Basics of Image Processing

Károly Erdei

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Károly Erdei — Basics of Image Processing



- 2 ImageProcessing
- 3 GIMP-Basics
- 4 Screenshots
- 5 Cropping
- 6 Scaling

7 Latex





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Image ImageProcessing GIMP-Basics Screenshots Cropping Scaling Latex OpenOffice Image - definitions

Raster image (bitmap) - Vector image

- In computer graphics, a raster graphics image or bitmap:
 - is a data structure representing a generally rectangular grid of pixels, or points of color, viewable via a monitor, paper, etc.
 - raster images are stored in image files with varying formats.
- In computer graphics, a vector graphics:
 - is the use of geometrical primitives (points, lines, curves, and shapes or polygons), which are all based upon mathematical equations, to represent images
- Images may be
 - two-dimensional: a photograph, screen display,
 - three-dimensional: such as a statue.

Image - Characterization

Bitmap image is technically characterized

- by the width and height of the image in pixels
 - giving the resolution of the image
- by the the number of bits per pixel
 - meaning the color depth, which determines the number of colors it can represent.

quality of raster image determinded by resolution and color depth

Color Spaces:

- RGB color space: Red, Green, Blue additive colors
 - color depth: defined by three bytes one byte for each color.
 - standard for computer displays since 1995
- Monochrom space: an image with only black and white pixels
 - requires only a single bit for each pixel.
- others: sRGB, Adobe-RGB, CMYK (printers), etc.
- RAW data by digital SLR cameras always shot in RAW mode



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Image ImageProcessing GIMP-Basics Screenshots Cropping Scaling Latex OpenOffice Image Processing Overview

Image Processing operations are among many other

- Geometric transformations: enlargement, reduction, and rotation
- Color corrections such as
 - brightness and contrast adjustments, quantization, or conversion to a different color space
- Image editing: increase the quality of a digital image

manipulate, enhance, and transform images

- HDR High dynamic range imaging
 - Extending dynamic range by combining differently exposed images

Special Software needed for Digital Image Processing (DIP)

- DIP is done by special software to manipulate images in many ways
 - Adobe Photoshop line
 - GIMP GNU Image Manipulation Program
 - DPP Canon Digital Photo Professional for Canon DSLRs
 - ACDSee more simple application



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GIMP - The Gnu Imaga Manipulation Program Features - I

What is GIMP

- a free raster graphics editor
- to process digital graphics and photographs
 - image composition: creating graphics and logos
 - photo retouching: removing unwanted image features
 - resizing and cropping photos
 - converting between different image formats (very important use)
 - create basic animated images in GIF format
 - altering colors, combining multiple images
- free software replacement for Adobe Photoshop
 - it is not designed to be a Photoshop clone
- the project was started in 1995
- current version (2.6) works with numerous OS:
 - Linux, Microsoft Windows, Apple's Mac OS X, OpenSolaris, FreeBSD

Image ImageProcessing GIMP-Basics Screenshots Cropping Scaling Latex OpenOffice GIMP - The Gnu Imaga Manipulation Program

Features - II

Effects and filters and formats

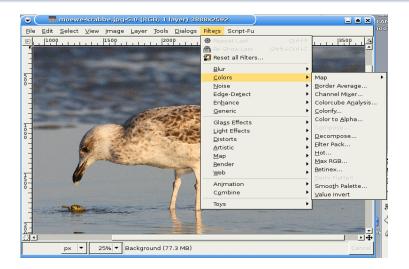
- GIMP has approximately 150 standard effects and filters
 - Drop Shadow, Blur, Motion blur and Noise.
 - operations can be automated with scripting languages
 - Scheme (LISP) interpreter named Script-Fu is built in
 - external Perl, Python, or Tcl can be used
- File formats (read and write)
 - BMP, JPEG, PNG, GIF, TIFF
 - Autodesk flic animations, Corel Paint Shop Pro images
 - Adobe Photoshop Documents, PostScript documents
- File formats (read only)
 - Adobe PDF documents
 - raw image formats used by many digital cameras

Starting GIMP Version 2.2.13 in Debian Etch



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General requirements

- make a snapshot from a window or from the full screen or from a region of the screen
- set a delay to prepare effects on the screen/window
- convert output to different formats

Software for generating screenshots

- gnome-screenshot
 - basic functions, command line parameters, lightweight
- ksnapshot
 - very professional, all requirements implemented
 - this is a screenshot generator only
- GIMP
 - very usable, all necessary functions available
 - DIP program !

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Screenshot with ksnapshot

Starting ksnapshot

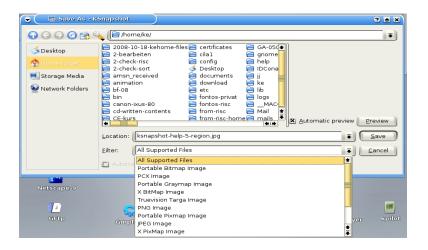
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Screenshot with ksnapshot

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Screenshot with ksnapshot

Output format filter



Screenshot with ksnapshot Help page

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The mini command line (invoked with Alt+F2) may also be used to start KSnapshot

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Screenshot with GIMP

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Screenshot with GIMP How to get menu lists by aquire



Full screen snapshot



Full screen shot - filetypes

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Image ImageProcessing GIMP-Basics Screenshots Cropping Scaling Latex OpenOffice Cropping - filetypes

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Cropping - filetypes



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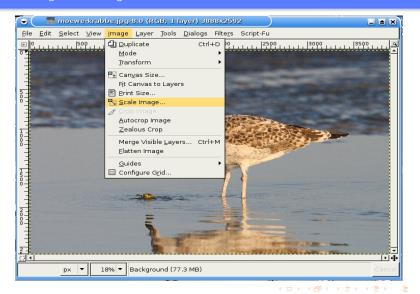


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Scaling in GIMP

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Scaling in GIMP Image - Scale Image



Scaling in GIMP

Window for new dimensions

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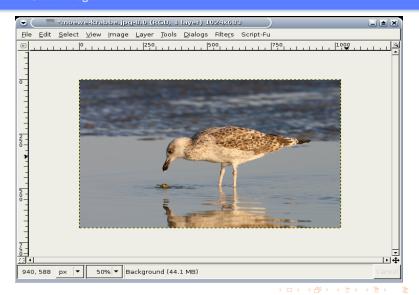
Scaling in GIMP

Set new dimensions

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Scaling in GIMP Scaled image





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How to include graphics in Latex

Using Latex you can include only .eps graphics (example.tex)

\documentclass{article}
\usepackage{graphicx}
\includegraphics[height=4in]{graphic.eps}
\end{document}

compile it by latex example.tex

Using PdfLatex you can include png, pdf, jpg, files (pdf-example.tex)

\documentclass{article}
\usepackage[pdftex]{graphicx}
\includegraphics[height=4in]{emtex.pdf}
\end{document}

compile it by pdflatex pdf-example.tex

Includegraphics Details The full command structure

Full command

\includegraphics [key=value,...]{file}

- the optional parameter accepts comma separated list of keys with associated values
- the keys can by used to change the width, height and rotation of the included graphics
- **file** is the graphics. The type may be .eps only using **latex**
- **file** is the graphics. The type may be: .png, .pdf, .jpg using **pdflatex**
- the most important keys:
 - width: scale graphics to the specified width
 - heigth: scale graphics to the specified heigth
 - angle: rotate graphics counterclockwise
 - scale: scale graphics

Image ImageProcessing GIMP-Basics Screenshots Cropping Scaling Latex OpenOffice Includegraphics Details

File conversion and Compatibility

- programs to convert graphics formats:
 - epstopdf
 - GIMP

For compatibility between latex and pdflatex:

- do NOT use file extensions in the file parameter
- create the appropriate versions of the graphics in the directory
- latex will look for .eps files
- pdflatex will look for .png, .pdf, .jpg files in this order !

Includegraphics Examples

Parameters for includegraphics

\includegraphics{sample0_a.pdf}
 - will use the graphics as it is
\includegraphics[scale=0.7]{sample0_a.pdf}
 - scales the inserted PDF image by factor 0.7
\includegraphics[width=12.5cm]{sample0_a.pdf}
 - will show the image transformed to width 12.5 cm
\includegraphics[height=4in]{sample0_a.pdf}
 - textwidth is the width of a standard paragraph
\includegraphics[height=0.65\textwidth]{sample0_a.pdf}
\includegraphics[width=.9\columnwidth,bb=67 385 525 742]{cpu.eps}
\includegraphics[angle=90,width=\columnwidth]{arch.eps}



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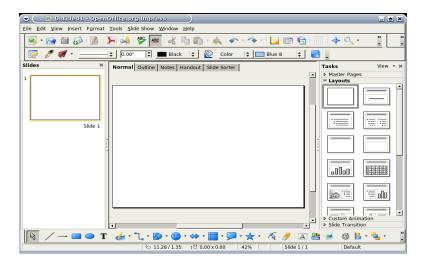
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Insert images in OpenOffice

Start new presentation



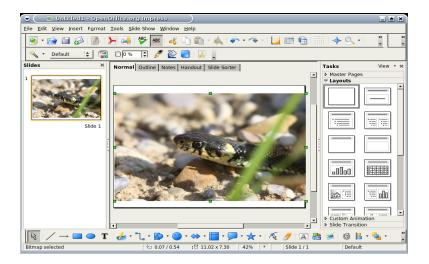
Insert images in OpenOffice

Insert image in the slide

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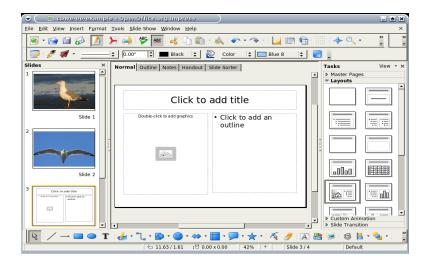
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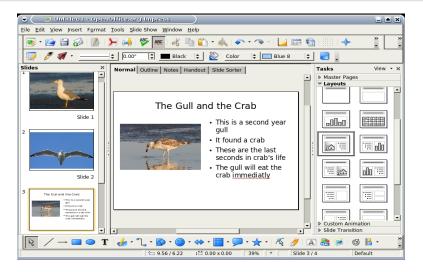
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Insert images in OpenOffice Use layouts



Insert images in OpenOffice

Layout filled with image and text



End of Basics of Image Processing

Thanks for your attention !