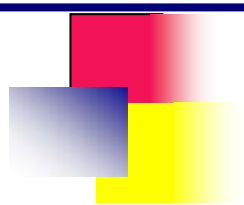
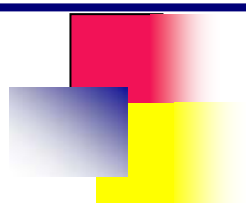


A Breadth-First Approach for Teaching Computer Graphics

Gitta Domik
Frank Goetz, Monika Schröder
University of Paderborn
Germany

Overview

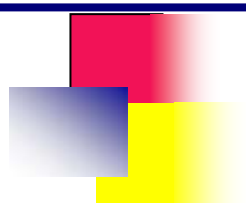


- Teaching Breadth-First
- SIMBA – An educational tool
- Courses “Creativity & Technology”
- Evaluation of course
- Summary

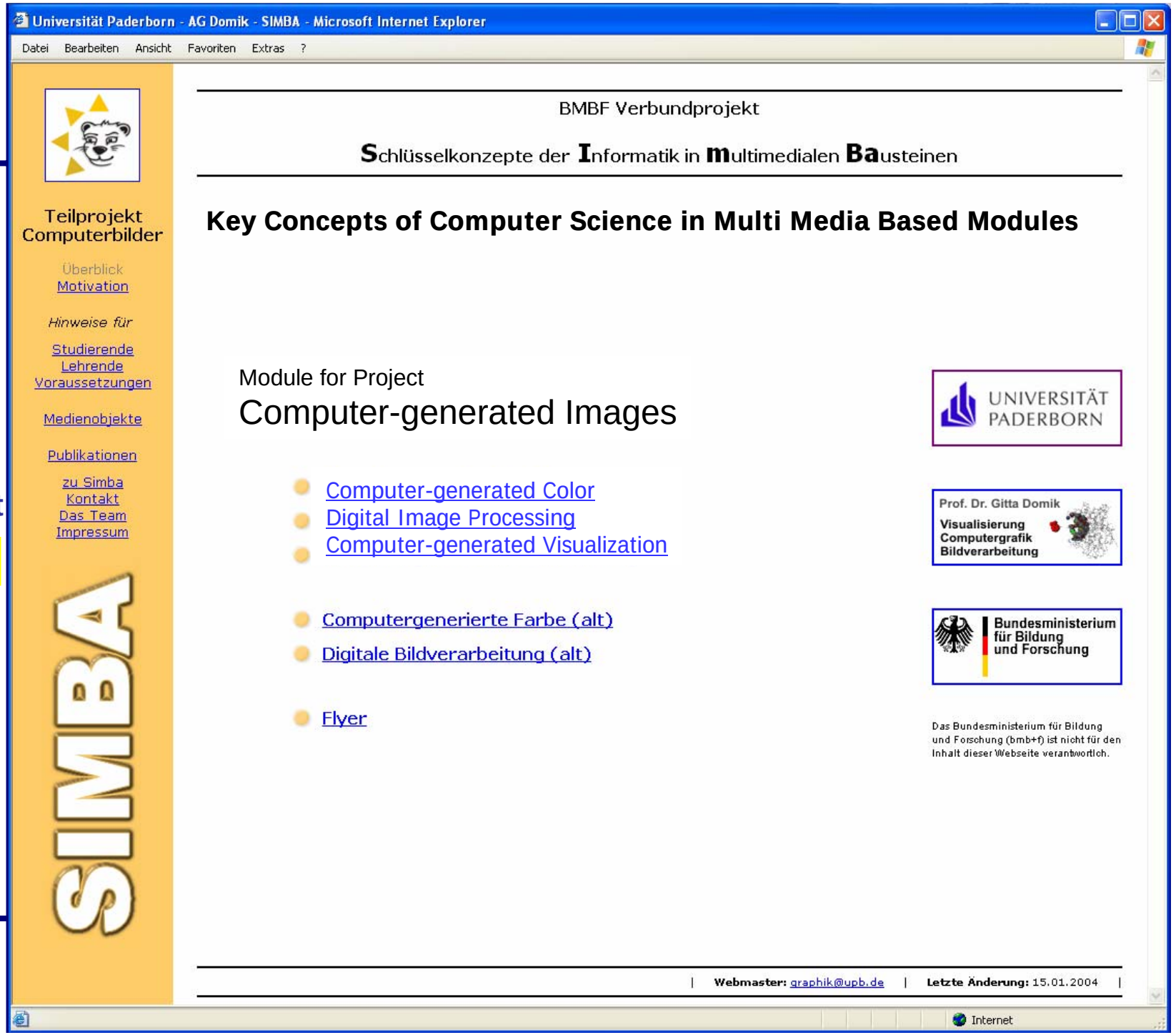
Teaching Breadth-First

- CS Computing Curricula 2001
  - Start with holistic view
  - Use broad approach
  - Undermine with application
  - Then use depth
- Advantages
  - Interdisciplinary teaching, women & men, CS students

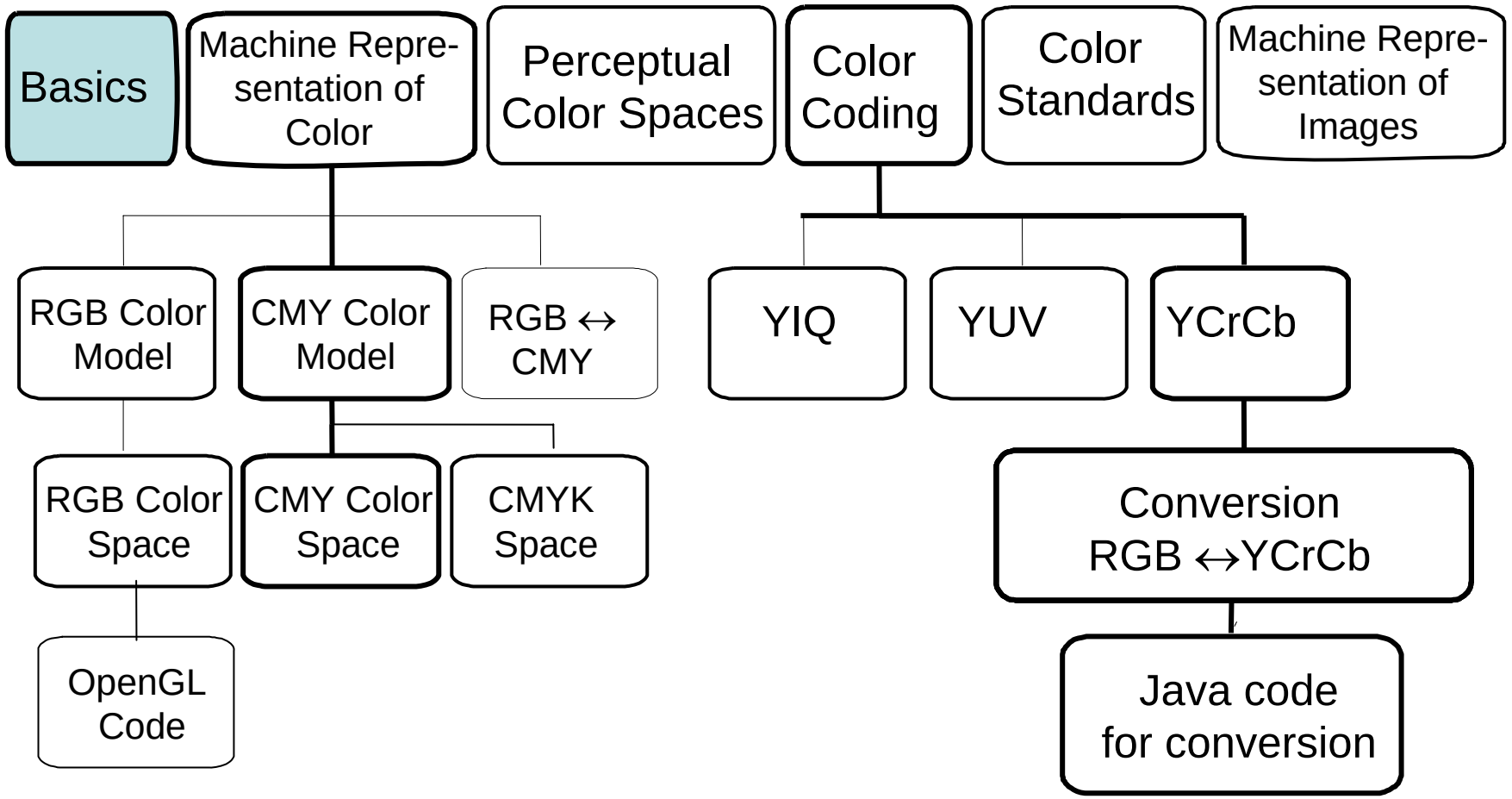
Interdisciplinary Teaching in CG



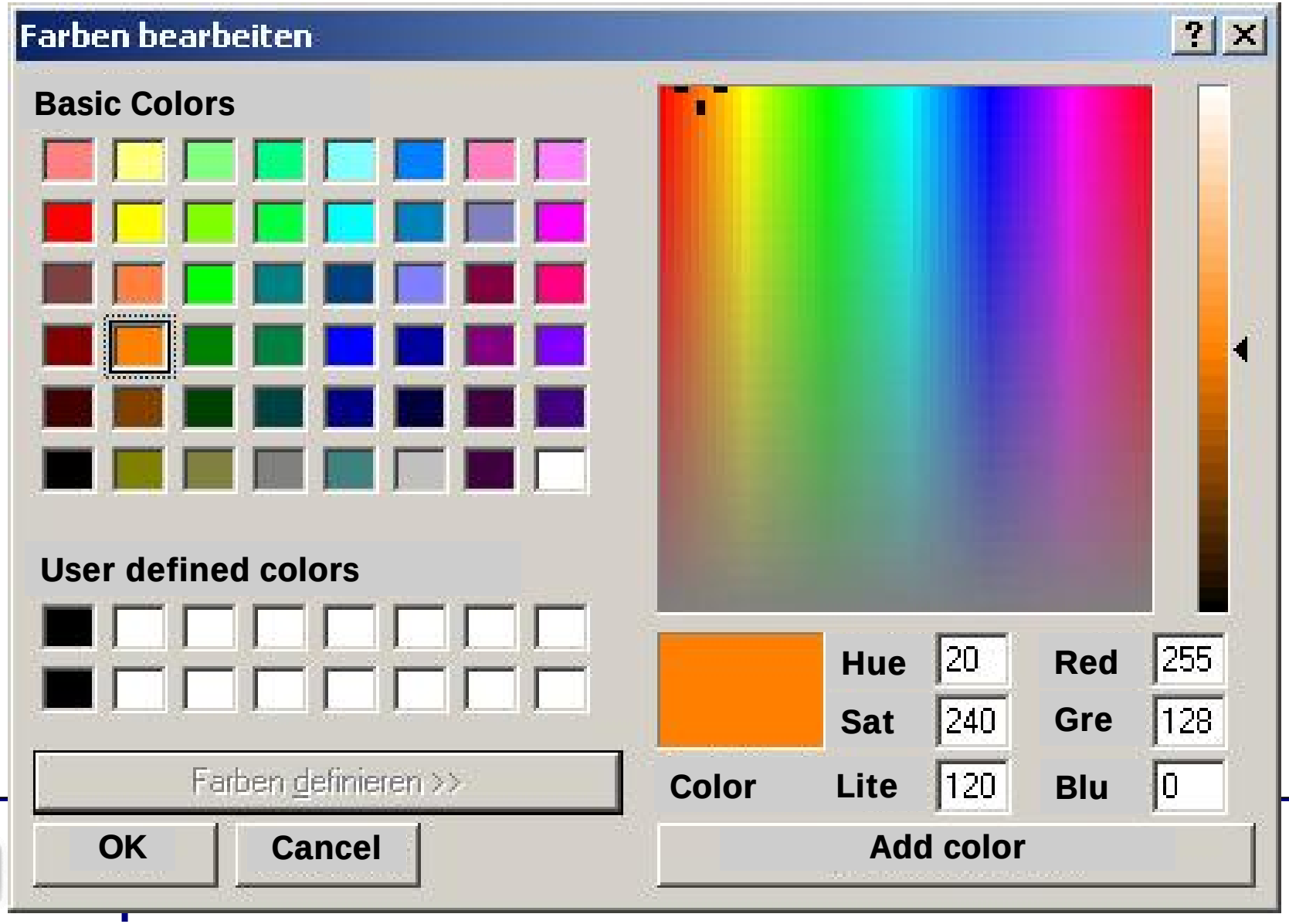
- Computer Graphics for CS and Media Studies
- Computer Graphics for CS and Engineering
- ……..
- Computer Graphics for CS and Arts
- ……..
- „Creativity and Technology“
  - CS: 2 semester project course (2L+2Se+2Lab + 6Proj)
  - Media Studies: 1 semester (2L+1Lab)
  - Teaching tool: SIMBA



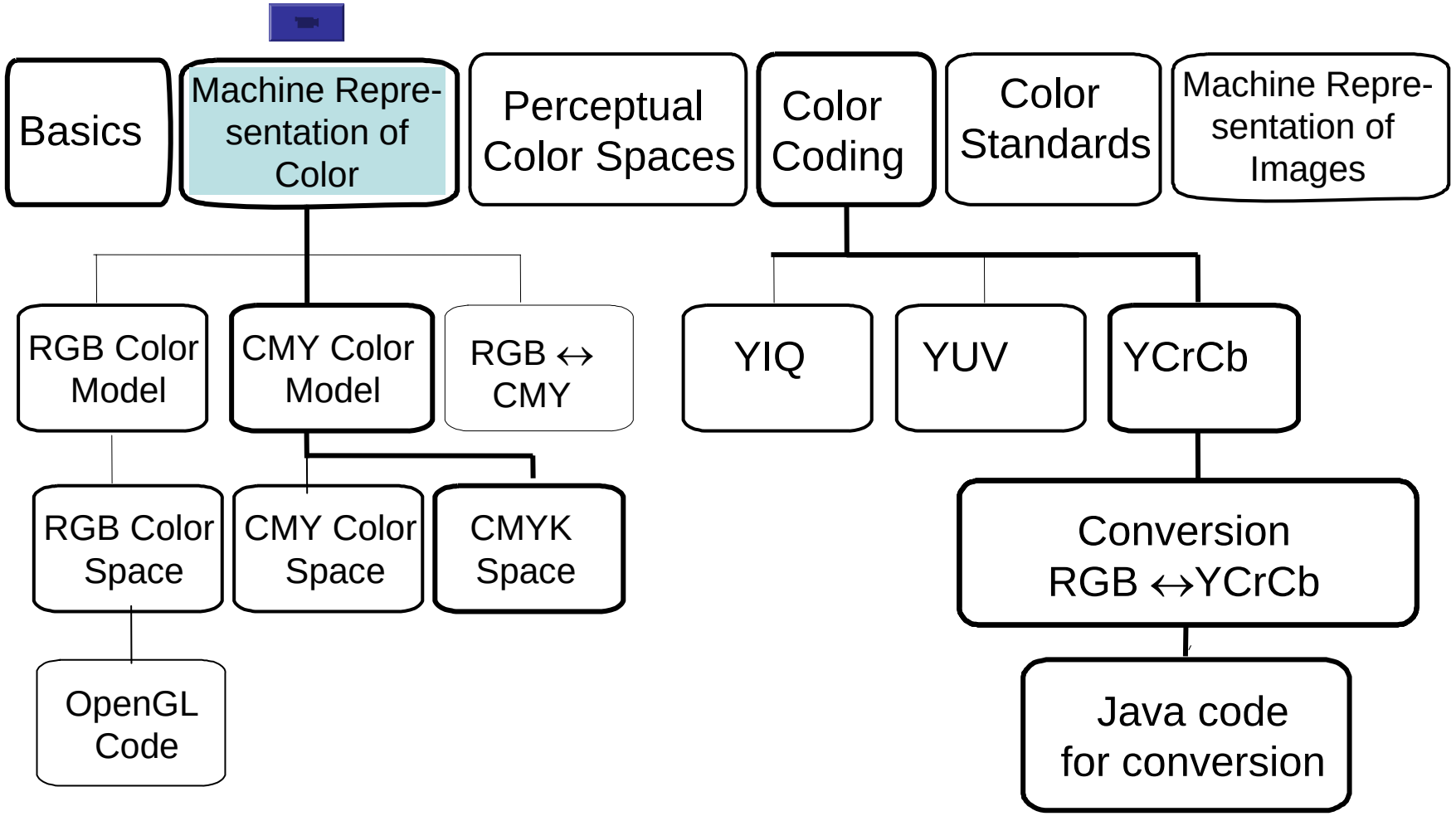
Computer-generated Color



Basics


Farben bearbeiten
Basic Colors
User defined colors
Farben definieren >>
OK
Cancel
Hue
20
Sat
240
Color
Lite
120
Red
255
Gre
128
Blu
0
Add color

Computer-generated Color

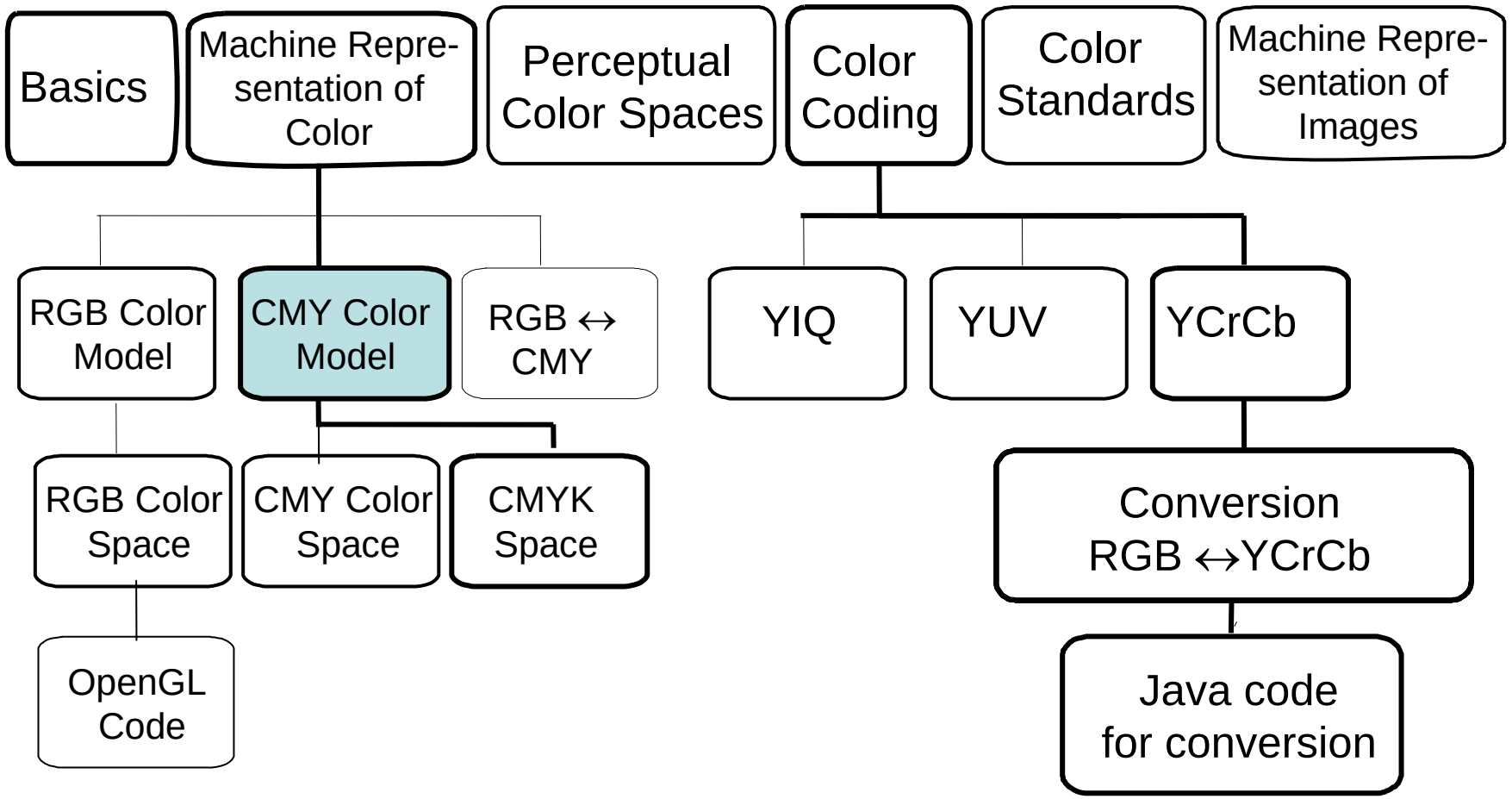


Machine Representation of Color

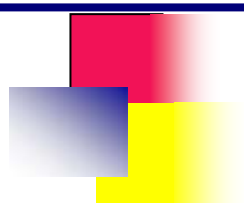
- Experiment by Mathematician Hermann Grassmann, 1853
- Color ~ a*R + b*G + c*B (additive color system)
- R, G, B … primary colors
- a, b, c, … tristimulus values

- metamers
- secondary colors, e.g. Y, M, C

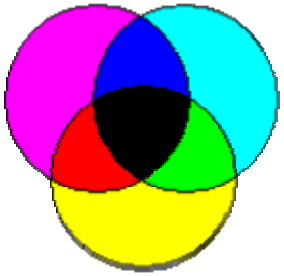
Computer-generated Color



CMY Color Model



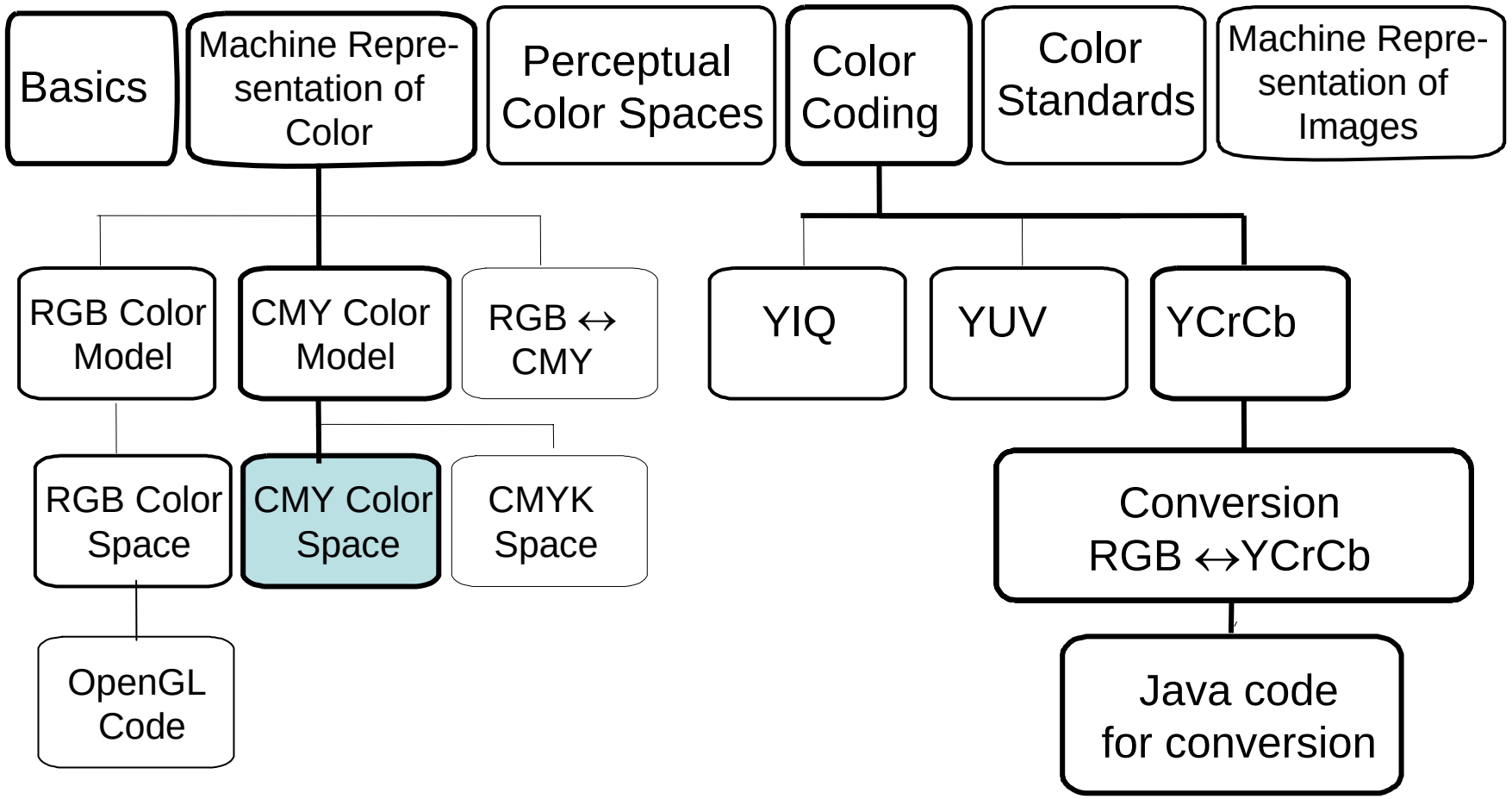
- describes reflection of color, as with color printers
- primary colors: Cyan, Magenta, Yellow
- subtraction of primary colors from white



- A note about pigments:
  - e.g. water colors contain pigments
  - pigments absorb and reflect color
  - e.g. blue water color absorbs long and medium λ, reflects only short λ.
- Absorbing process:

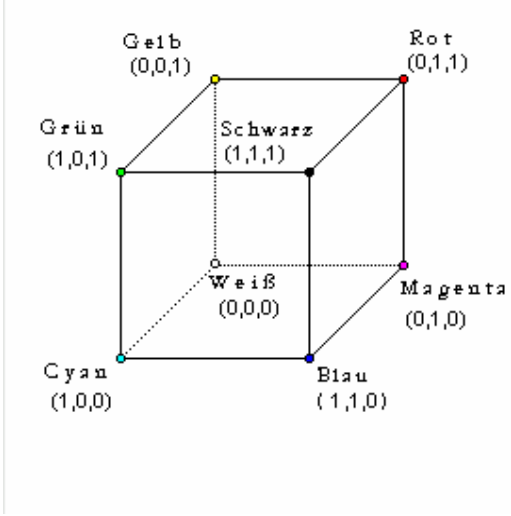
CMY Color	Absorbing λ
Black	all
Cyan	long
Magenta	medium
Yellow	short

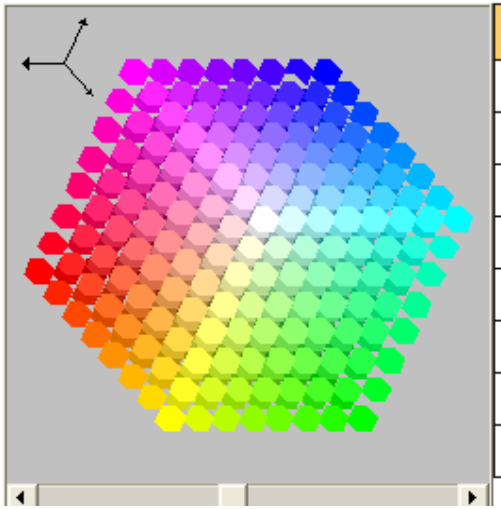
Computer-generated Color



CMY Color Space

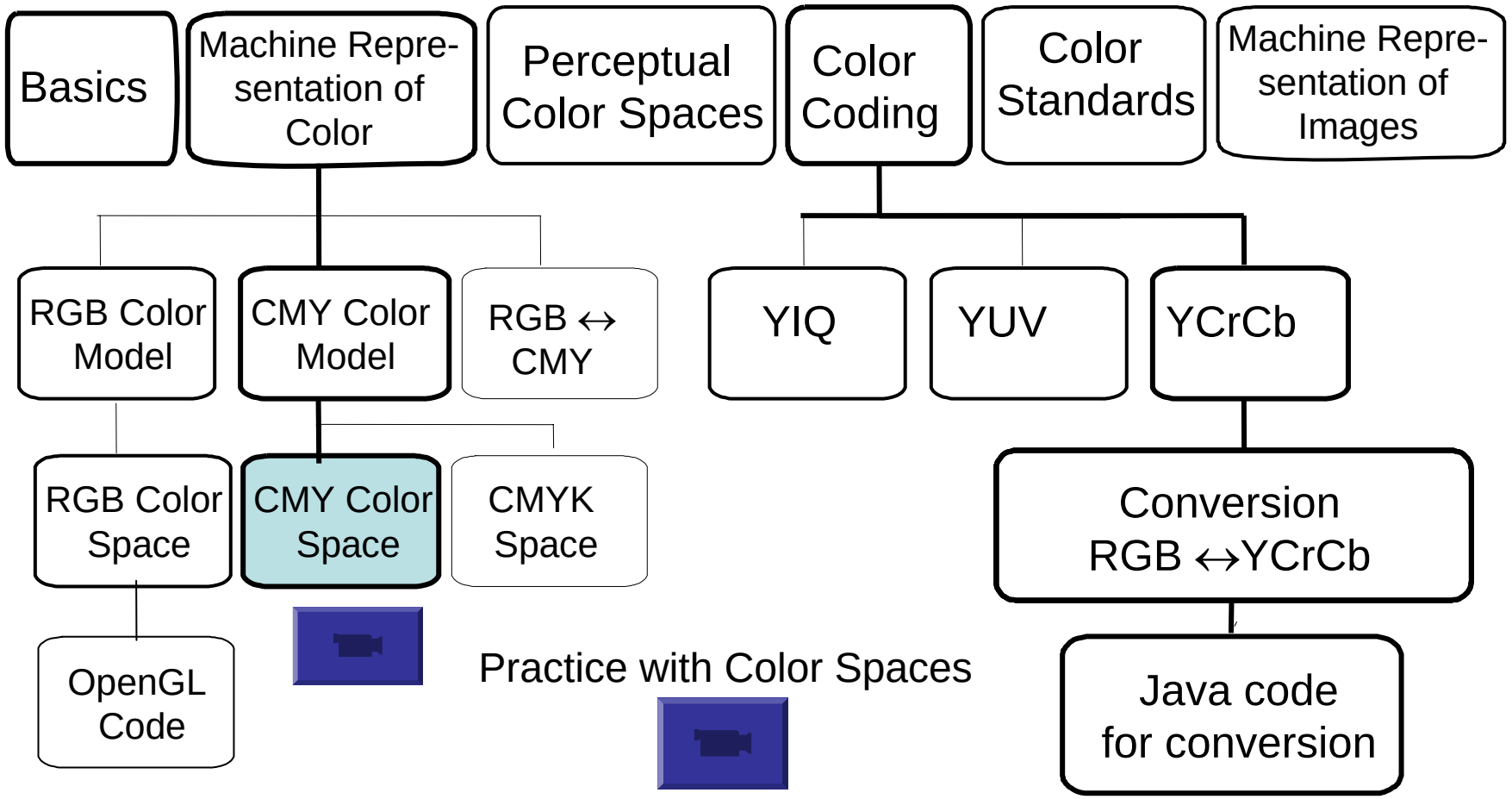
- CMY Color space is geometric form of subtractive color model
- Grey values: diagonal white to black
- Unit cube defines color coordinates



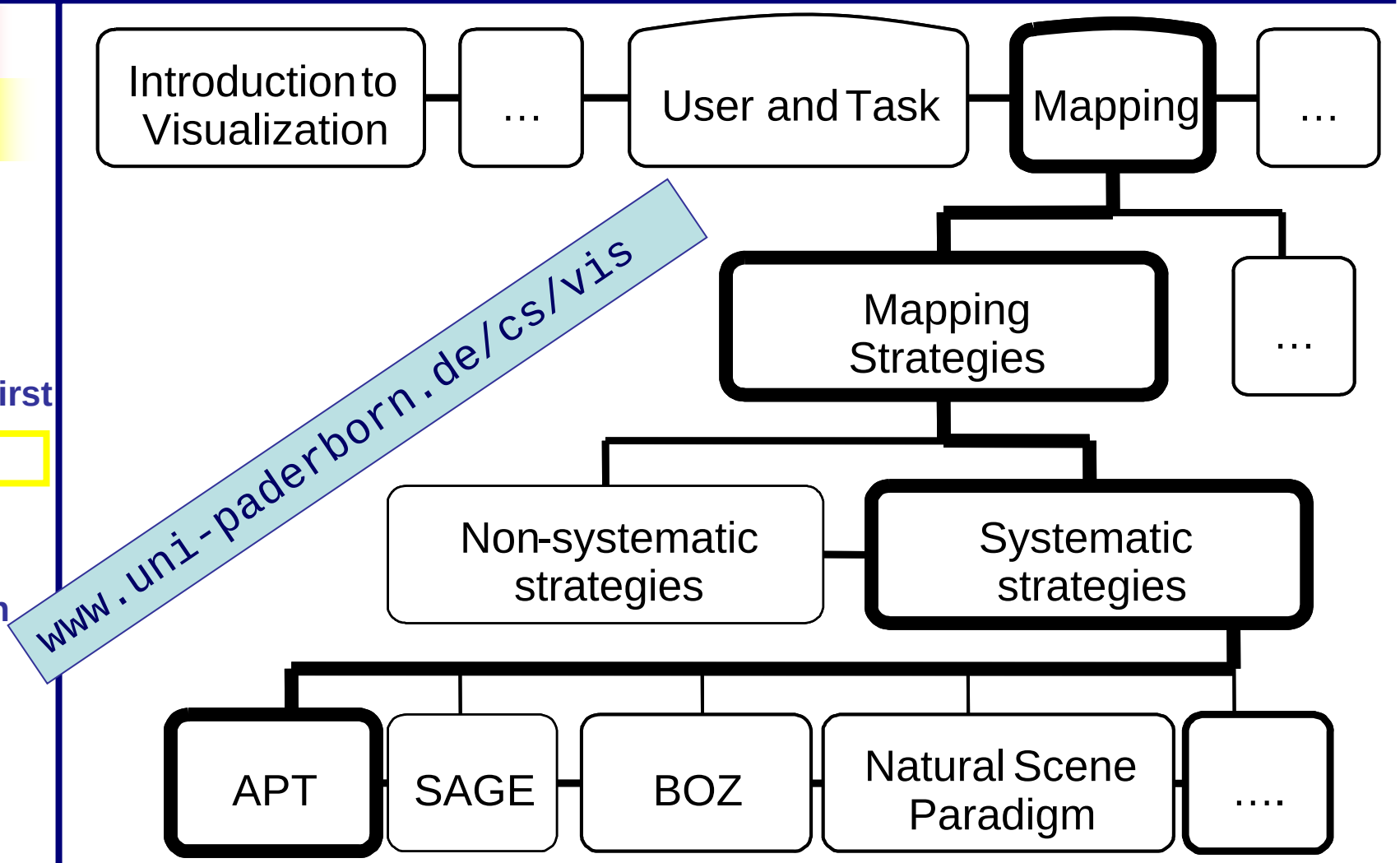


C,M,Y	Farbe	
0,0,0	Weiß	
0,0,1	Gelb	
0,1,0	Magenta	
0,1,1	Rot	
1,0,0	Cyan	
1,0,1	Grün	
1,1,0	Blau	
1,1,1	Schwarz	

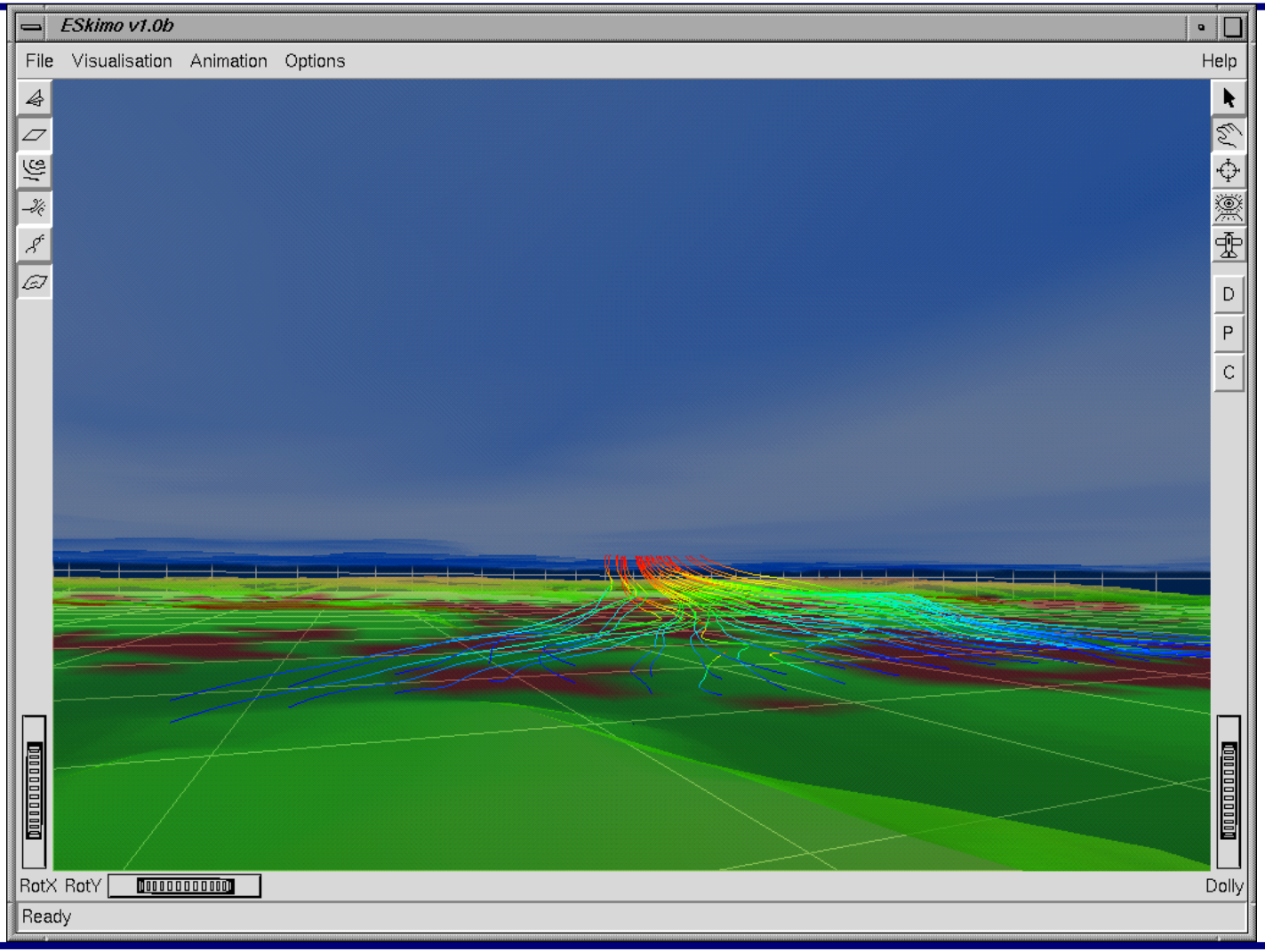
Computer-generated Color



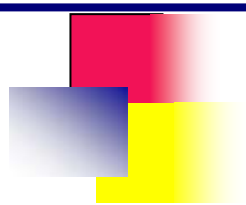
Breadth and Depth for Visualization



High-Risers in Valley?

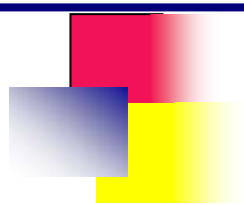


Teaching Creativity and Technology - Computer Science students side



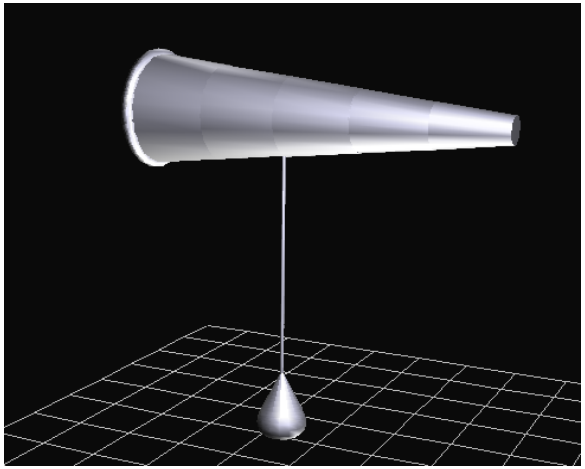
- Two semester project course
- Prerequisite: Two semesters CG
- First semester
  - Seminar “3D Web Technology”
  - Lectures on Visualization, C&T etc.
  - Project openVisaar (c-s based tool for vis/Java)
- Second semester
  - Project only, pair with media students

Teaching Creativity and Technology - Media Science students side

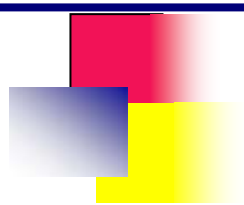


- One semester course
  - No prerequisites
  - Color
  - Visualization
  - Creativity and Technology
- Lab
  - Maya, Flash, Shockwave
  - Develop effective and expressive visualizations for complex data sets

Teaching Creativity and Technology - Computer Science AND Media students

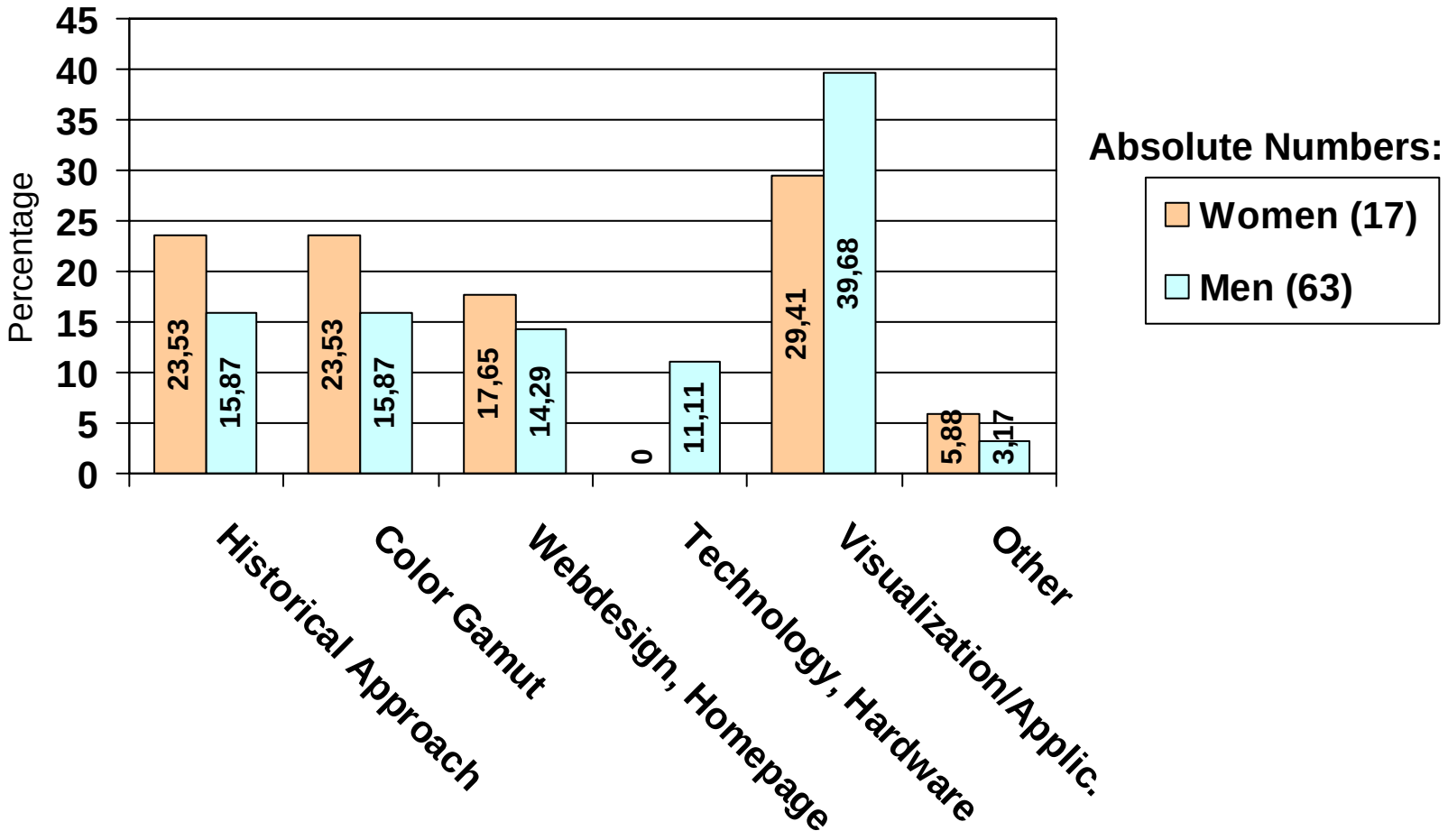


Evaluation of Tool SIMBA – (by UniDo)

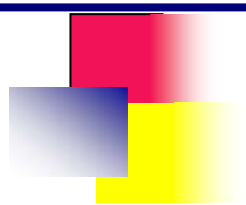


- 84 CS students (70 male, 12 female; 2 unknown)
- 70% approved strongly of the breadth and depth order in the menu
- > 90% : interactive elements helpful to enhance understanding
- 70% found the modules motivational
- 70% declared that application was helpful

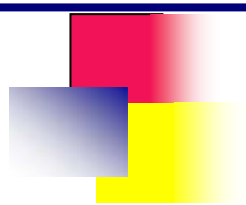
Our own question: „*What would motivate YOU to learn about color?*“



Conclusions



- Breadth-First approach found useful
- Not easy to develop such tools



Thank you for your attention !