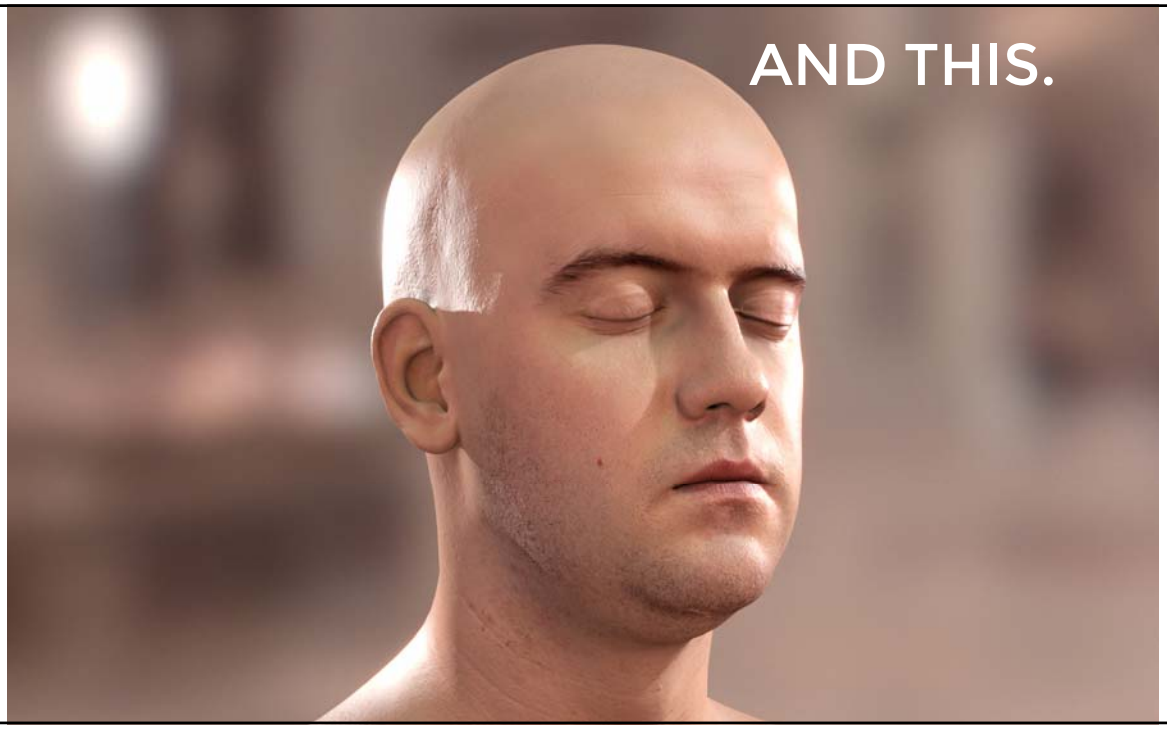
CPSC 314
INTRODUCTION

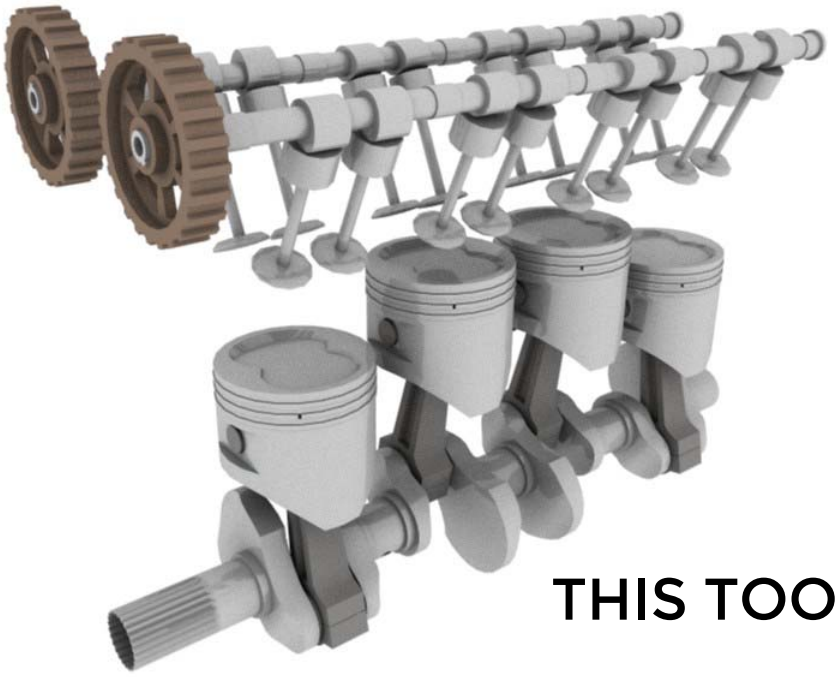
ugrad.cs.ubc.ca/~cs314

Alla Sheffer
Sep 2016

WHAT IS COMPUTER GRAPHICS?

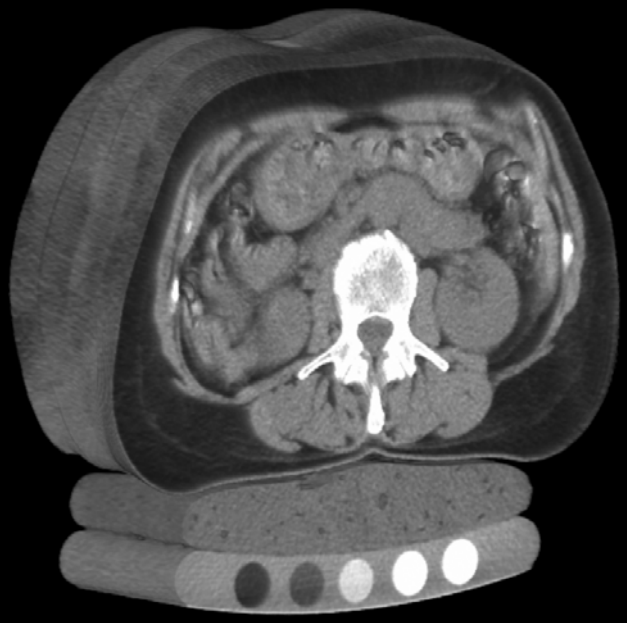
THIS.





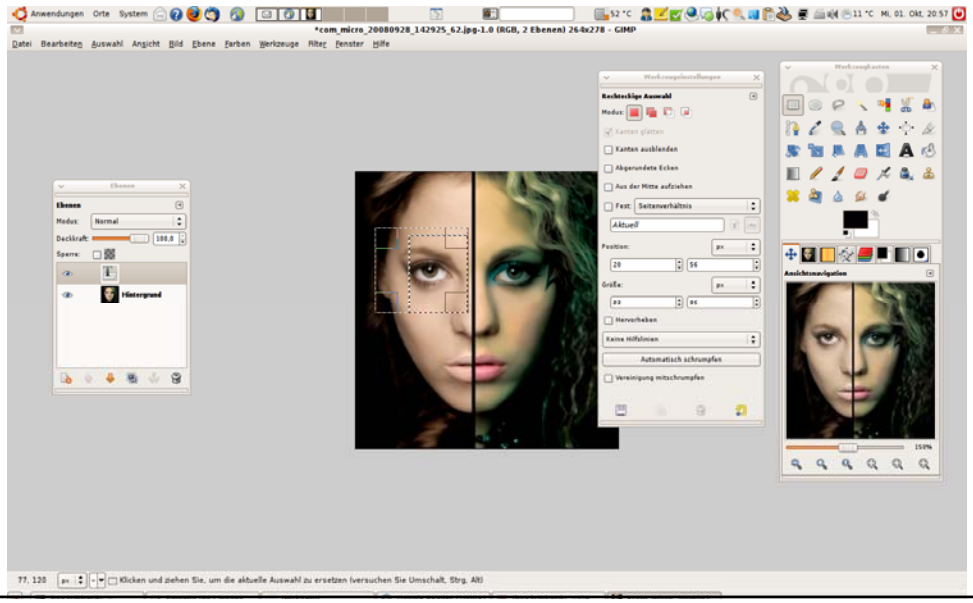
THIS TOO.

AND EVEN THIS.



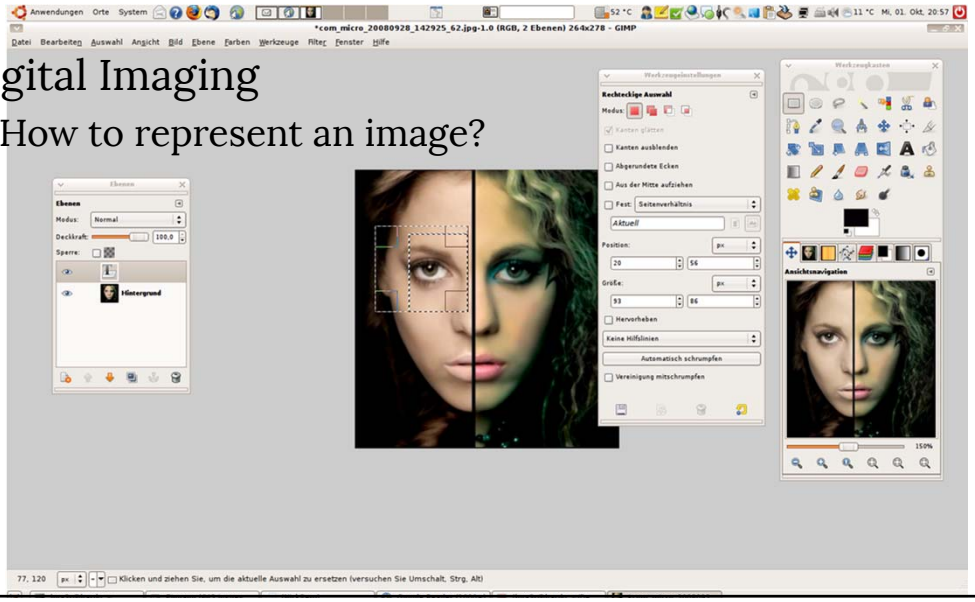
WHAT ARE AREAS OF CG?

2D IMAGING



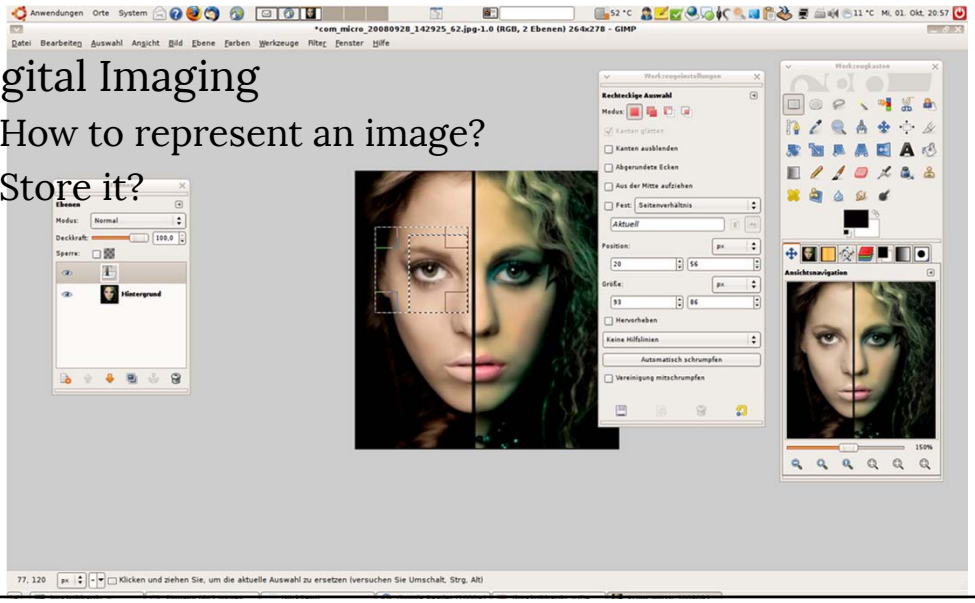
2D IMAGING

- Digital Imaging
  - How to represent an image?



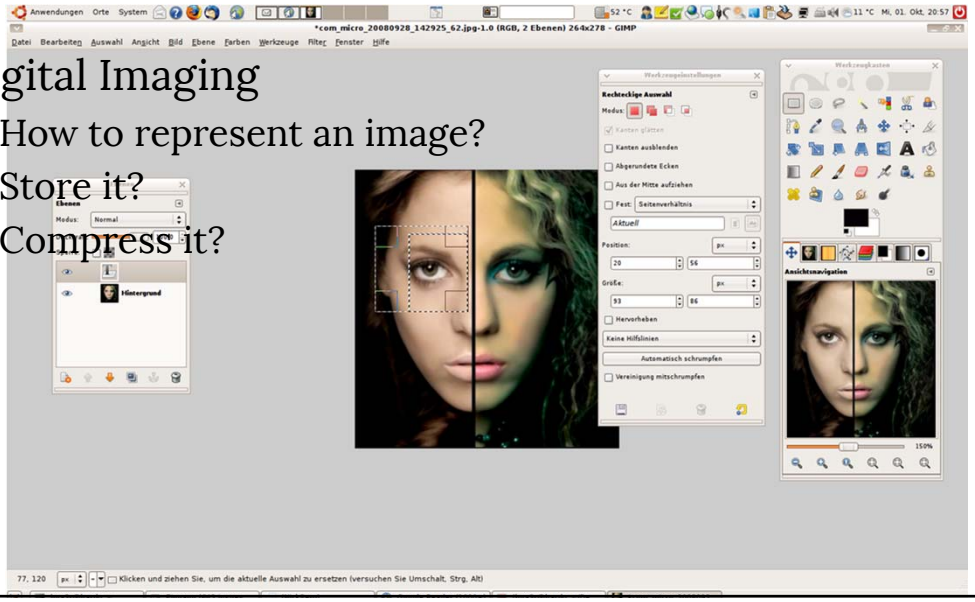
2D IMAGING

- Digital Imaging
  - How to represent an image?
  - Store it?



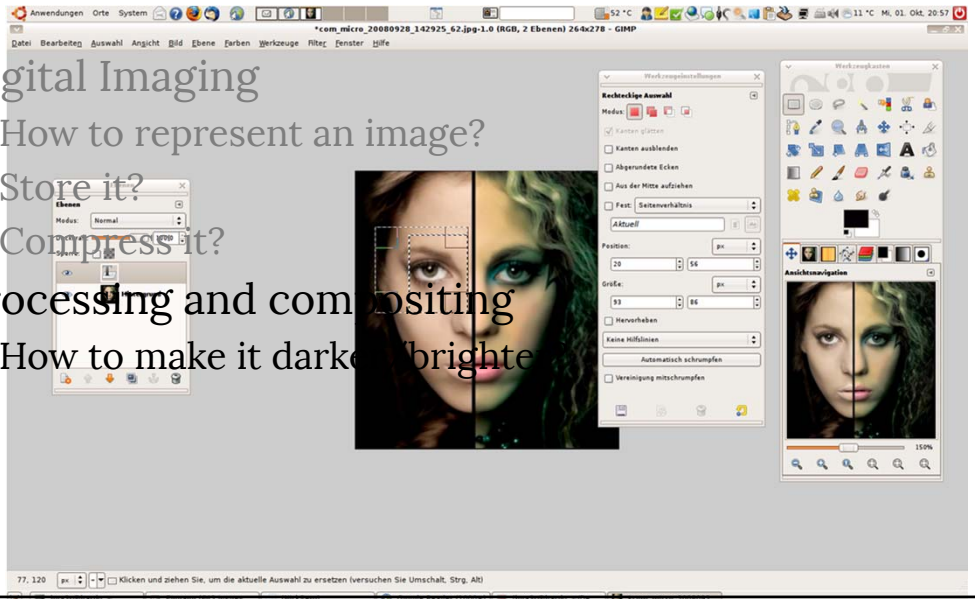
2D IMAGING

- Digital Imaging
  - How to represent an image?
  - Store it?
  - Compress it?

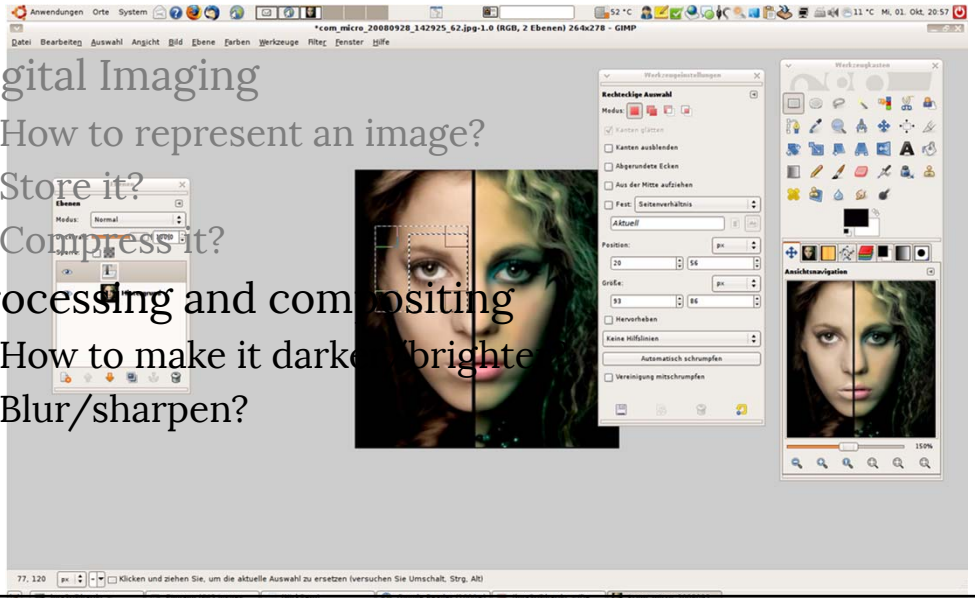


2D IMAGING

- Digital Imaging
  - How to represent an image?
  - Store it?
  - Compress it?
- Processing and compositing
  - How to make it darker/brighter

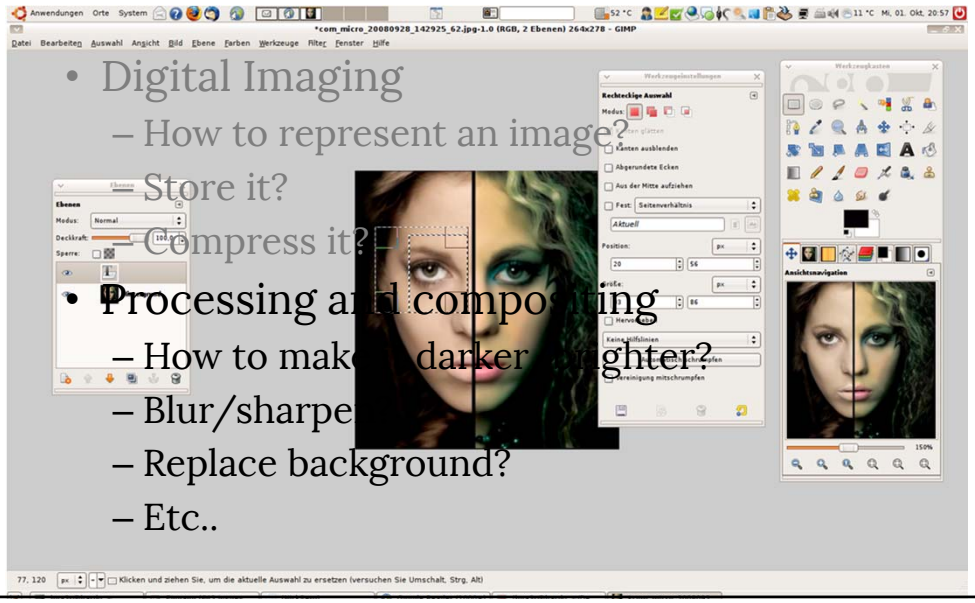


2D IMAGING



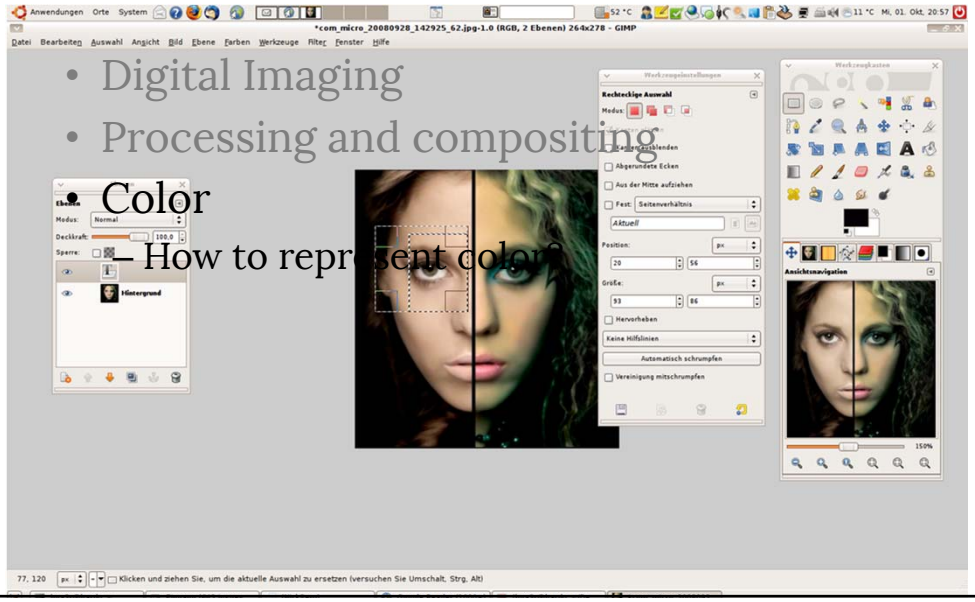
- Digital Imaging
  - How to represent an image?
  - Store it?
  - Compress it?
- Processing and compositing
  - How to make it darker/brighter?
  - Blur/sharpen?

2D IMAGING



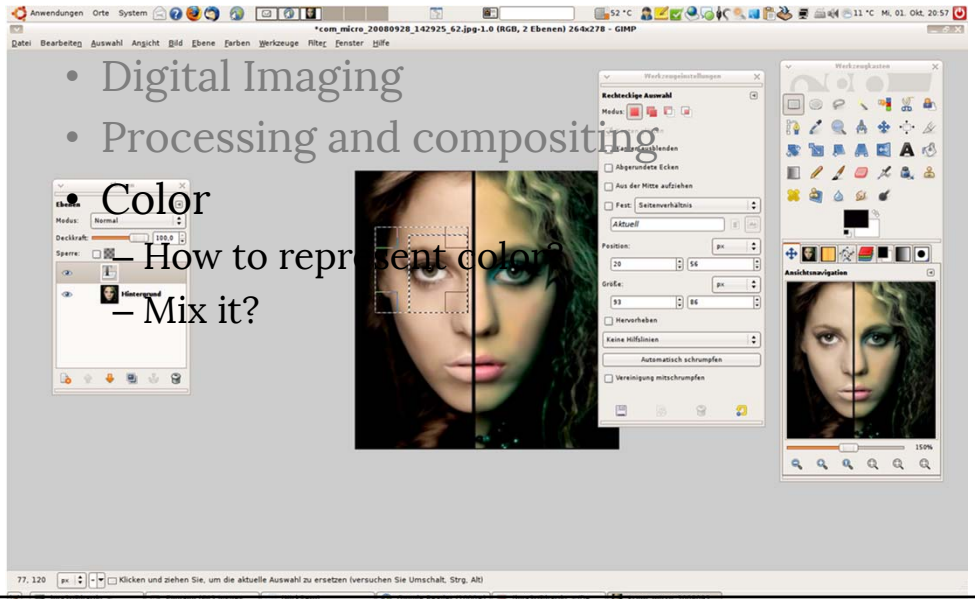
- Digital Imaging
  - How to represent an image?
  - Store it?
  - Compress it?
- Processing and compositing
  - How to make it darker/brighter?
  - Blur/sharpen?
  - Replace background?
  - Etc..

2D IMAGING



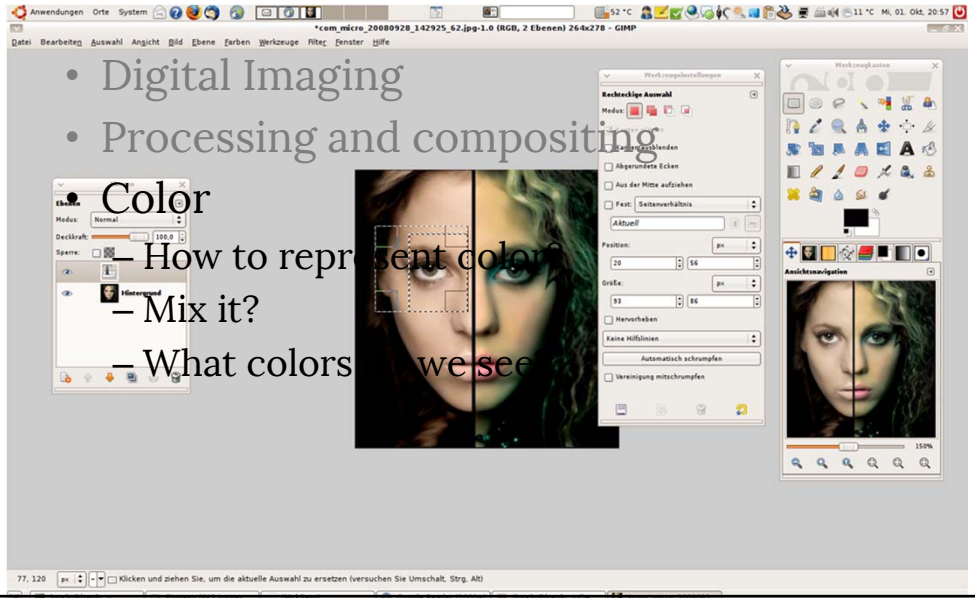
- Digital Imaging
- Processing and compositing
- Color
  - How to represent color?

2D IMAGING



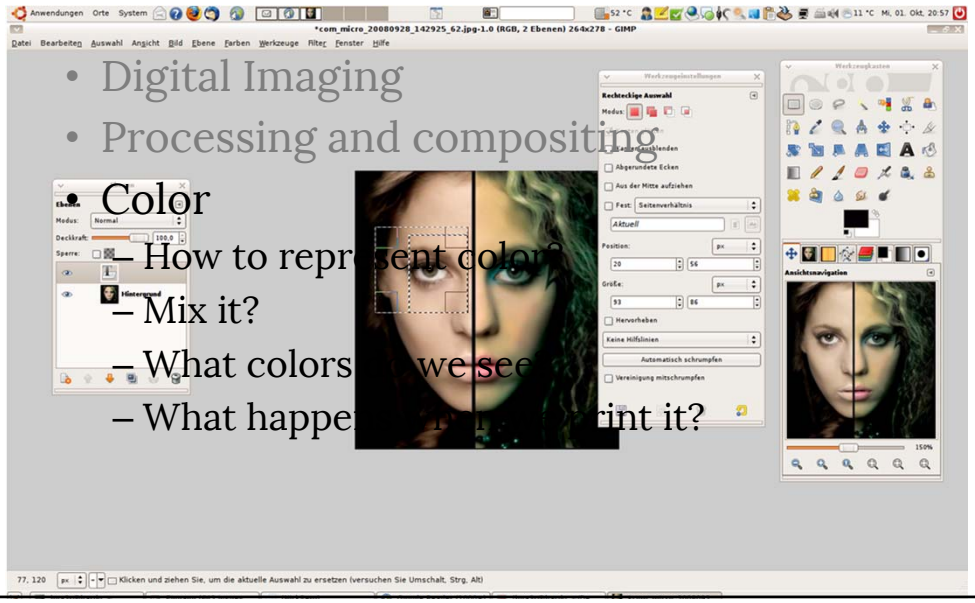
- Digital Imaging
- Processing and compositing
- Color
  - How to represent color?
    - Mix it?

2D IMAGING



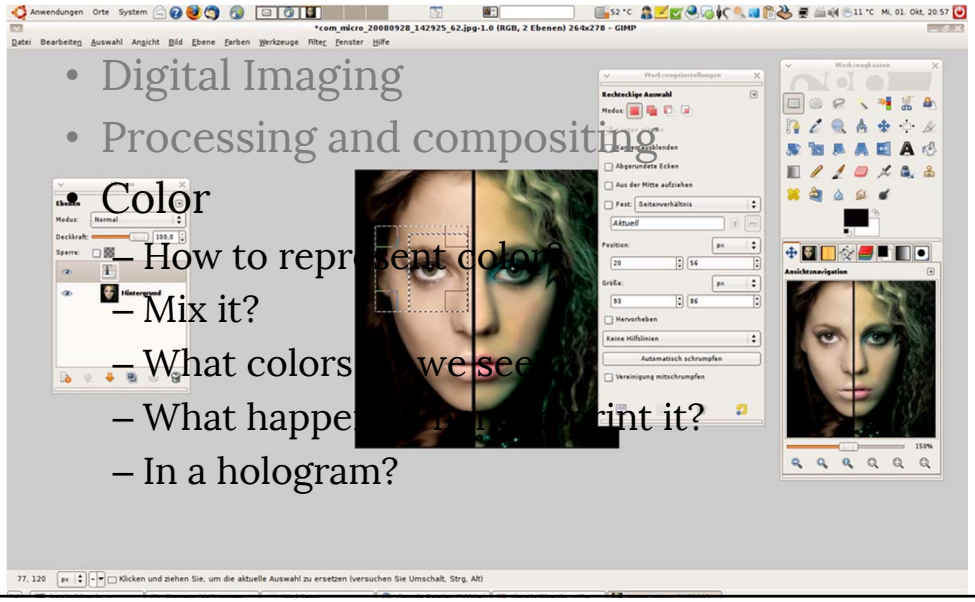
- Digital Imaging
- Processing and compositing
- Color
  - How to represent color?
  - Mix it?
  - What colors do we see

2D IMAGING



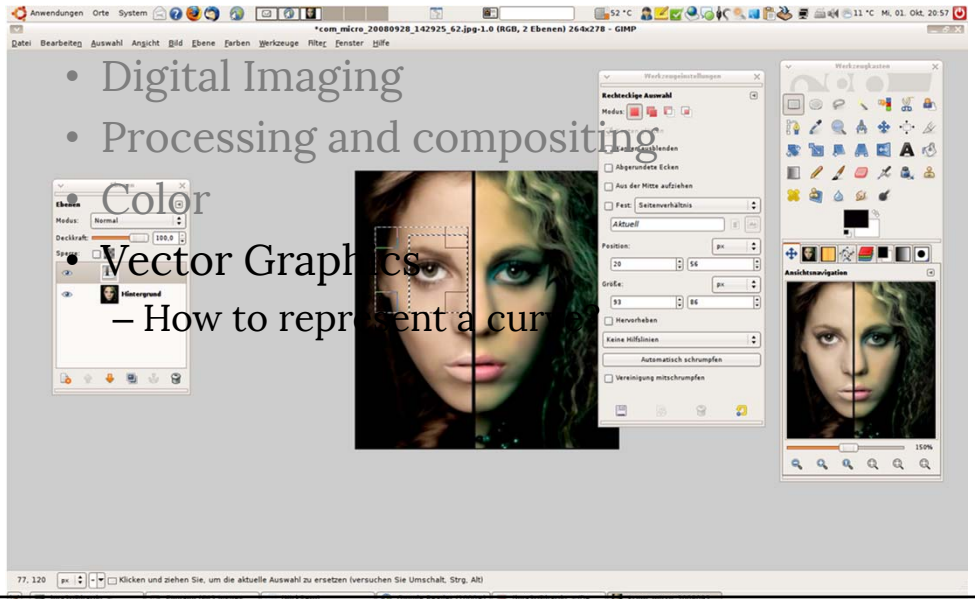
- Digital Imaging
- Processing and compositing
- Color
  - How to represent color?
  - Mix it?
  - What colors do we see
  - What happens when we print it?

2D IMAGING



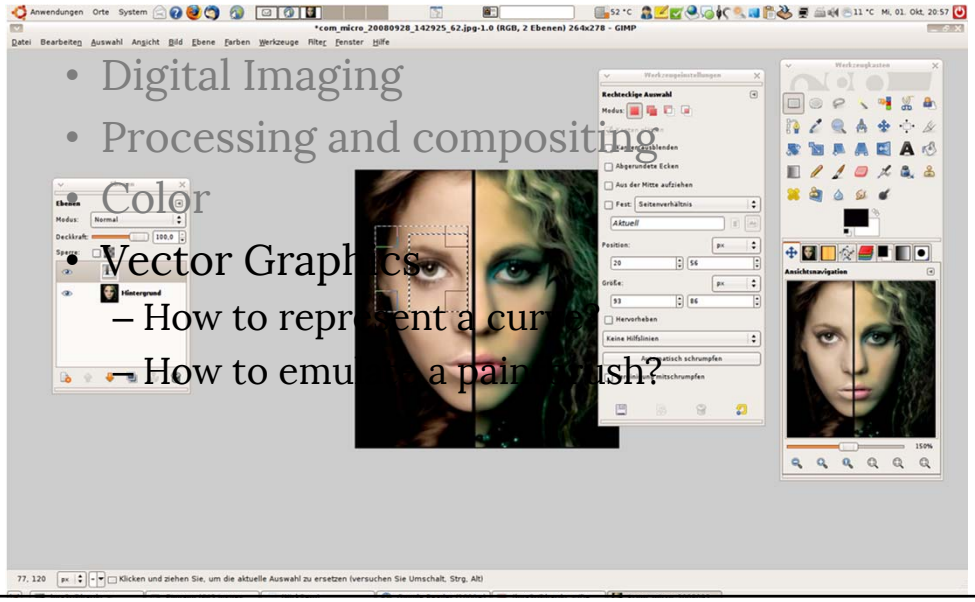
- Digital Imaging
- Processing and compositing
- Color
  - How to represent color?
  - Mix it?
  - What colors do we see
  - What happe int it?
  - In a hologram?

2D IMAGING



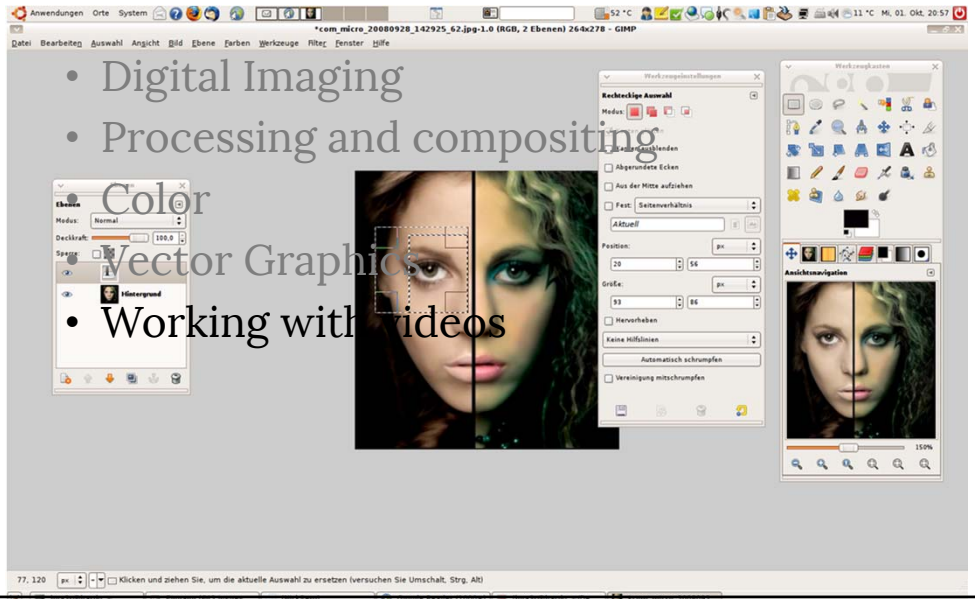
- Digital Imaging
- Processing and compositing
- Color
- Vector Graphics
  - How to repr ent a cur

2D IMAGING



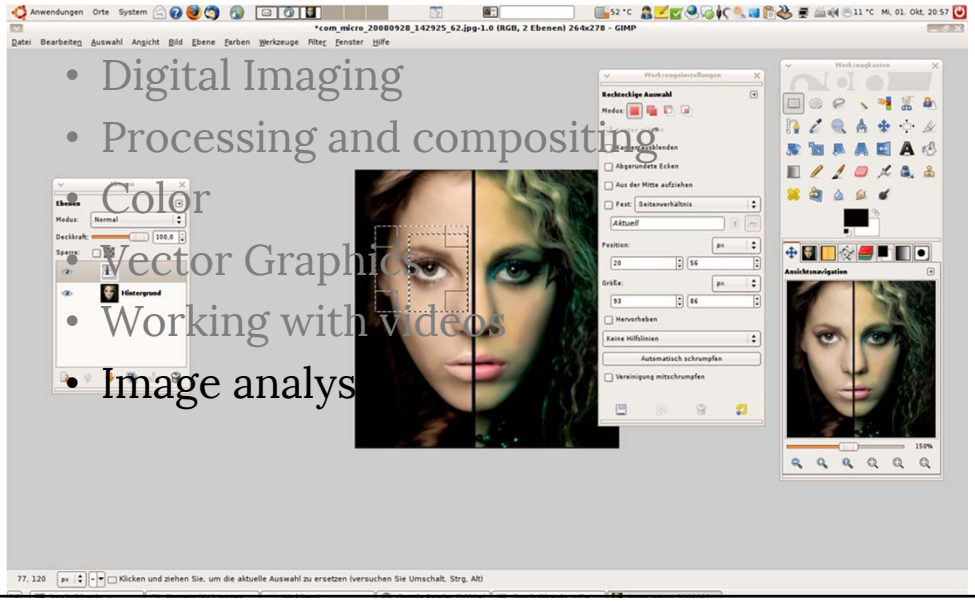
- Digital Imaging
- Processing and compositing
- Color
- Vector Graphics
  - How to represent a curve?
  - How to emulate a paint brush?

2D IMAGING



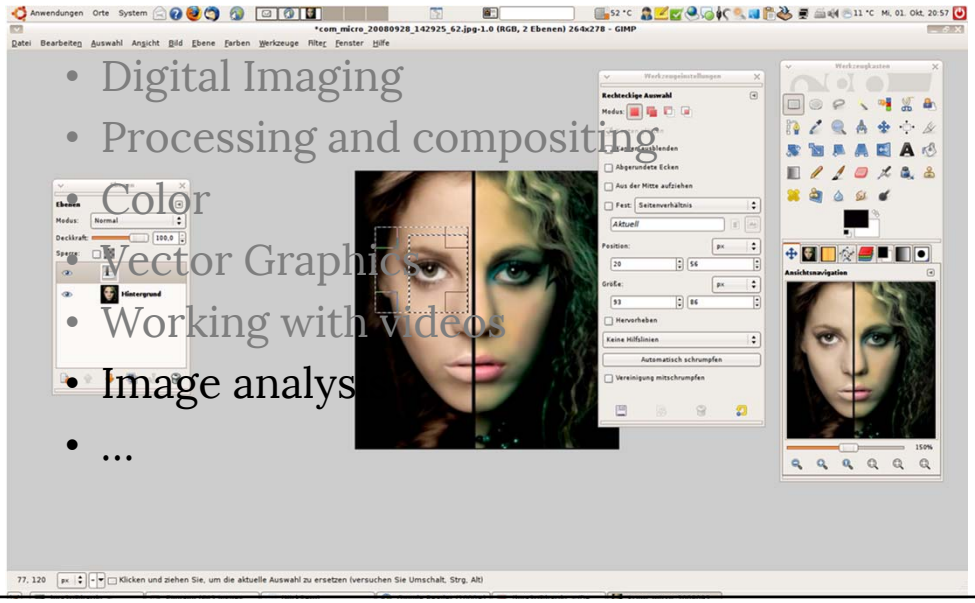
- Digital Imaging
- Processing and compositing
- Color
- Vector Graphics
- Working with videos

2D IMAGING



- Digital Imaging
- Processing and compositing
- Color
- Vector Graphics
- Working with videos
- Image analys

2D IMAGING

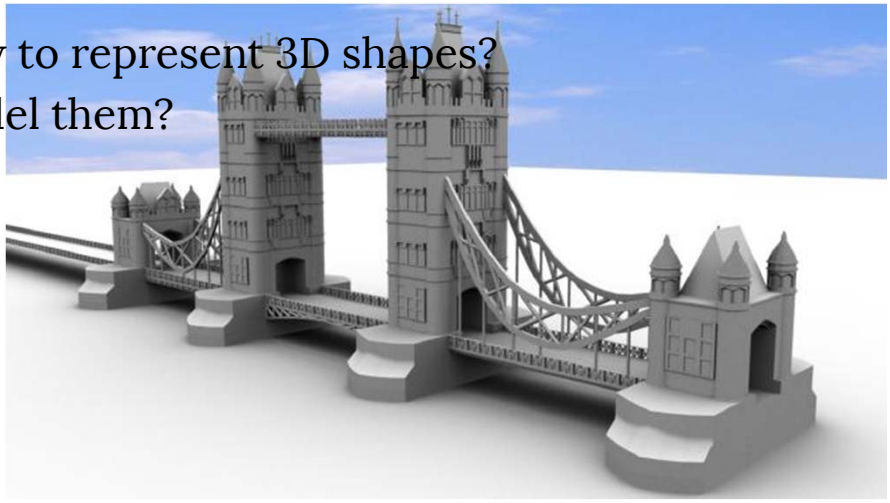


- Digital Imaging
- Processing and compositing
- Color
- Vector Graphics
- Working with videos
- Image analys
- …

MODELING

MODELING

- How to represent 3D shapes?
- Model them?



MODELING

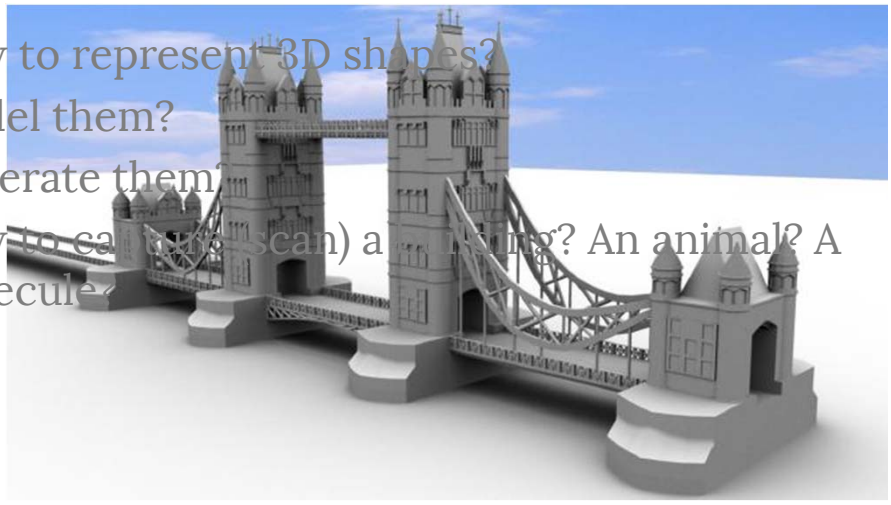
- How to represent 3D shapes?
- Model them?
- Modify them?

MODELING

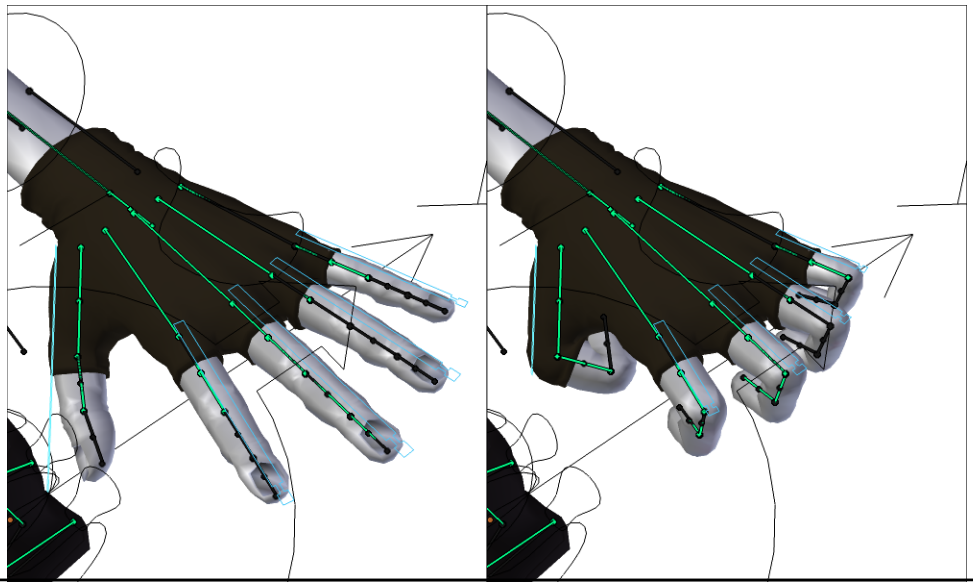
- How to represent 3D shapes?
- Model them?
- Modify them?
- How to capture (scan) a building? An animal? A molecule?

MODELING

- How to represent 3D shapes?
- Model them?
- Generate them?
- How to capture (scan) a building? An animal? A molecule?
- …

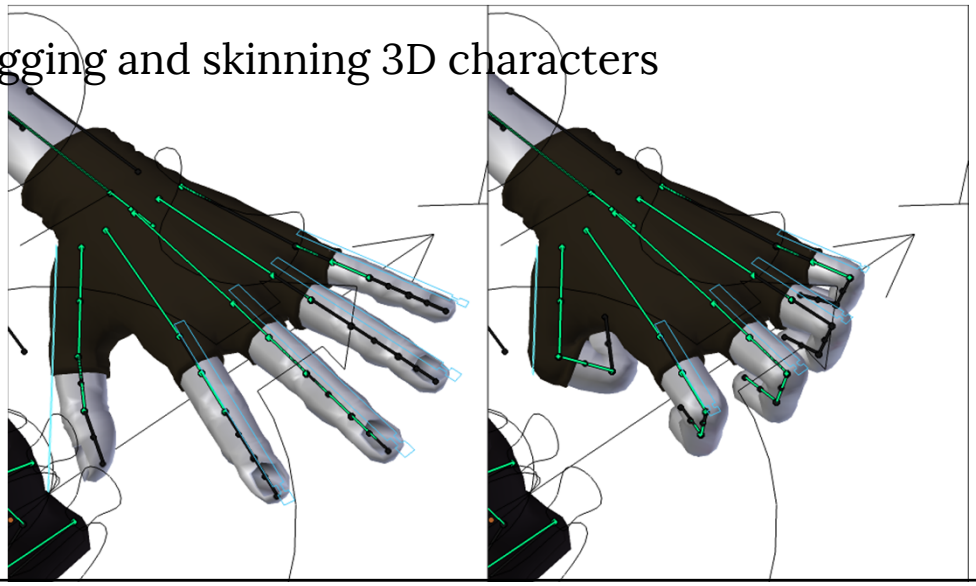


ANIMATING



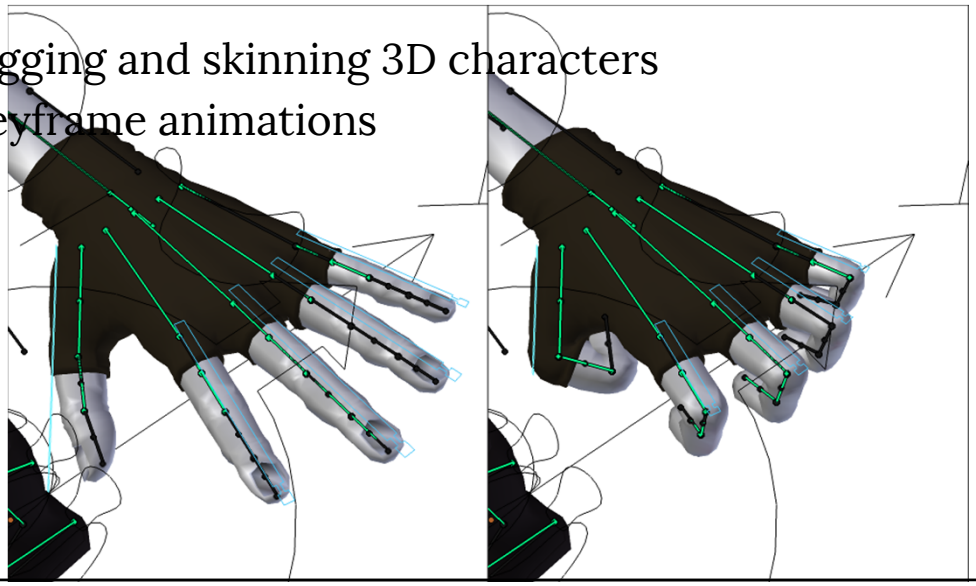
ANIMATING

- Rigging and skinning 3D characters



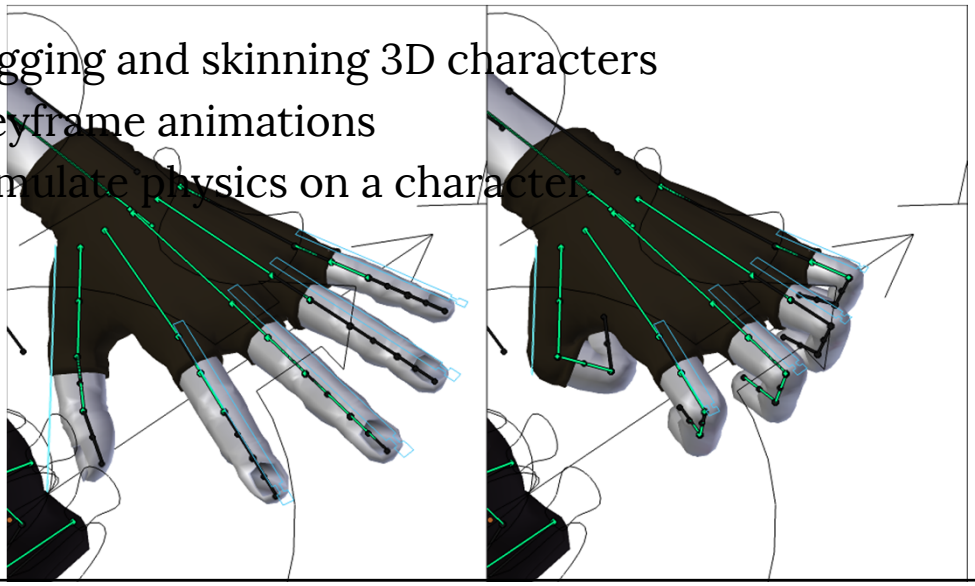
ANIMATING

- Rigging and skinning 3D characters
- Keyframe animations



ANIMATING

- Rigging and skinning 3D characters
- Keyframe animations
- Simulate physics on a character



RENDERING

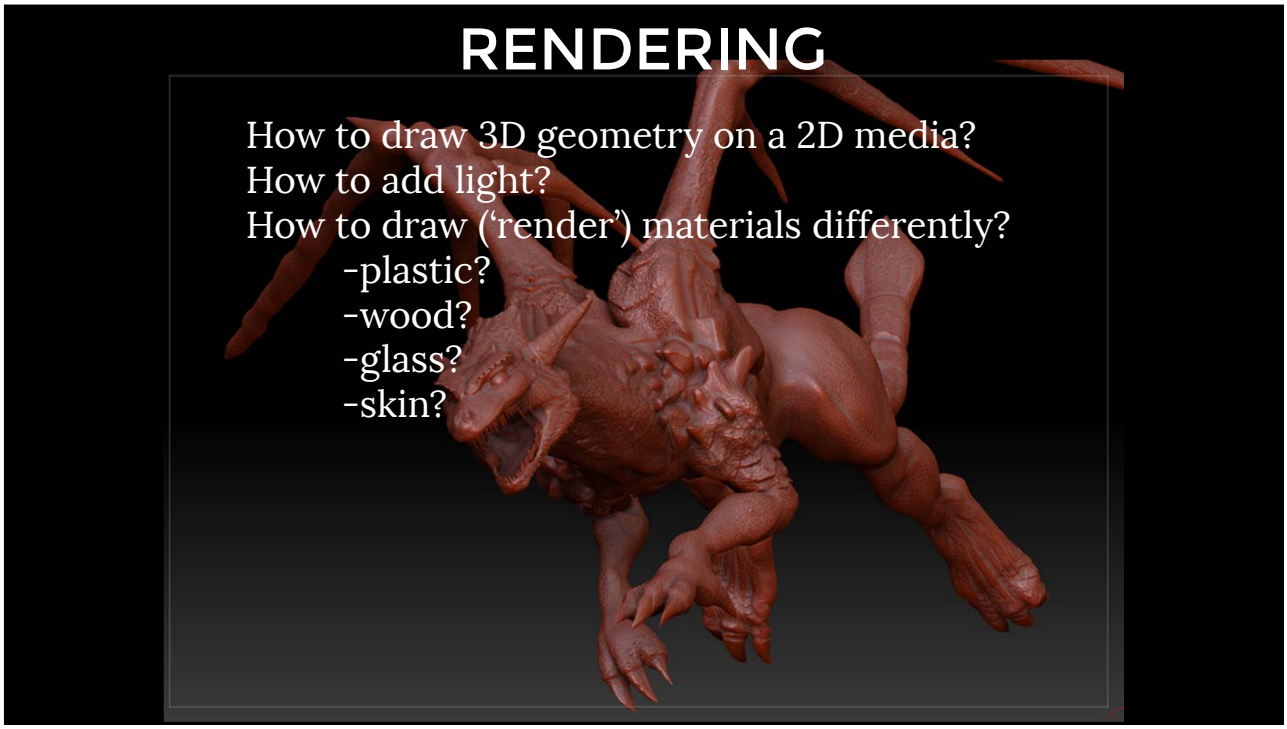
RENDERING

How to draw 3D geometry on a 2D media?

RENDERING

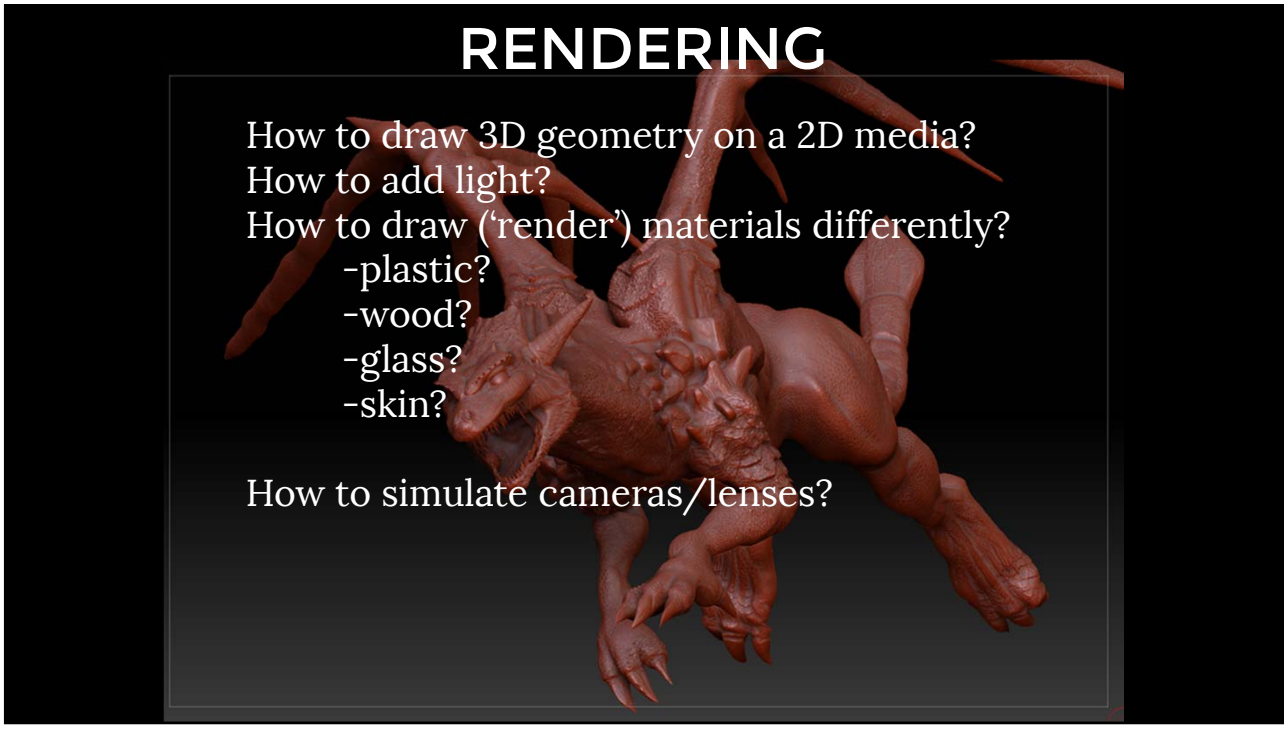
How to draw 3D geometry on a 2D media?
How to add light?

RENDERING



How to draw 3D geometry on a 2D media?
How to add light?
How to draw ('render') materials differently?
- -plastic?
- -wood?
- -glass?
- -skin?

RENDERING

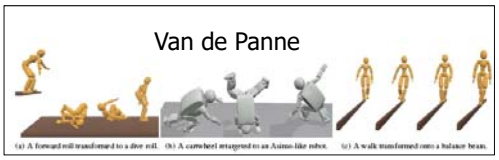


How to draw 3D geometry on a 2D media?
How to add light?
How to draw ('render') materials differently?
- -plastic?
- -wood?
- -glass?
- -skin?

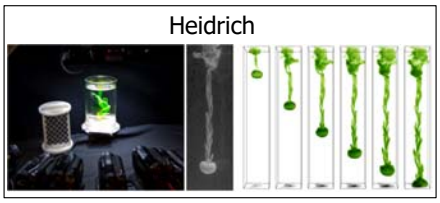
How to simulate cameras/lenses?

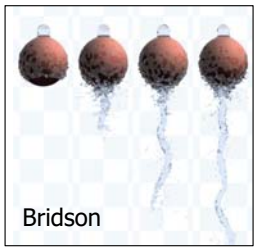
Context: CG Research at UBC

Van de Panne



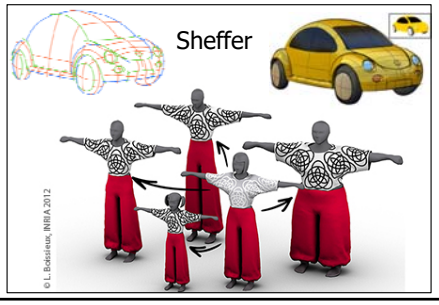
Heidrich





Bridson

Pai



Sheffer

Course Details (aka Boring Bits)

TEAM

Instructor: Alla Sheffer
Office hour: Fri, 11-12 pm ICICS 005 (or X651)

TAs: Xinyi Zhang , Daniela Correa, Enrique Alberto Rosales Ruiz, Amon Ge

To contact us, **use Piazza**!
Only use e-mail for personal issues
Or come to the labs/office hours.

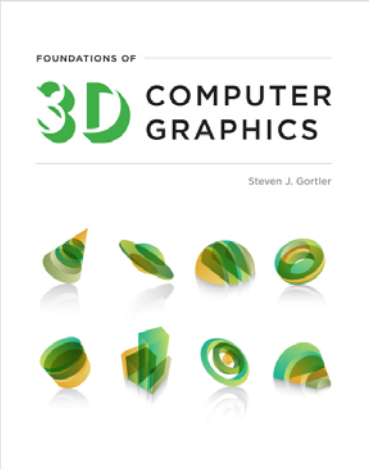
SUMMARY

Lectures: Mon Wed Fri 10-11, DMP 110
Labs: Tue 1-2, Wed 1-2 & 2-3, Thu 2:30 – 3:30 & 3:30-4:30
Labs start next week.

Grades: connect.cs.ubc.ca
Announcements, questions, etc.: Piazza
Course website: ugrad.cs.ubc.ca/~cs314

TEXTBOOK (optional)

Foundations of Computer Graphics by S.J.Gortler
Free online at ubc library



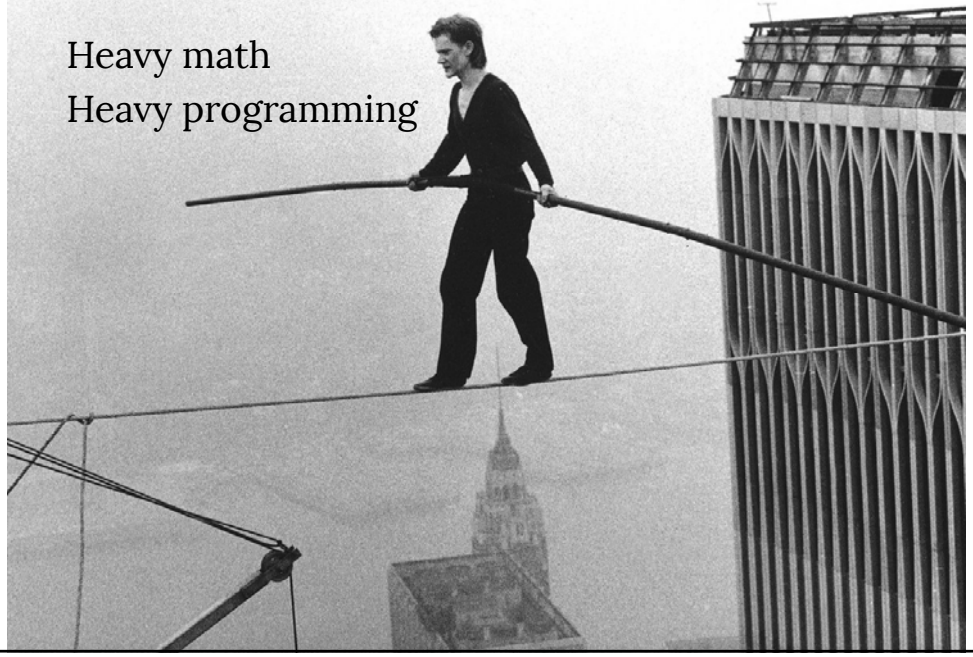
PREREQS

- Know thy maths!
  - Calculus
  - Linear algebra
  - Algorithms

(MATH 200 || MATH 253) &&
(MATH 152 || MATH 221 || MATH 223) &&
(CPSC 221 || (CPSC 260 && EECE 320))

THIS IS NOT AN EASY COURSE.

Heavy math
Heavy programming



GRADING

Programming Assignments (40%)
Theory Assignments/Home Quizzes (6%)
Midterms (24%)
Participation (2%)
Final Exam (28%)

100%

+

Bonus (8%)

ASSIGNMENTS (40%+6%)

- Short theory assignments (1 week) + Home Quizzes (multiple choice) (6%)
  - 4-5 short theory assignments
  - Weekly multiple choice question quizzes
- Big programming assignments (40%), ~3 weeks
- Both will help you on midterms/final

EXAMS (24% + 28%)

Midterm 1: Wed, Oct 12th
Midterm 2: Mon, Nov 18th
Final: TBD

CODING

3 assignments will use WebGL + Javascript

It is your responsibility to learn Javascript, but we won't need a lot of it

4th assignment will use pure C++

FACE TO FACE GRADING

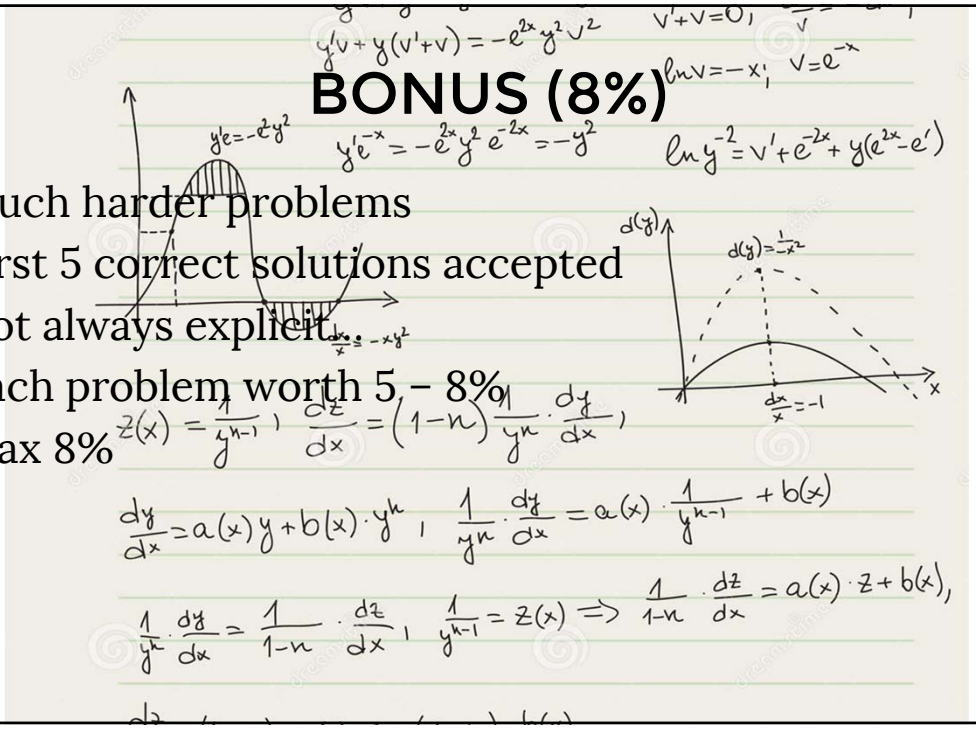
- Understand each line of your code
- Plagiarism policy

PARTICIPATION (2%)

- Note taking
- Classroom
  - Clicker questions
- Review Questions
  - Multiple choice
  - Post weekly on piazza (private)
  - If selected your grade on containing quiz doubles

BONUS (8%)

- Much harder problems
- First 5 correct solutions accepted
- Not always explicit
- Each problem worth 5 – 8%
- Max 8%



WHAT YOU WILL LEARN

Representation of 3D shapes
3D shape transformations
Rendering Algorithms
Shading and lighting models
Texturing
Raytracing

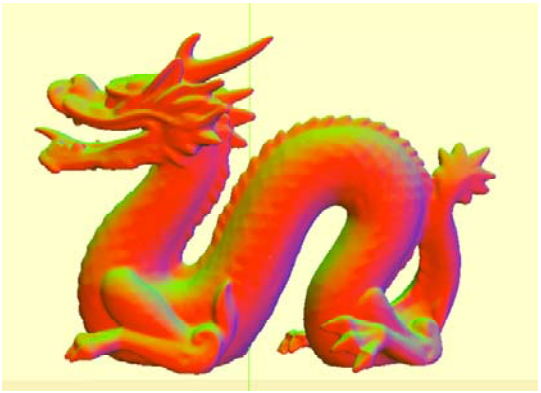
(Coding/Soft skills)

WHAT YOU WON'T LEARN

- Graphics "Tools": How to use Maya/Photoshop/Zbrush etc.
- Artistic skills

ROADMAP

- Rendering Pipeline $\int dx$
- GLSL $\int dx$
- Transformations $\iiint dxdydz$
- Rasterization $\int dx$
- Lighting $\iint dxdy$
- Texturing $\int dx$
- Blending $\int dx$
- Ray Tracing $\iint dxdy$
- Advanced topics: shading, modeling, color,... $\iint dxdy$



</INTRO>

ugrad.cs.ubc.ca/~cs314

Piazza! Piazza! Piazza!

Office hour: Fri, 11am-12pm ICICS 187/X651