

# A Breadth-First Approach for Teaching Computer Graphics

Overview

Breadth-First

SIMBA

C & T

Evaluation

Summary

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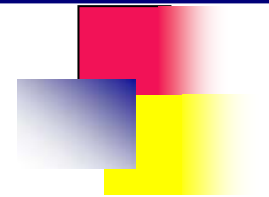
University of Paderborn

Germany



1/23

# Overview



## Overview

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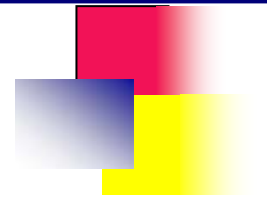
Evaluation

Summary

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



# Teaching Breadth-First



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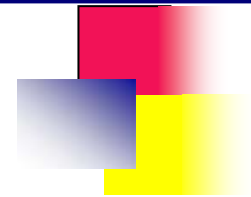
Evaluation

Summary

- 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



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Summary

- 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



Universität Paderborn - AG Domik - SIMBA - Microsoft Internet Explorer


Datei Bearbeiten Ansicht Favoriten Extras ?

BMBF Verbundprojekt

**S**chlüsselkonzepte der **I**nformatik in **m**ultimedialen **Ba**usteinen

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**Key Concepts of Computer Science in Multi Media Based Modules**



Teilprojekt  
Computerbilder

[Überblick](#)  
[Motivation](#)

*Hinweise für*  
[Studierende](#)  
[Lehrende](#)  
[Voraussetzungen](#)

[Medienobjekte](#)

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SIMBA

Module for Project  
**Computer-generated Images**


- [Computer-generated Color](#)
- [Digital Image Processing](#)
- [Computer-generated Visualization](#)

- [Computergenerierte Farbe \(alt\)](#)
- [Digitale Bildverarbeitung \(alt\)](#)



- [Flyer](#)



UNIVERSITÄT  
PADERBORN

Prof. Dr. Gitta Domik  
Visualisierung  
Computergrafik  
Bildverarbeitung

Bundesministerium  
für Bildung  
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Das Bundesministerium für Bildung und Forschung (bmb+f) ist nicht für den Inhalt dieser Webseite verantwortlich.

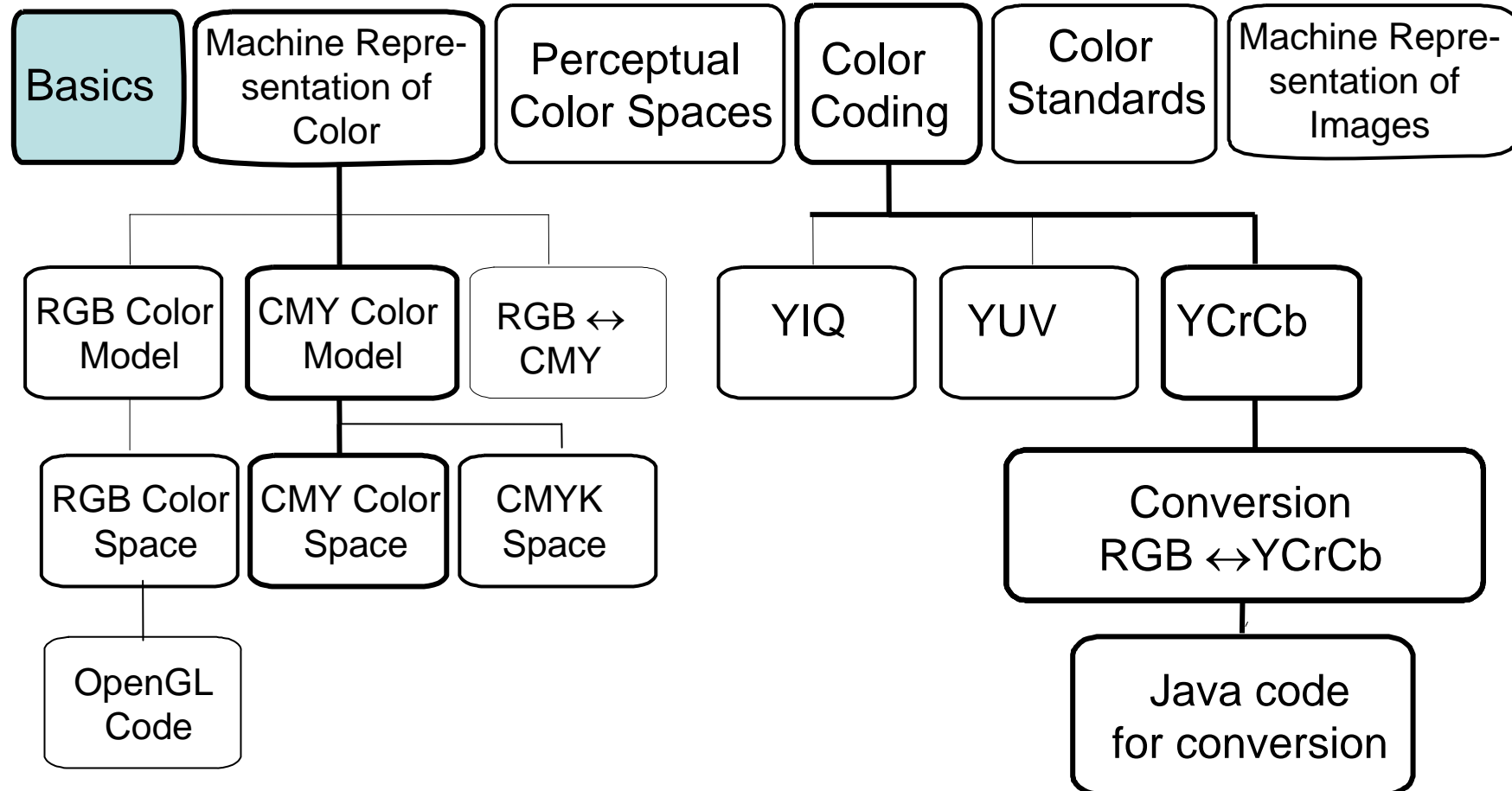
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Webmaster: [graphik@upb.de](mailto:graphik@upb.de) | Letzte Änderung: 15.01.2004

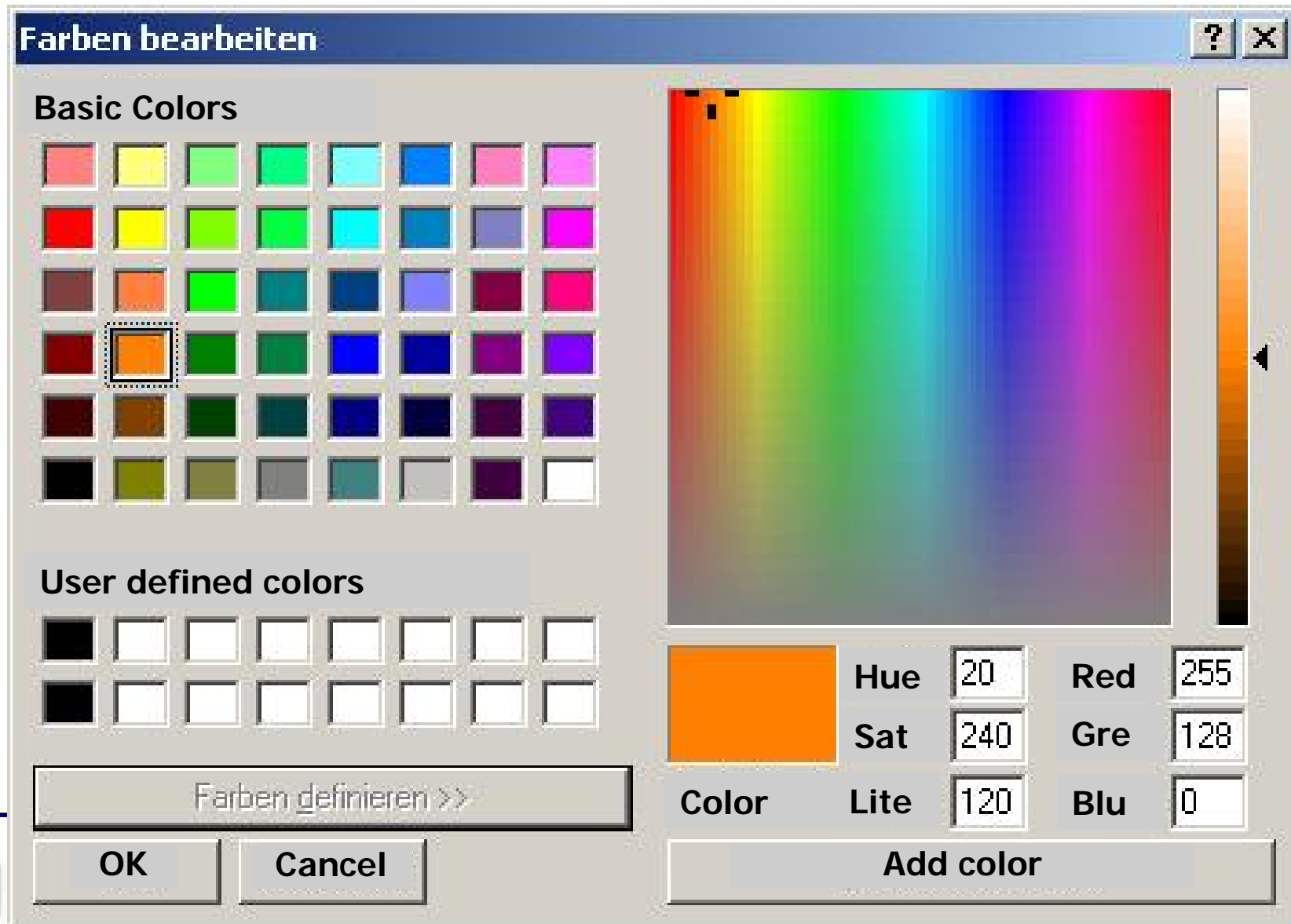
Internet

- Overview
- Breadth-First
- SIMBA
- C & T
- Evaluation
- Summary

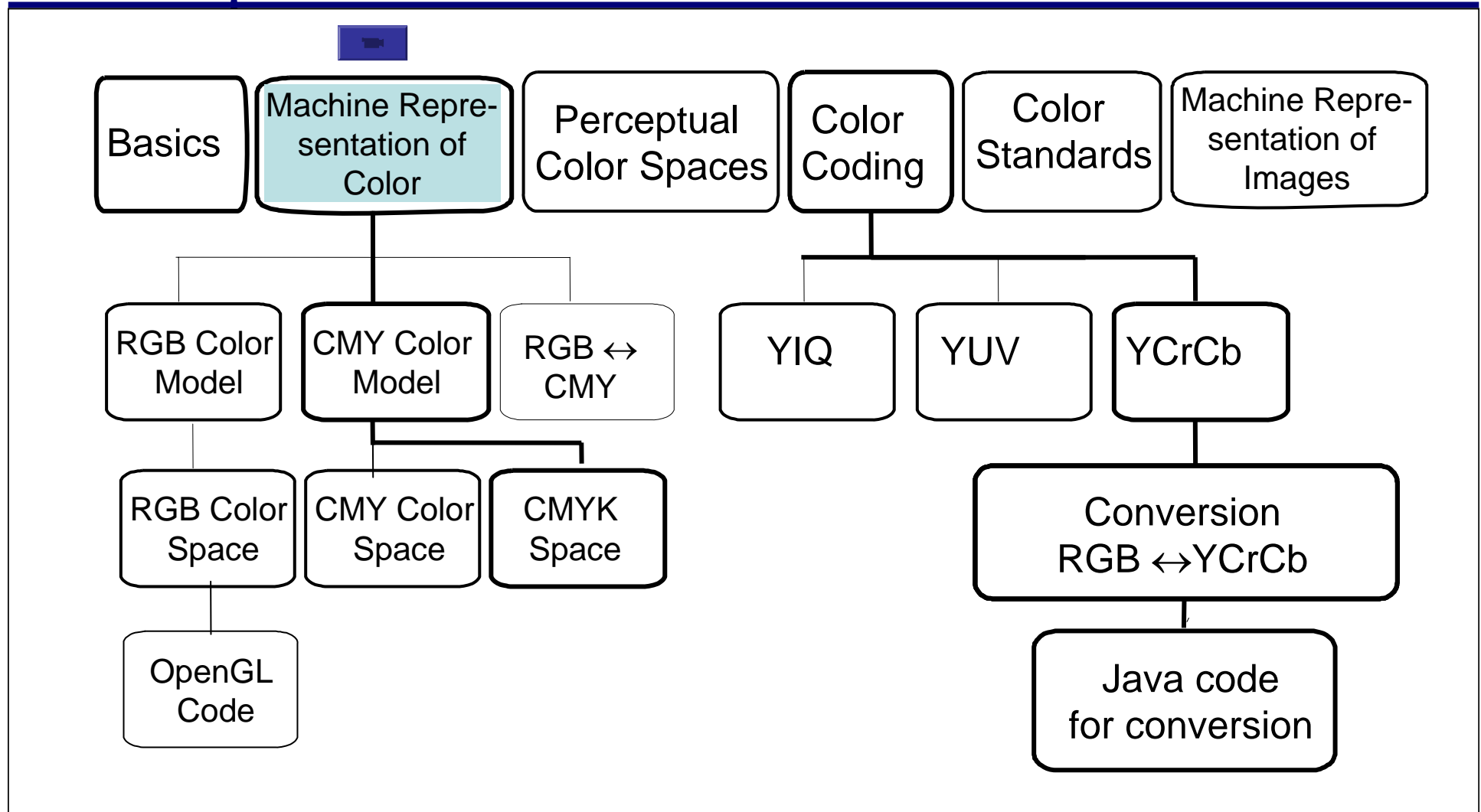
# Computer-generated Color



# Basics

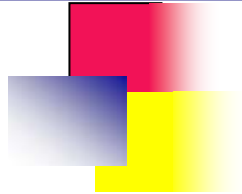


# Computer-generated Color





## Machine Representation of Color



- ❖ Experiment by Mathematician Hermann Grassmann, 1853
- ❖ Color  $\sim a \cdot R + b \cdot G + c \cdot B$  (additive color system)
- ❖ R, G, B ... primary colors
- ❖ a, b, c, ... tristimulus values
- ❖ metamers
- ❖ secondary colors, e.g. Y, M, C

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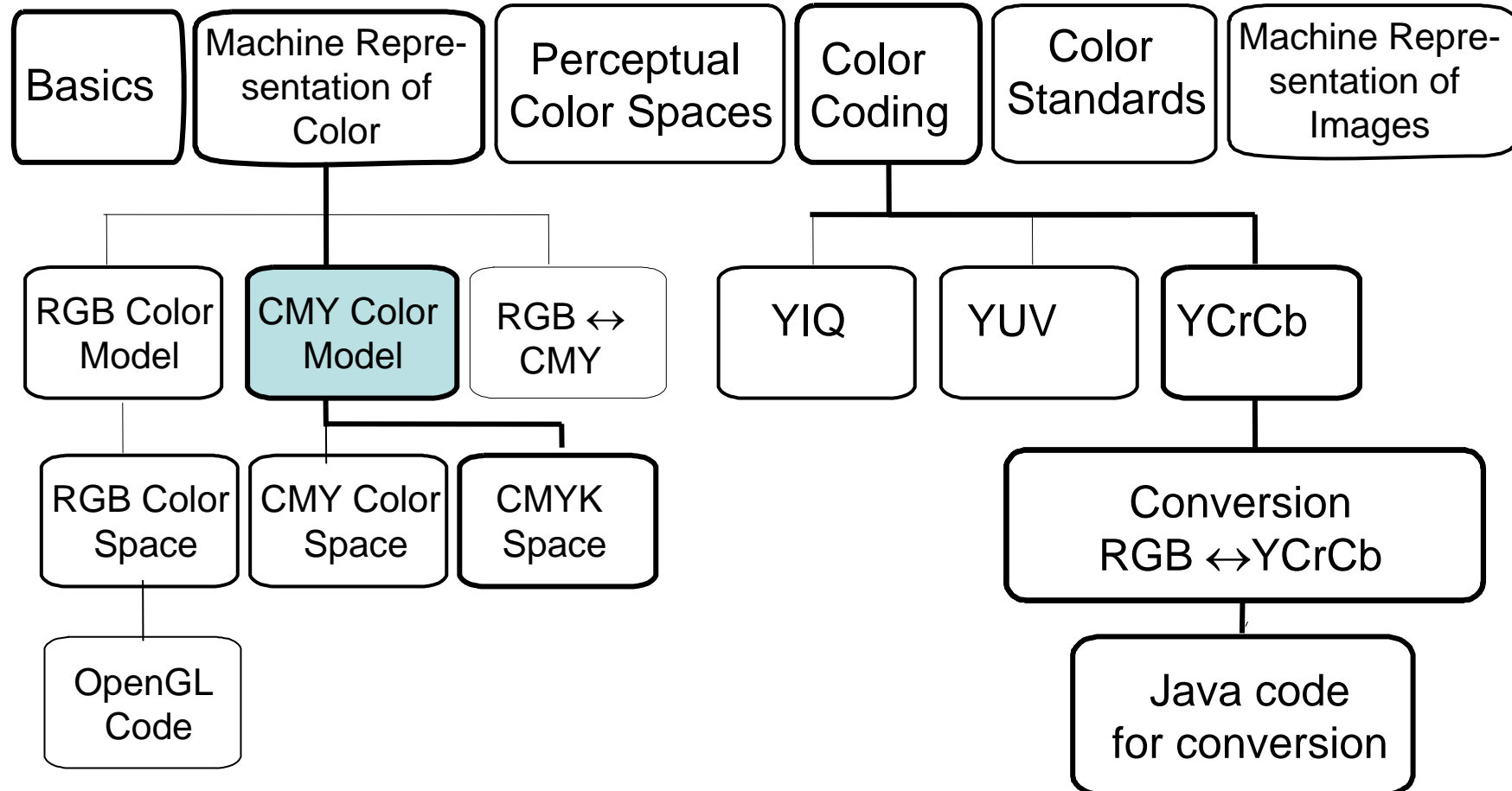
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Evaluation

Summary

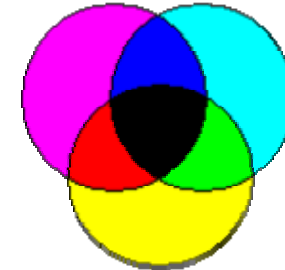


# Computer-generated Color



## 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  $\lambda$ , reflects only short  $\lambda$ .
- ❖ Absorbing process:



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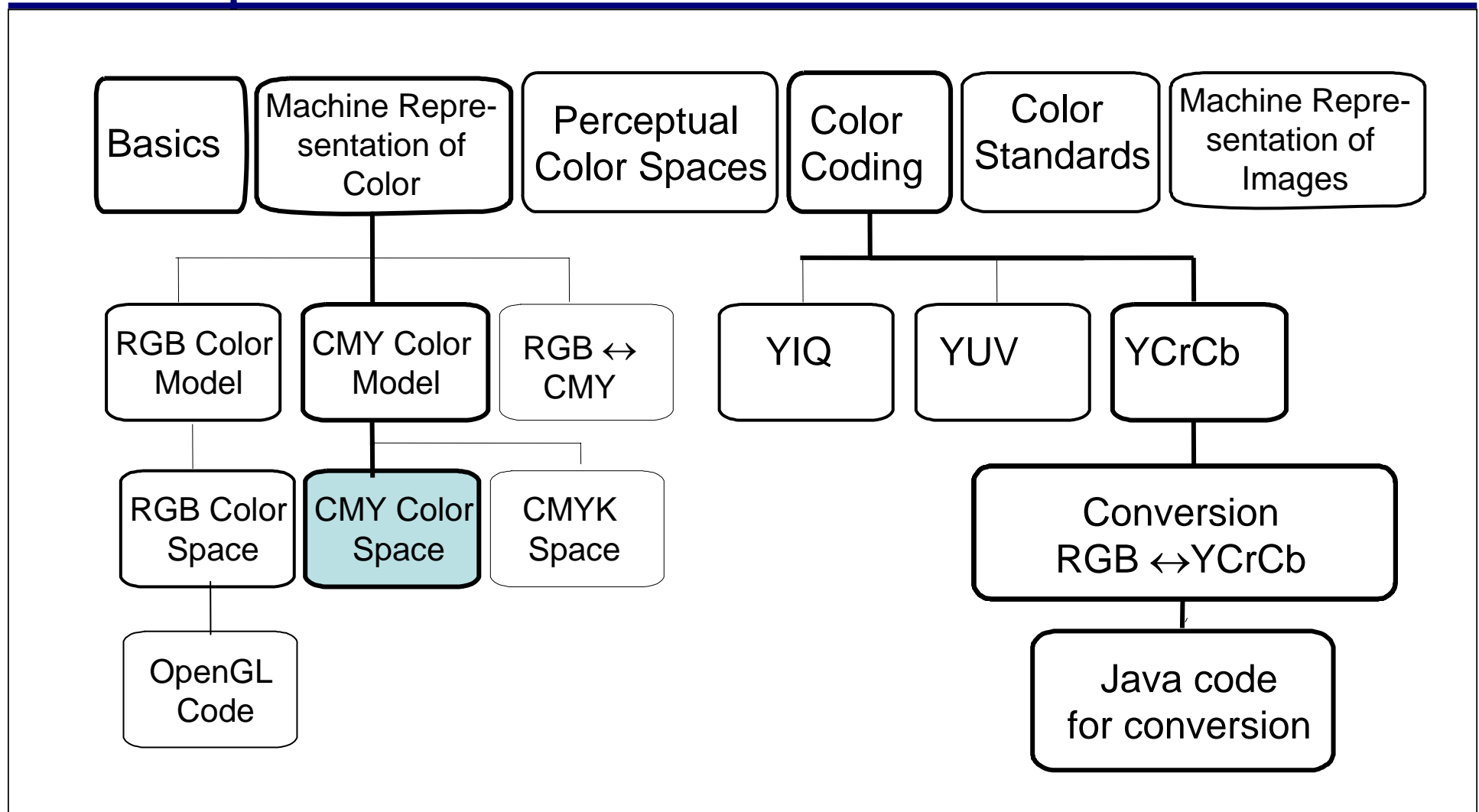
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Summary

CMY Color	Absorbing $\lambda$
Black	all
Cyan	long
Magenta	medium
Yellow	short

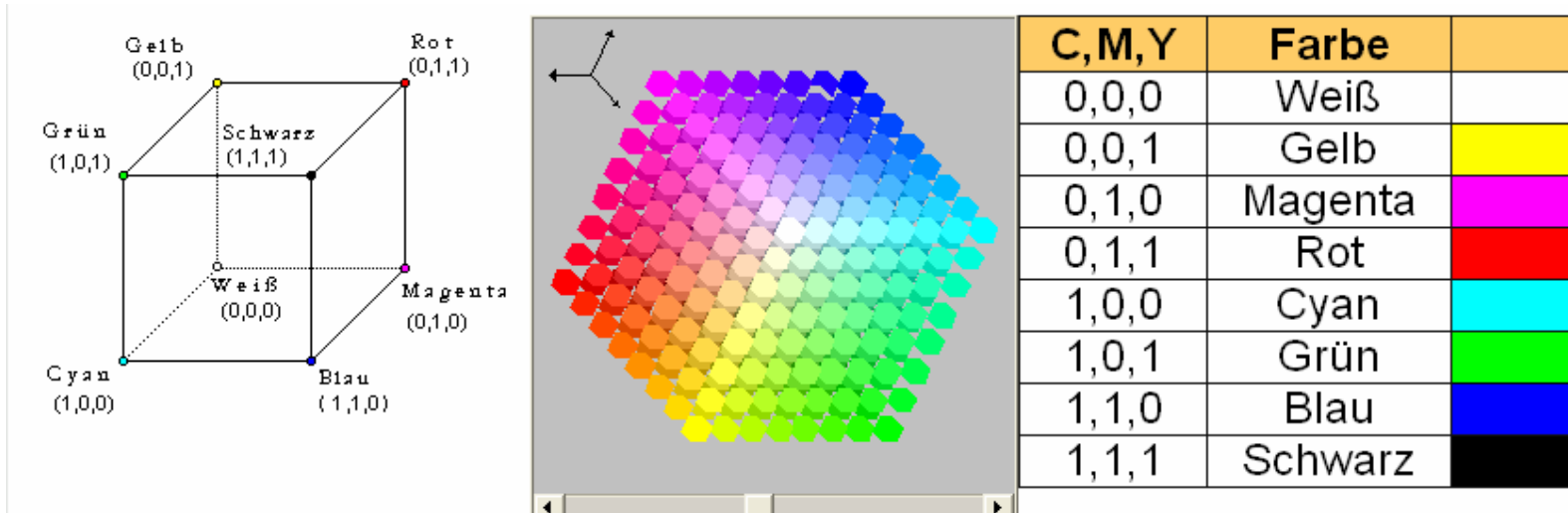


# Computer-generated Color

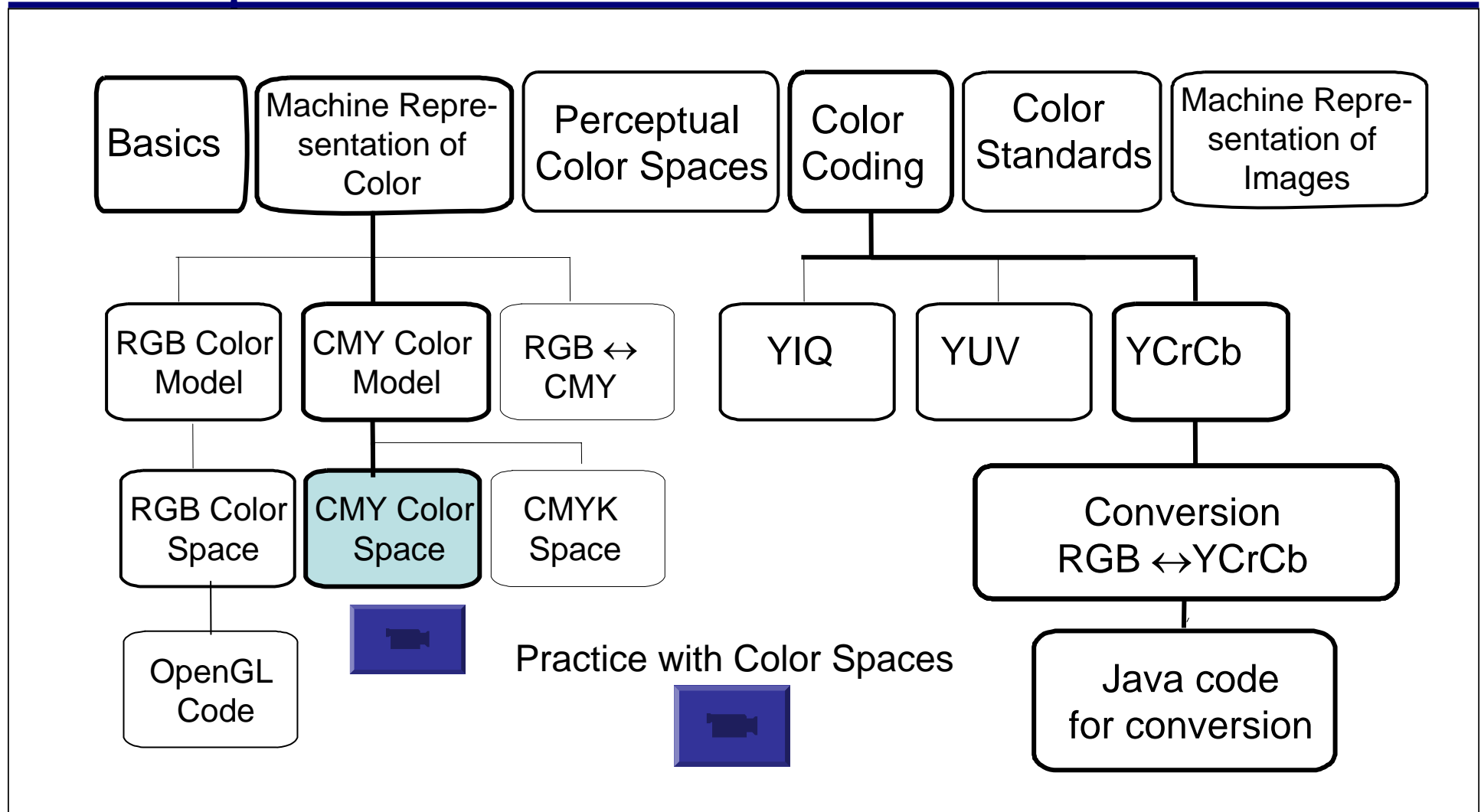


# CMY Color Space

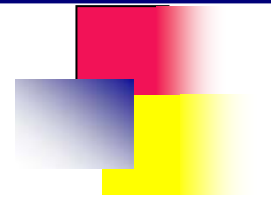
- ❖ CMY Color space is geometric form of subtractive color model
- ❖ Grey values: diagonal white to black
- ❖ Unit cube defines color coordinates



# Computer-generated Color



# Breadth and Depth for Visualization



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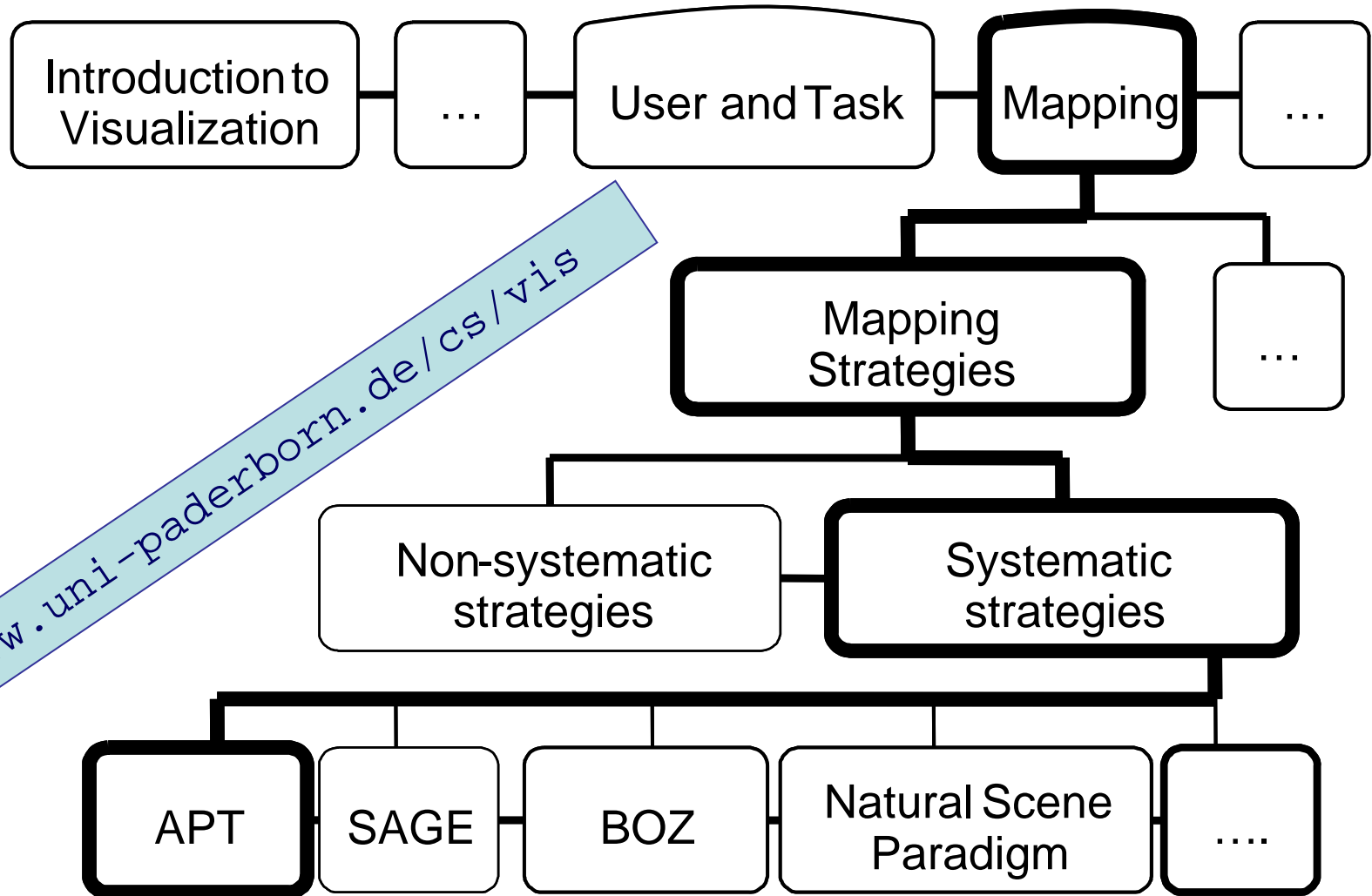
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[www.uni-paderborn.de/cs/vis](http://www.uni-paderborn.de/cs/vis)



# High-Risers in Valley?

Overview

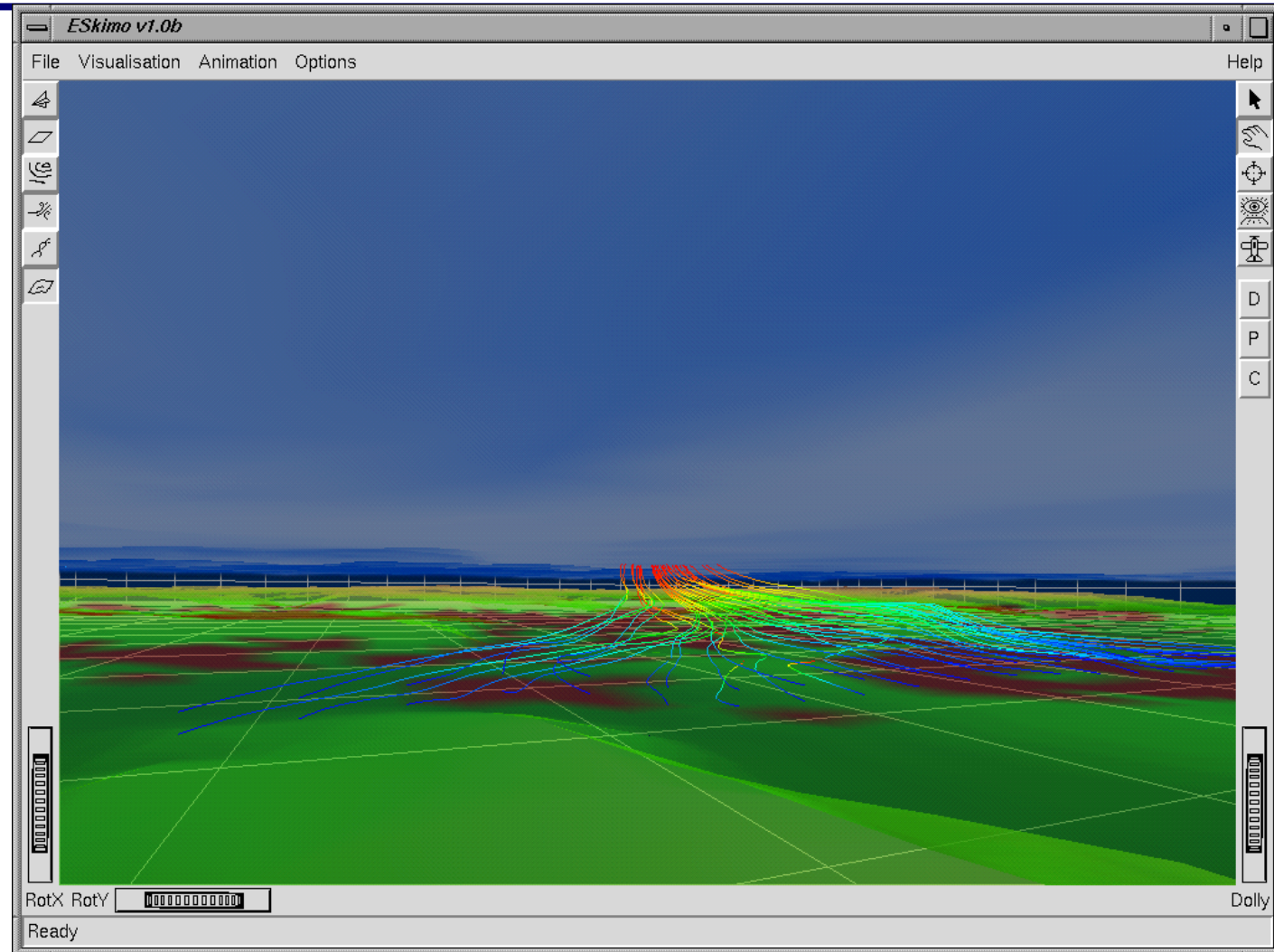
Breadth-First

**SIMBA**

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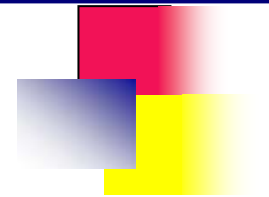
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# Teaching Creativity and Technology - Computer Science students side



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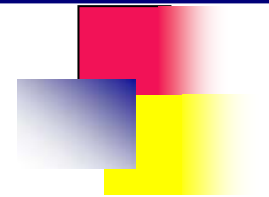
Evaluation

Summary

- 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



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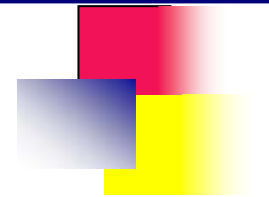
Evaluation

Summary

- 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



Overview

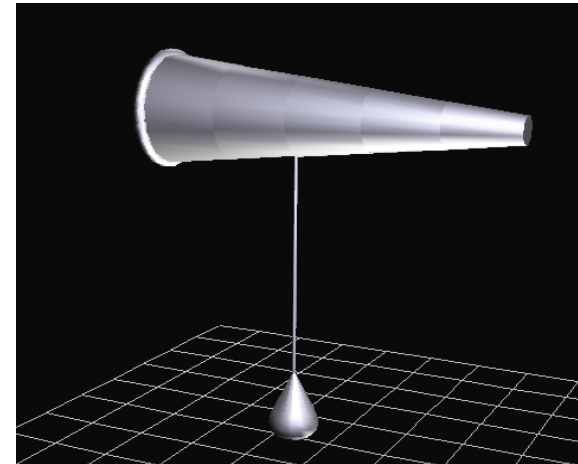
Breadth-First

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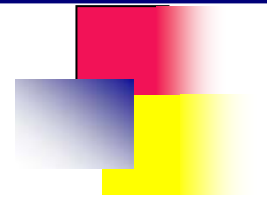
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# Evaluation of Tool SIMBA – (by UniDo)



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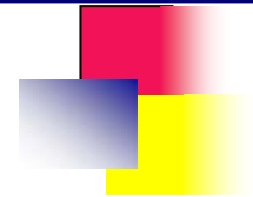
Evaluation

Summary

- 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?“



Overview

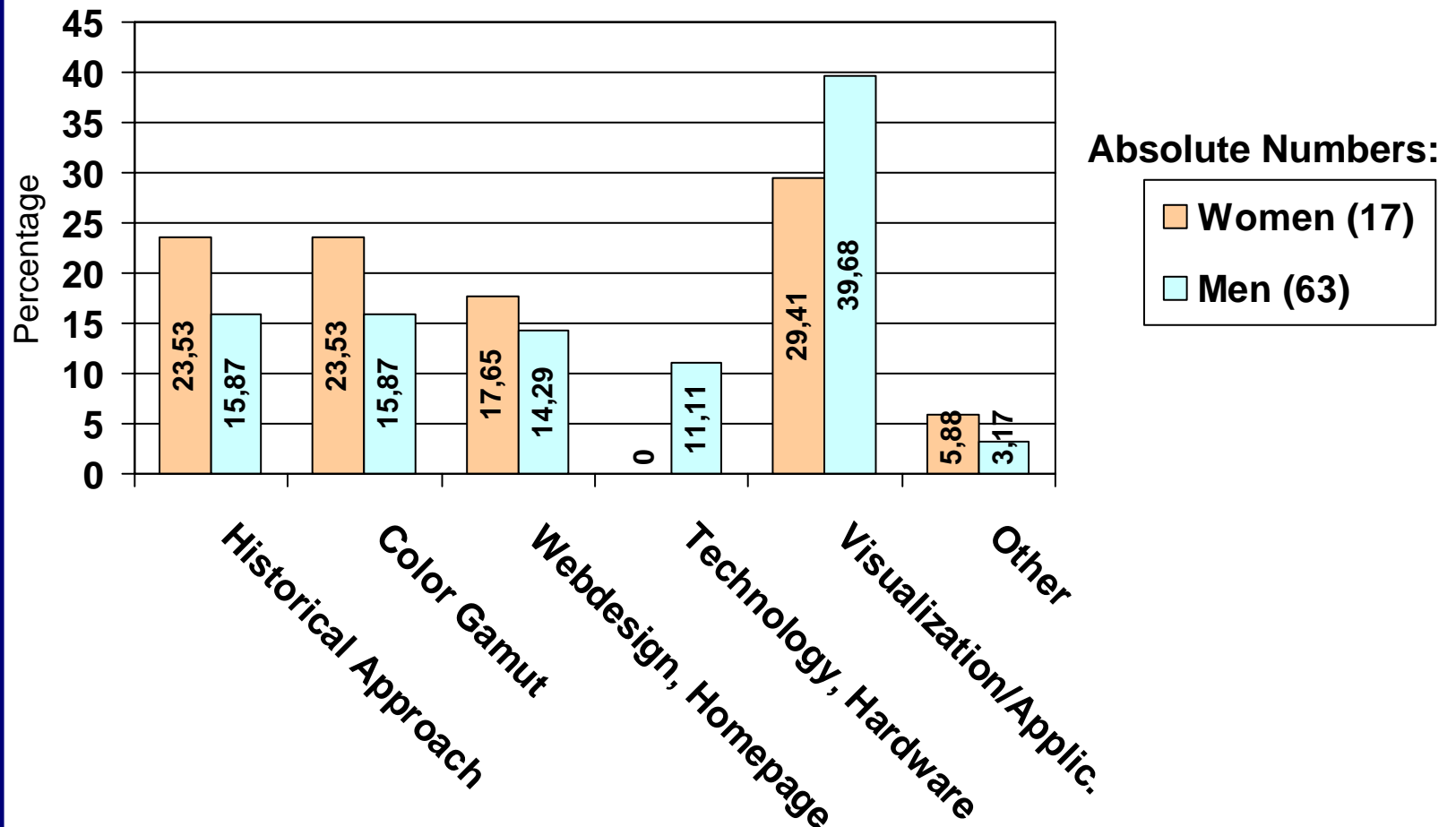
Breadth-First

SIMBA

C & T

Evaluation

Summary



# Conclusions

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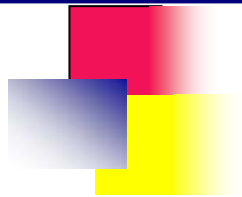
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Evaluation

Summary

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





Overview

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# Thank you for your attention !

