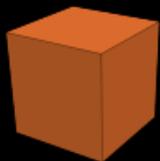


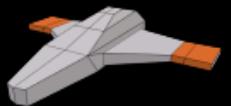
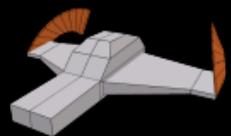
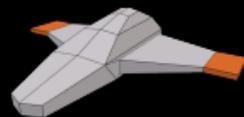
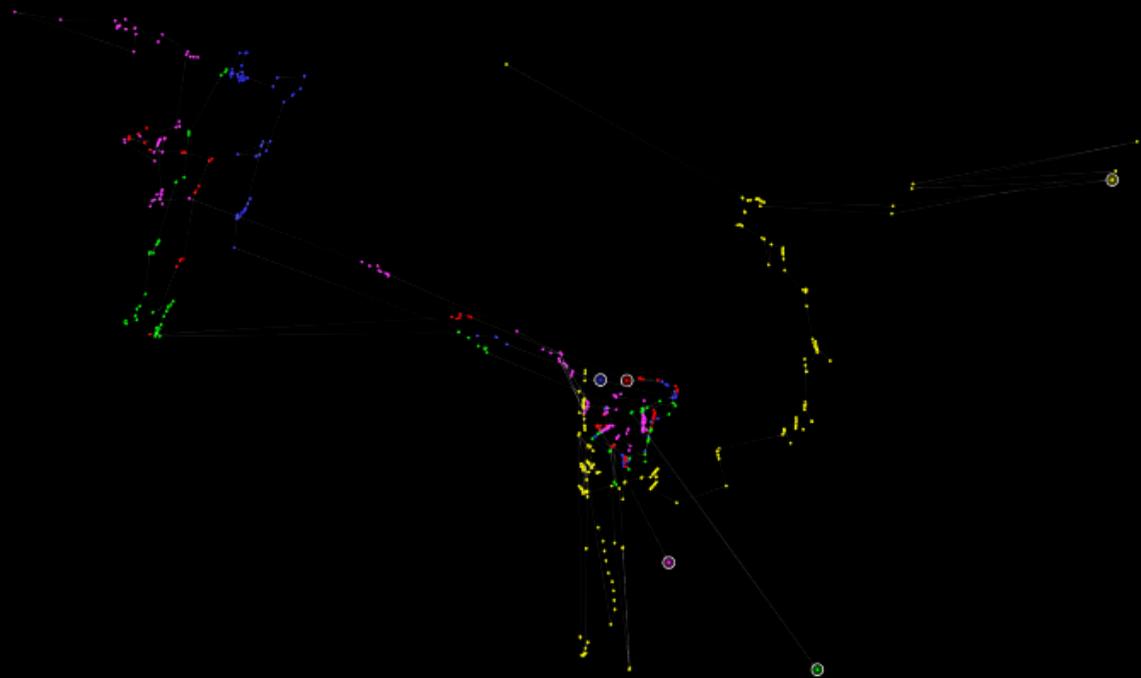
station

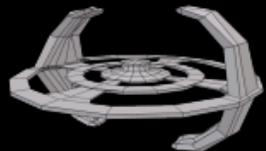
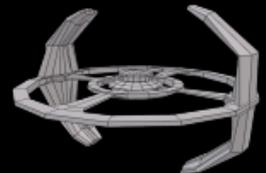
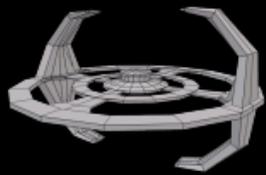
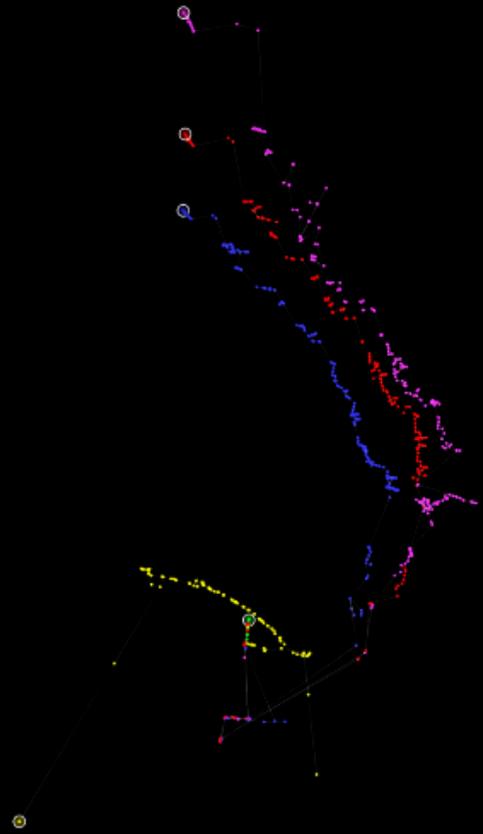


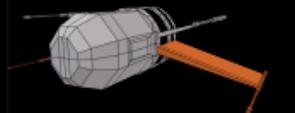
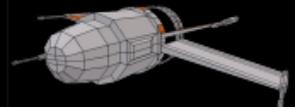
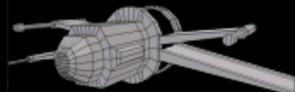
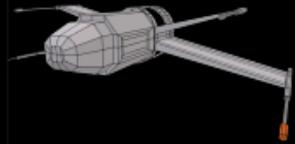
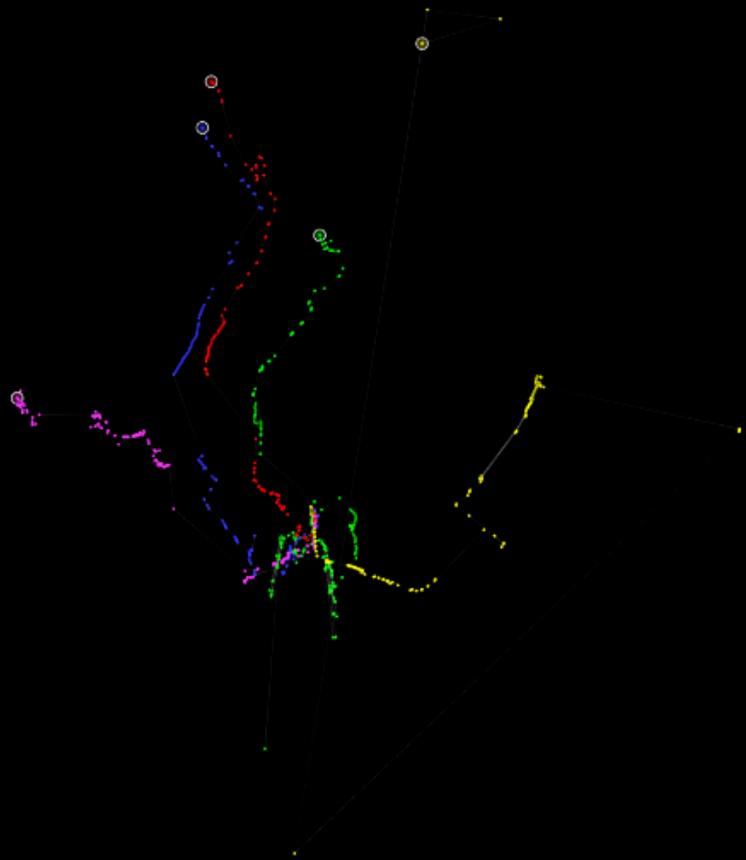
interceptor











# feedback

professional artist and instructor  
created flashlight motivation exercise

“Based on the response we got I think the exercises have been incredibly helpful for the students. We get constant requests to do more of them. I believe they were helpful because it helps give the students some direct guidance but without hand holding. They’re given a challenge but still have to find their own ways to complete that challenge. This is much more valuable than following along with a tutorial step by step. It allows them to apply the skills they learn from the tutorials.”

“We’d like to do more but just haven’t been able to yet. Time is the issue; too much to do. Feedback is the most difficult part. More specifically, direct and constructive feedback that helps the student know what to improve upon. One thing that would be really helpful, I think, is an automated way of reviewing all the models. For example, dumping a batch into CrossComp and then receiving an interactive playback.”

embedded view made artist's mistakes clear  
curves hinted at the similarities of the workflows

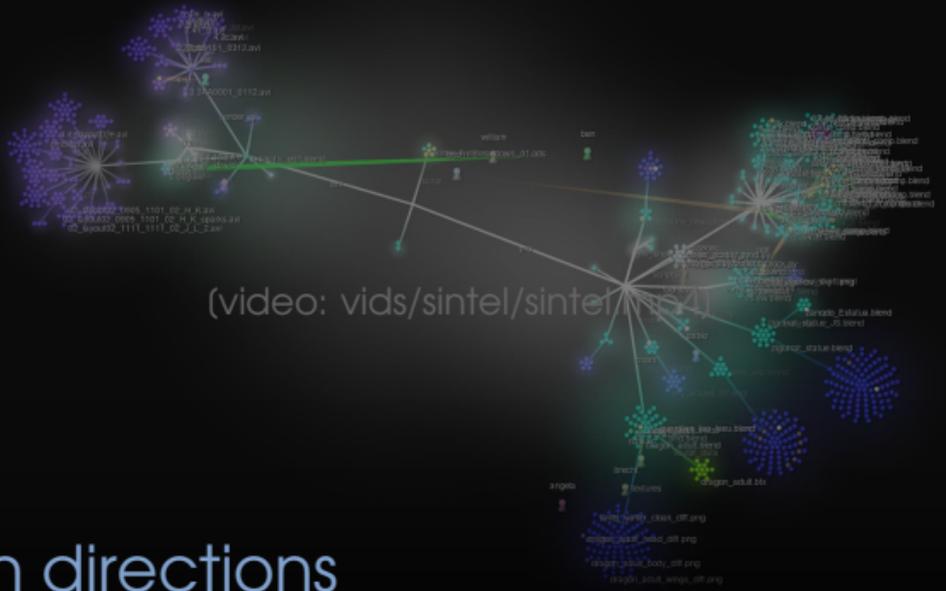
subjects on interceptor took similar approach despite not having step-by-step instructions, which was unexpected

## compare

intra- and inter-correspondences

pair-wise edit distance

non-linear dimensionality reduction

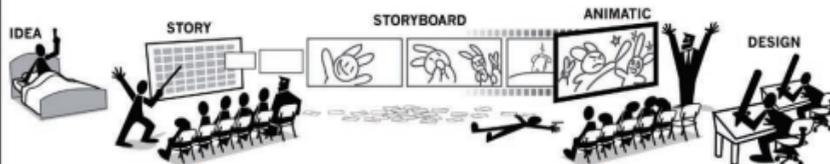


# future

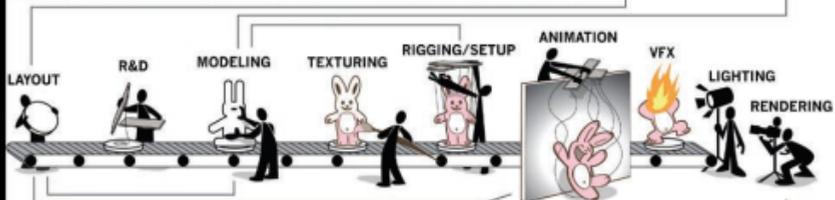
possible future research directions

# 3D Production Pipeline

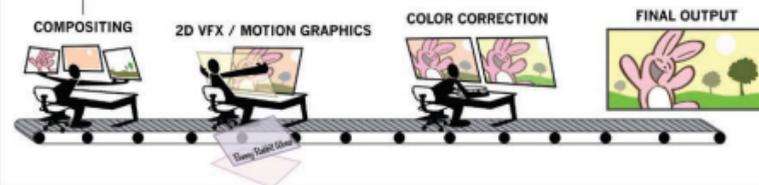
## PREPRODUCTION

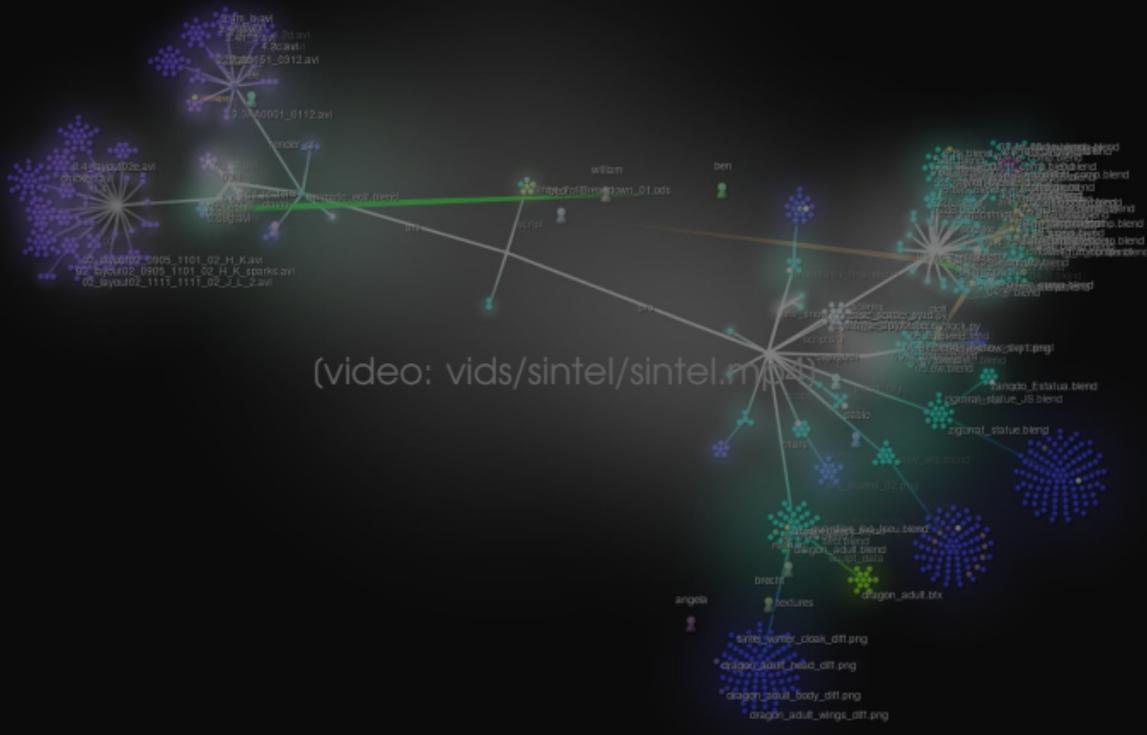


## PRODUCTION



## POSTPRODUCTION





(video: vids/sintel/sintel.n)



## GOOSEBERRY STUDIO LINE-UP

📅 28/01/2014 📌 Production

When Gooseberry was announced, the shortlist of possible studio partners quickly grew to over 30... it's really great to see so many companies using Blender and be ready for film. We would love to work with all of them, but that's just not practical for a feature film. The original idea to involve "8-10" studios now already became 12.



### *Sponsor Prospectus*

We are working on a well balanced offer to reward partners and sponsors. Contact [institute@blender.org](mailto:institute@blender.org) to learn more about this.

### *Twitter feed*

Follow Gooseberry project:  
[@gooseberry\\_film](#)

extend to other evolving datasets (code repo)

most unusual (levenshtein dictionary)

# modflows

summarize  
from meshes  
compare

all data and source code available

## collaborators and support

fabio pellacini

brandon kerr

jiawei ou

jonathan williamson

roberto roch

many other artists

nsf, intel, sloan foundation

thank you!

