Basics of Image Processing

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1 Image

2 ImageProcessing

3 GIMP-Basics

4 Screenshots

5 Cropping

6 Scaling

7 Latex

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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 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

GIMP - The Gnu Imaga Manipulation Program

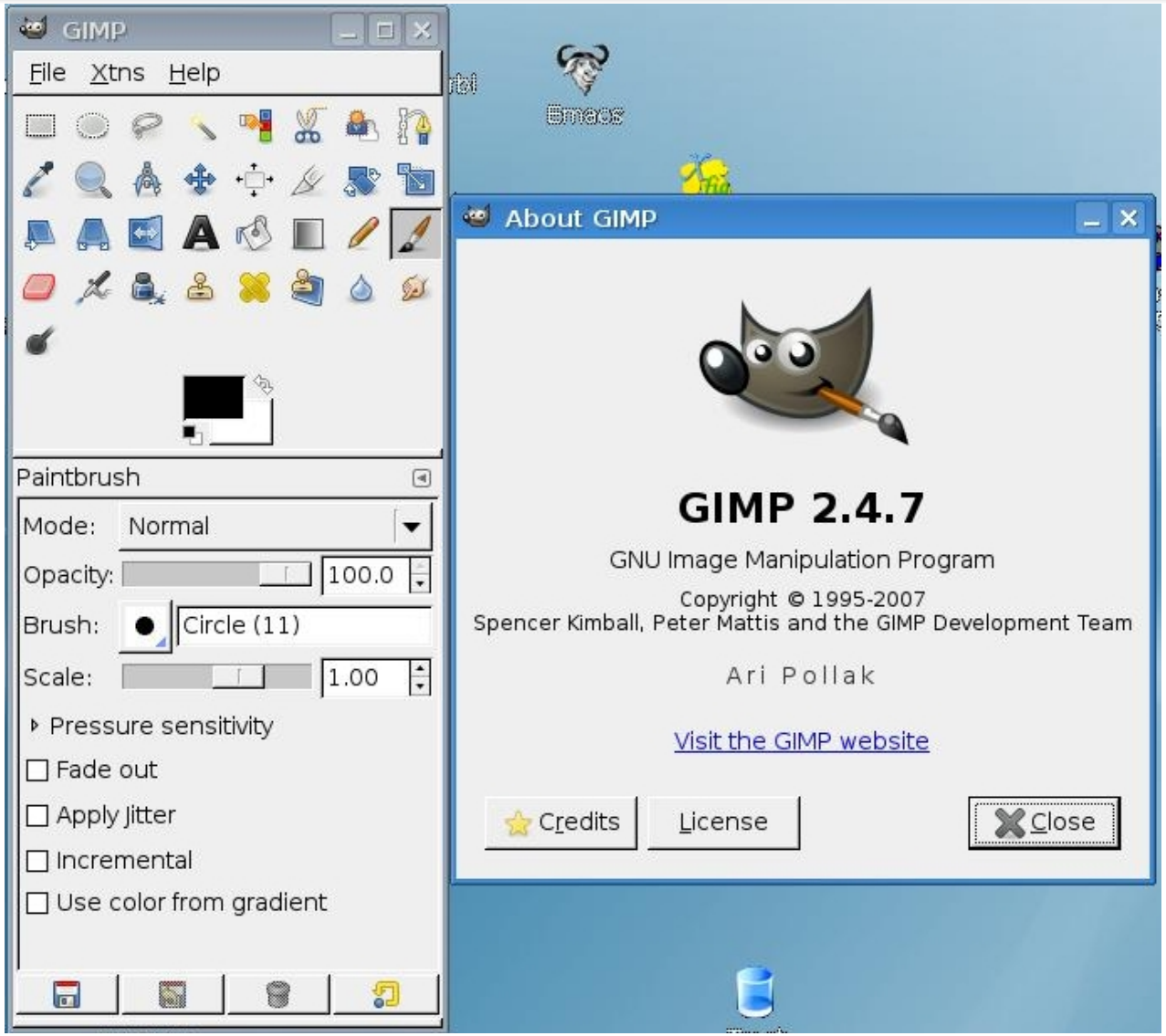
Features - II

Effects and filters and formats

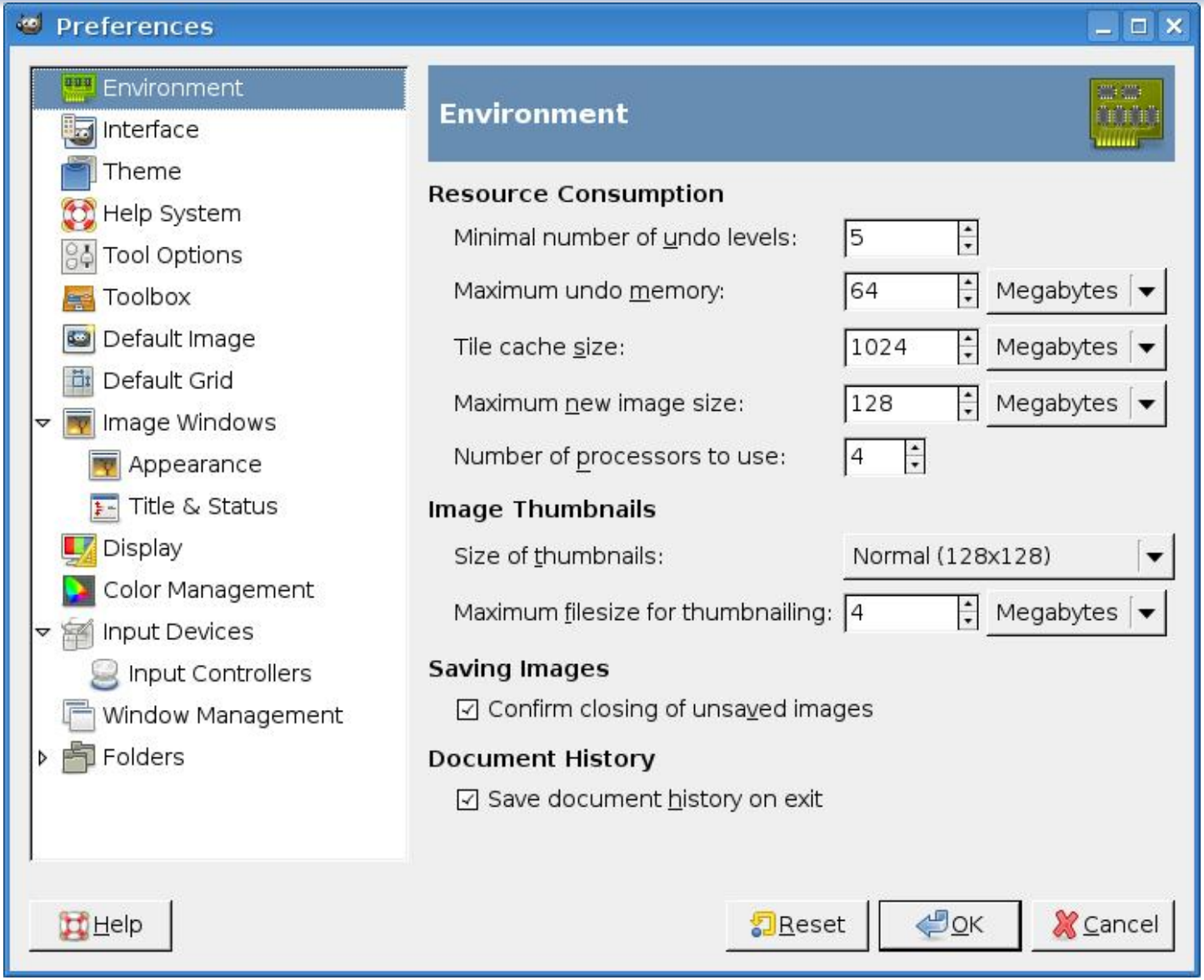
- GIMP has approximately 150 standard effects and filters
  - Drop Shadow, Blur, Motion blur and Noise.
  - operations can be automated with scripting languages
  - Scheme (LISP) interpreter named Script-Fu is built in
  - external Perl, Python, or Tcl can be used
- File formats (read and write)
  - 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

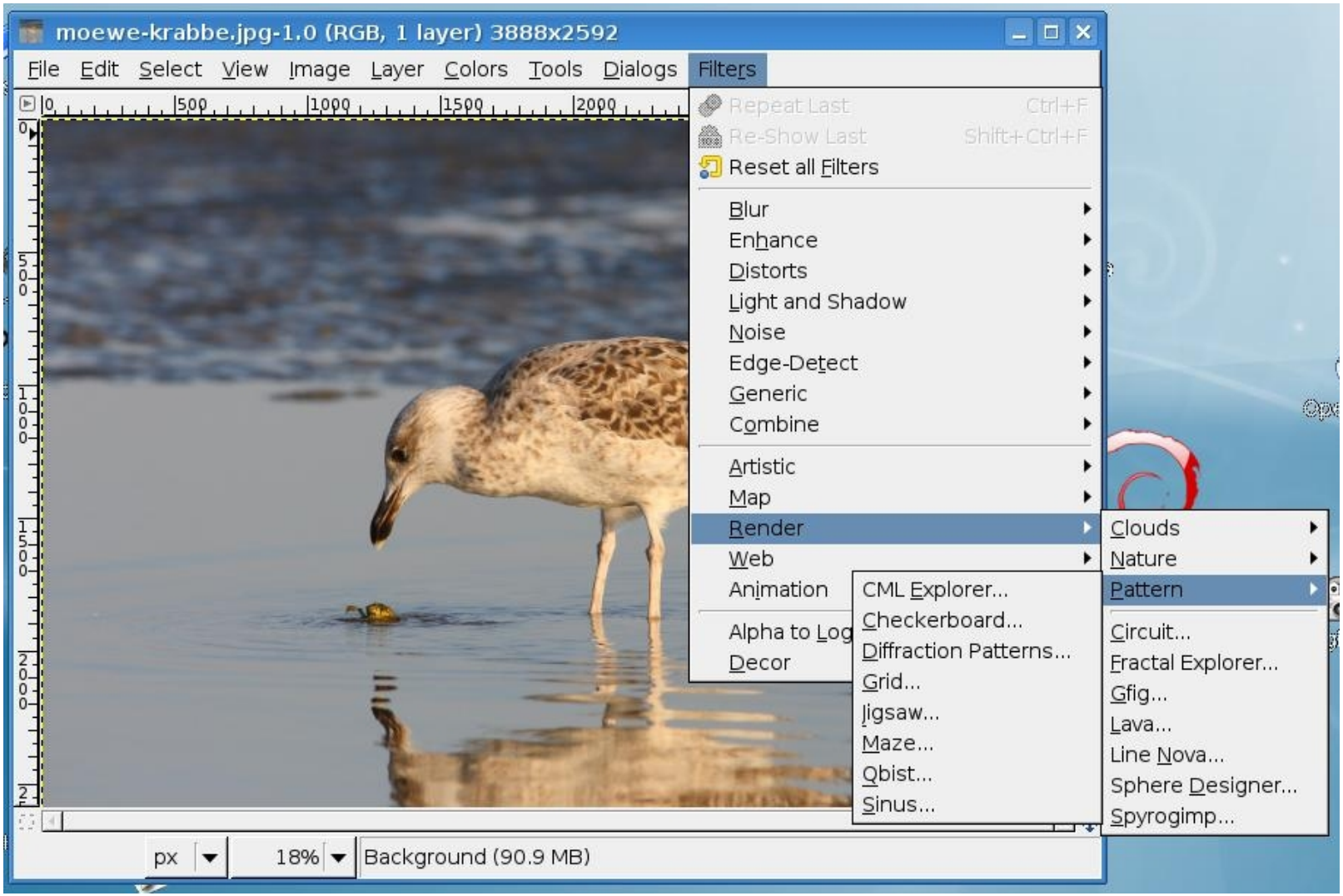
Version 2.4.7 in Debian Lenny



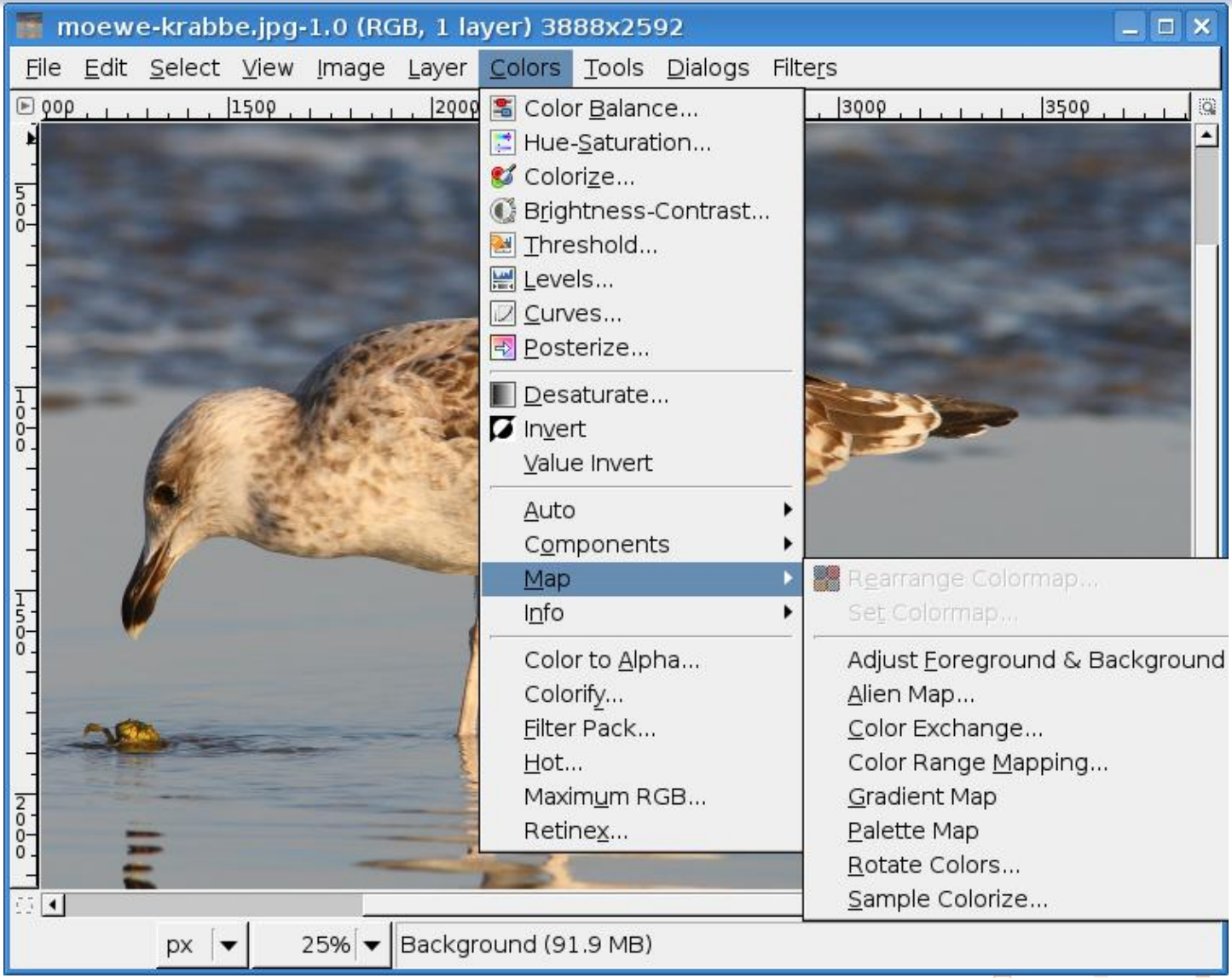
GIMP Preferences



GIMP - Filters



GIMP - Colors


moewe-krabbe.jpg-1.0 (RGB, 1 layer) 3888x2592
File Edit Select View Image Layer Colors Tools Dialogs Filters
Color Balance...
Hue-Saturation...
Colorize...
Brightness-Contrast...
Threshold...
Levels...
Curves...
Posterize...
Desaturate...
Invert
Value Invert
Auto
Components
Map
Info
Color to Alpha...
Colorify...
Filter Pack...
Hot...
Maximum RGB...
Retinex...
Rearrange Colormap...
Set Colormap...
Adjust Foreground & Background
Alien Map...
Color Exchange...
Color Range Mapping...
Gradient Map
Palette Map
Rotate Colors...
Sample Colorize...
px
25%
Background (91.9 MB)

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Screenshot

General requirements

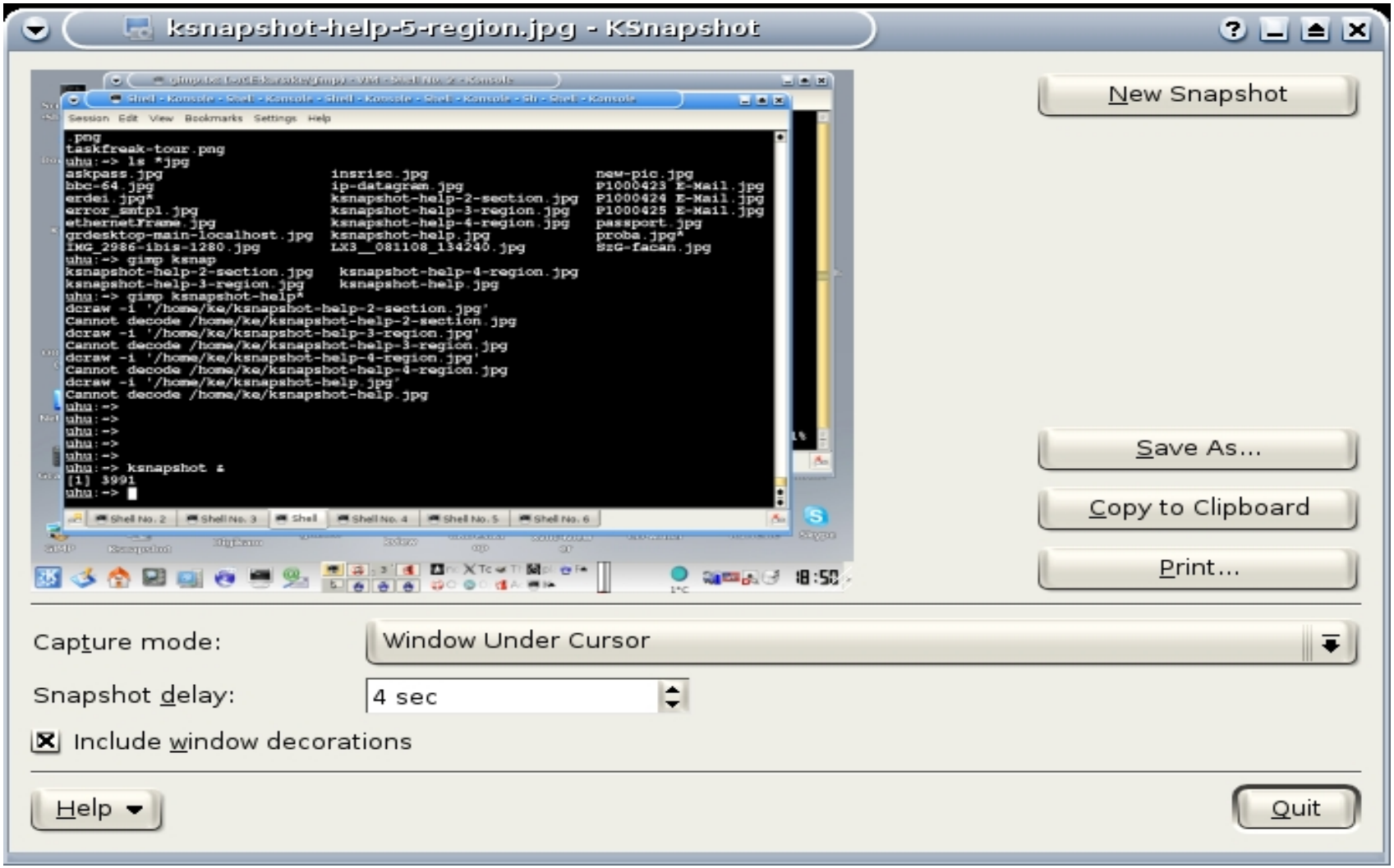
- make a snapshot from a window or from the full screen or from a region of the screen
- set a delay to prepare effects on the screen/window
- convert output to different formats

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 !

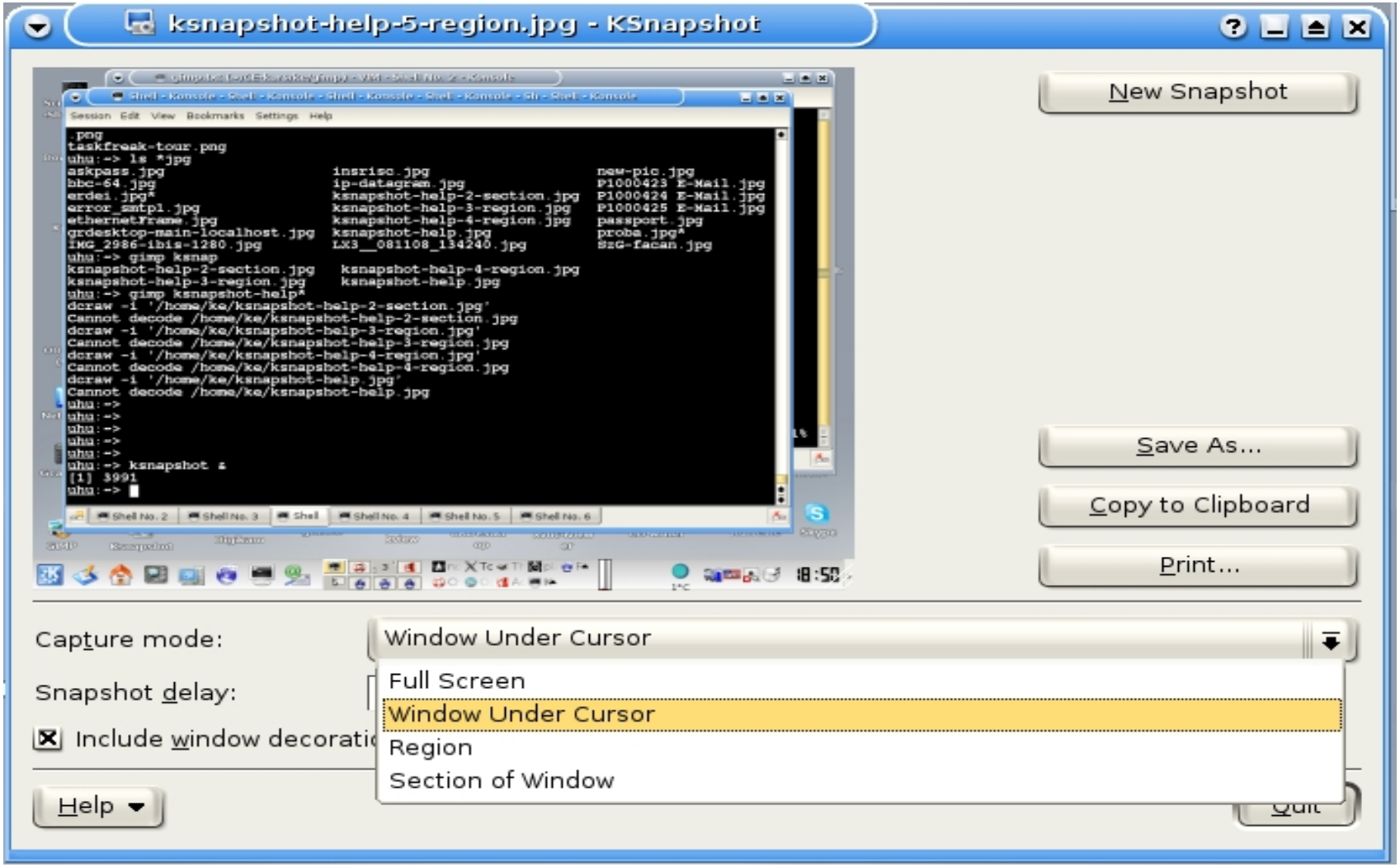
Screenshot with ksnapshot

Starting ksnapshot



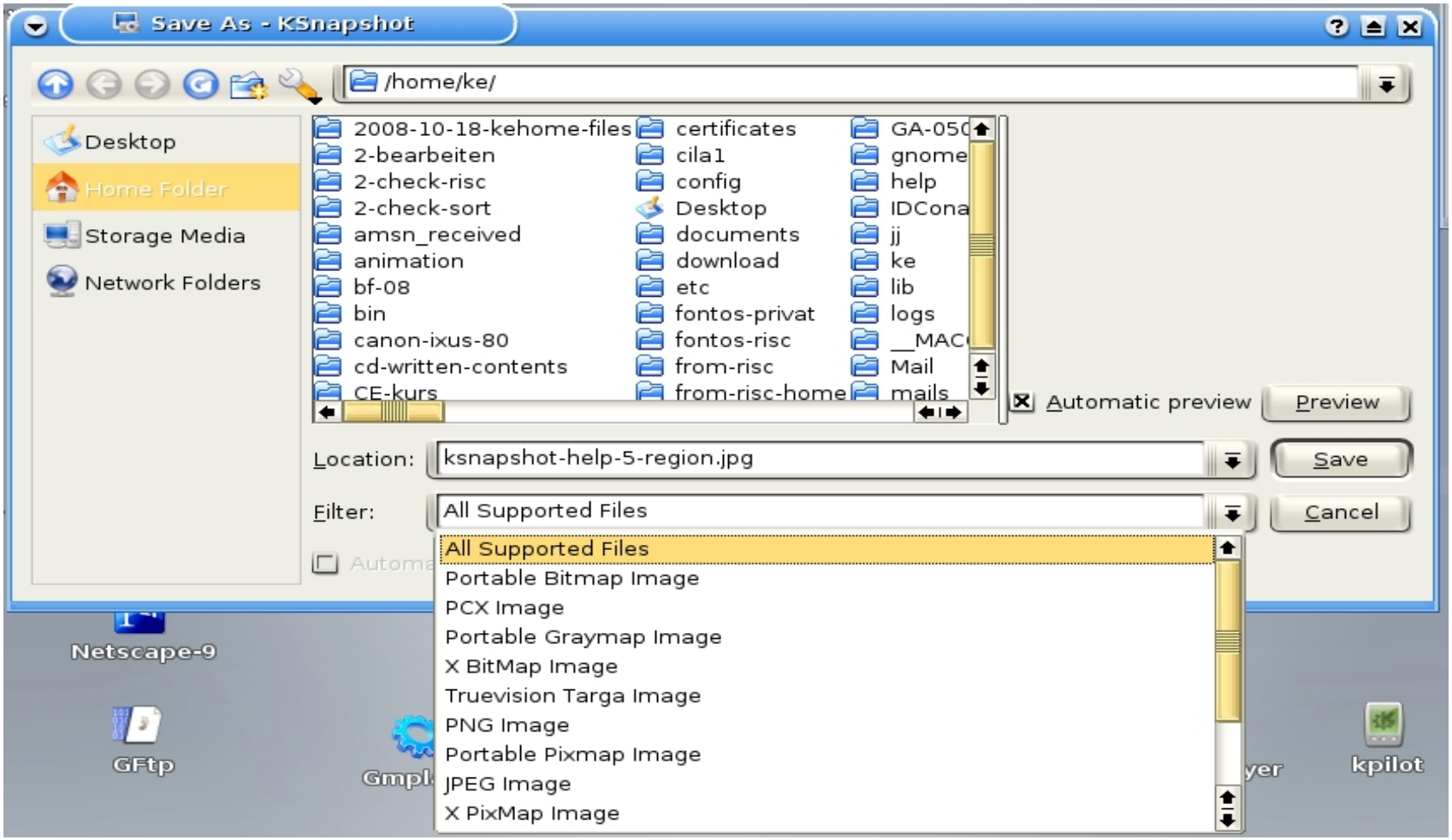
Screenshot with ksnapshot

Capture mode



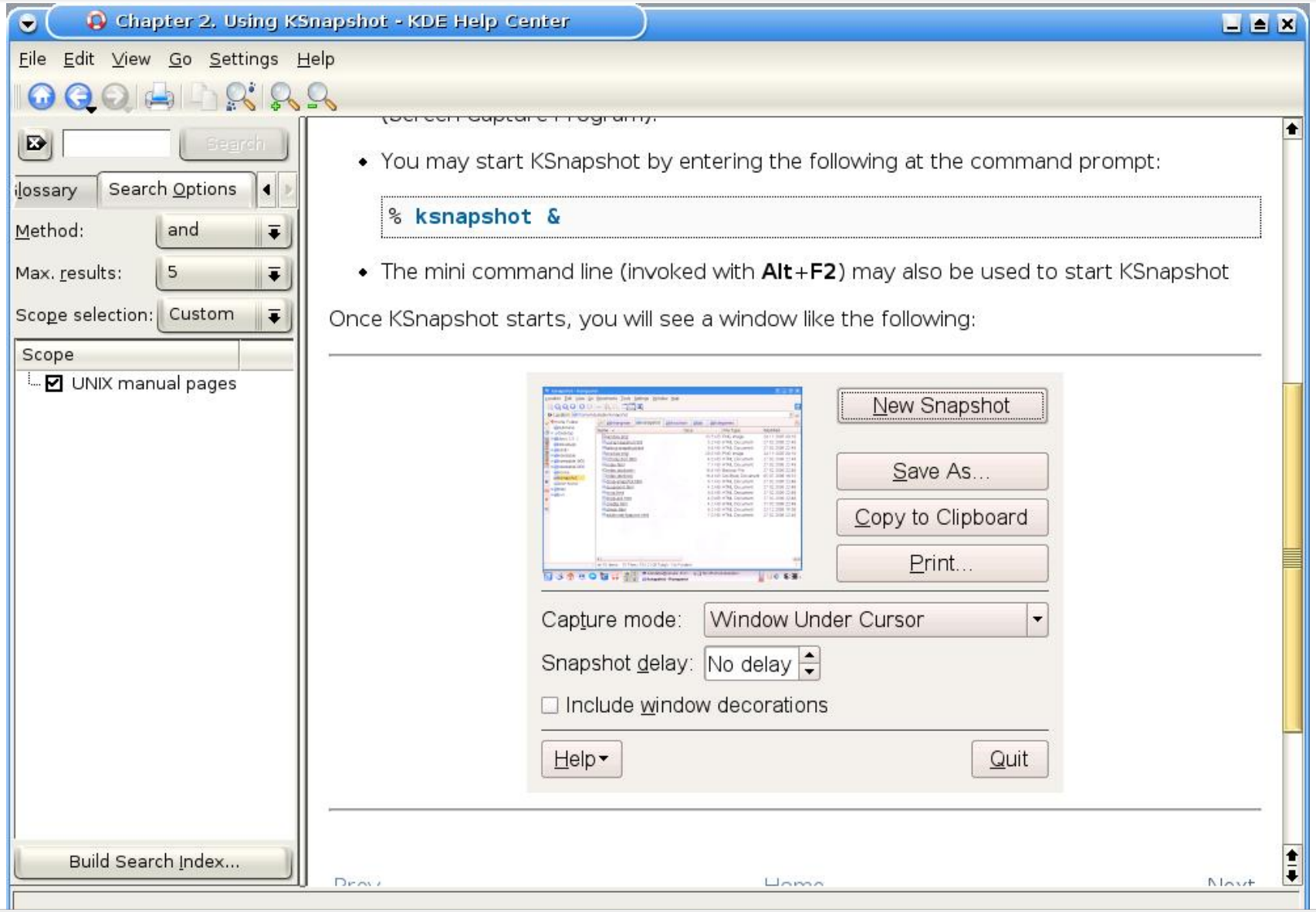
Screenshot with ksnapshot

Output format filter



Screenshot with ksnapshot

Help page



ksnapshot - help - section

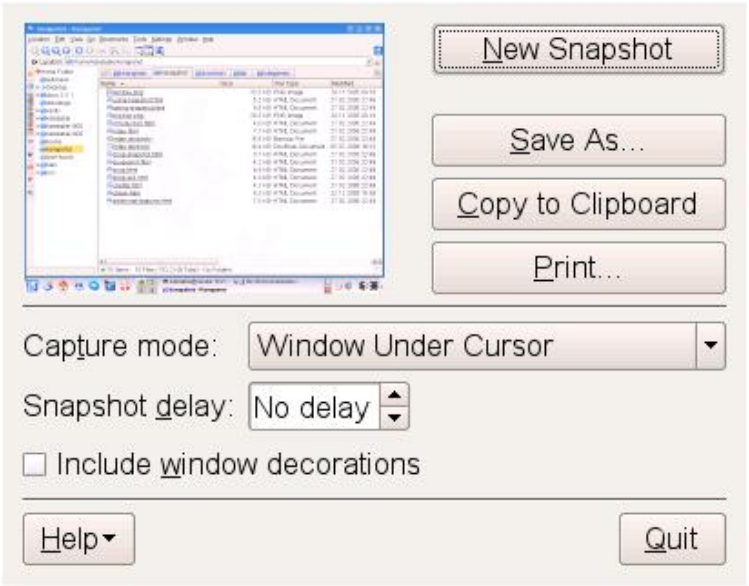
Window section screen shot

- You may start KSnapshot by entering the following at the command prompt:

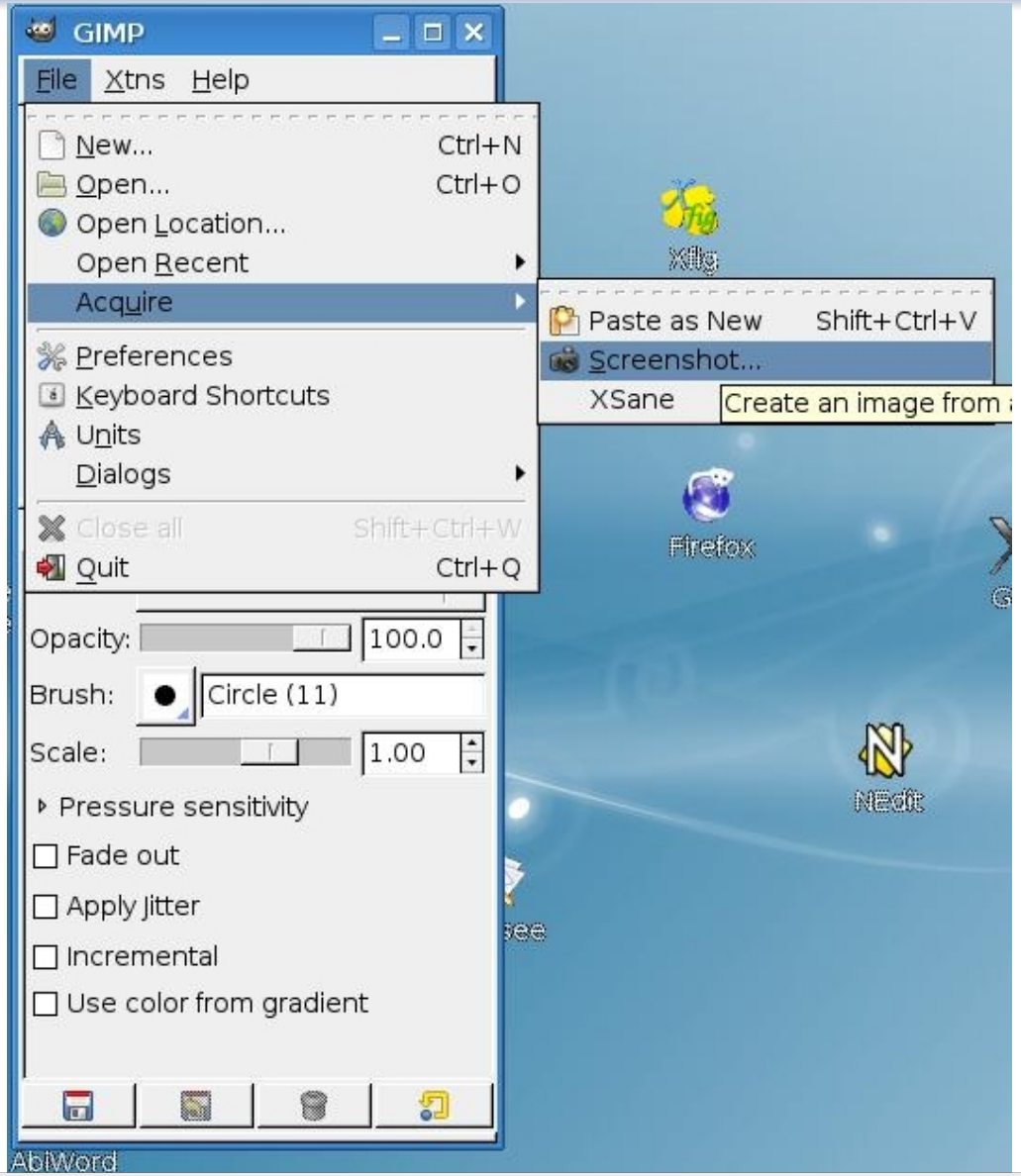
```
% ksnapshot &
```

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

Once KSnapshot starts, you will see a window like the following:

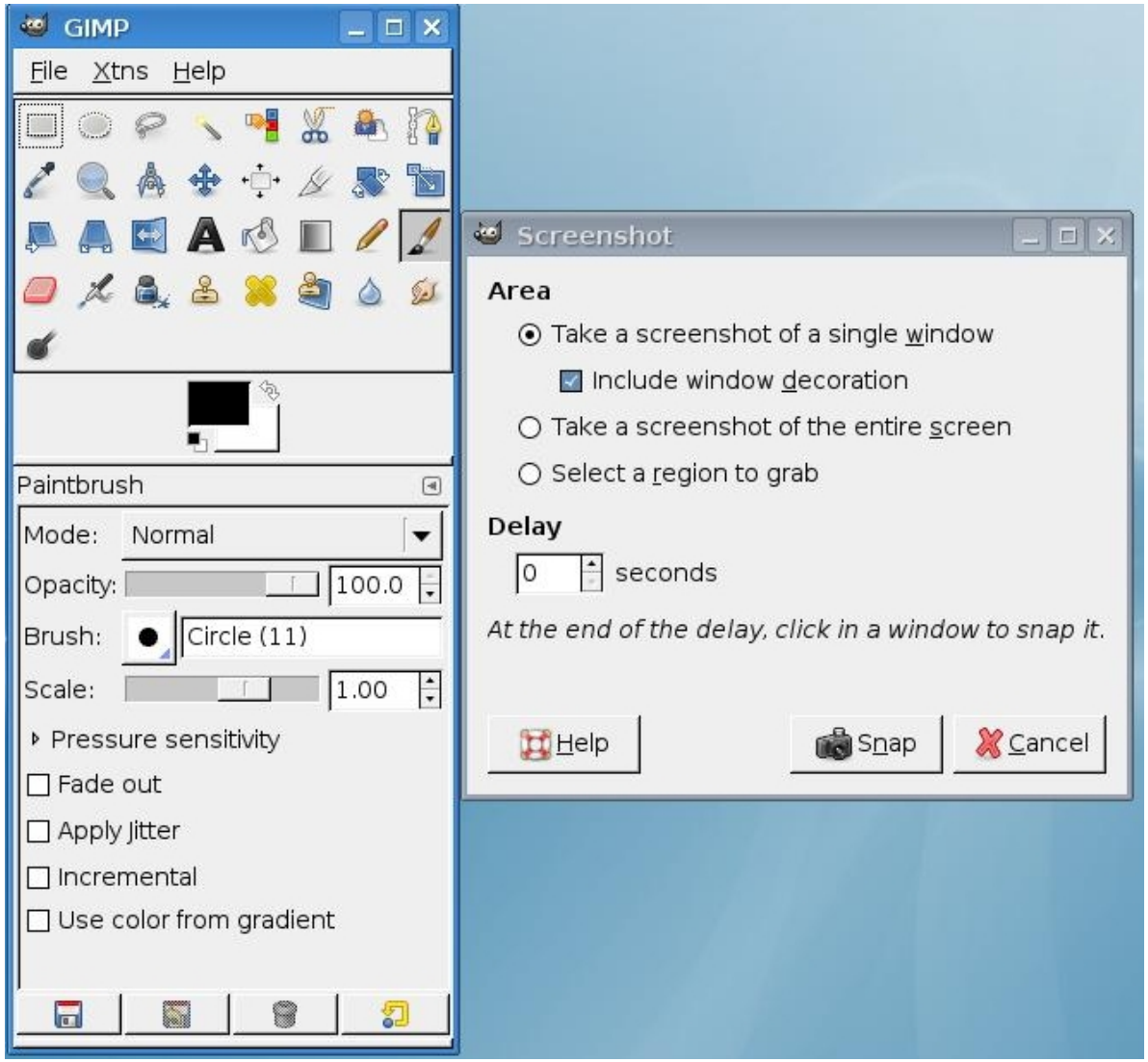


Screenshot with GIMP

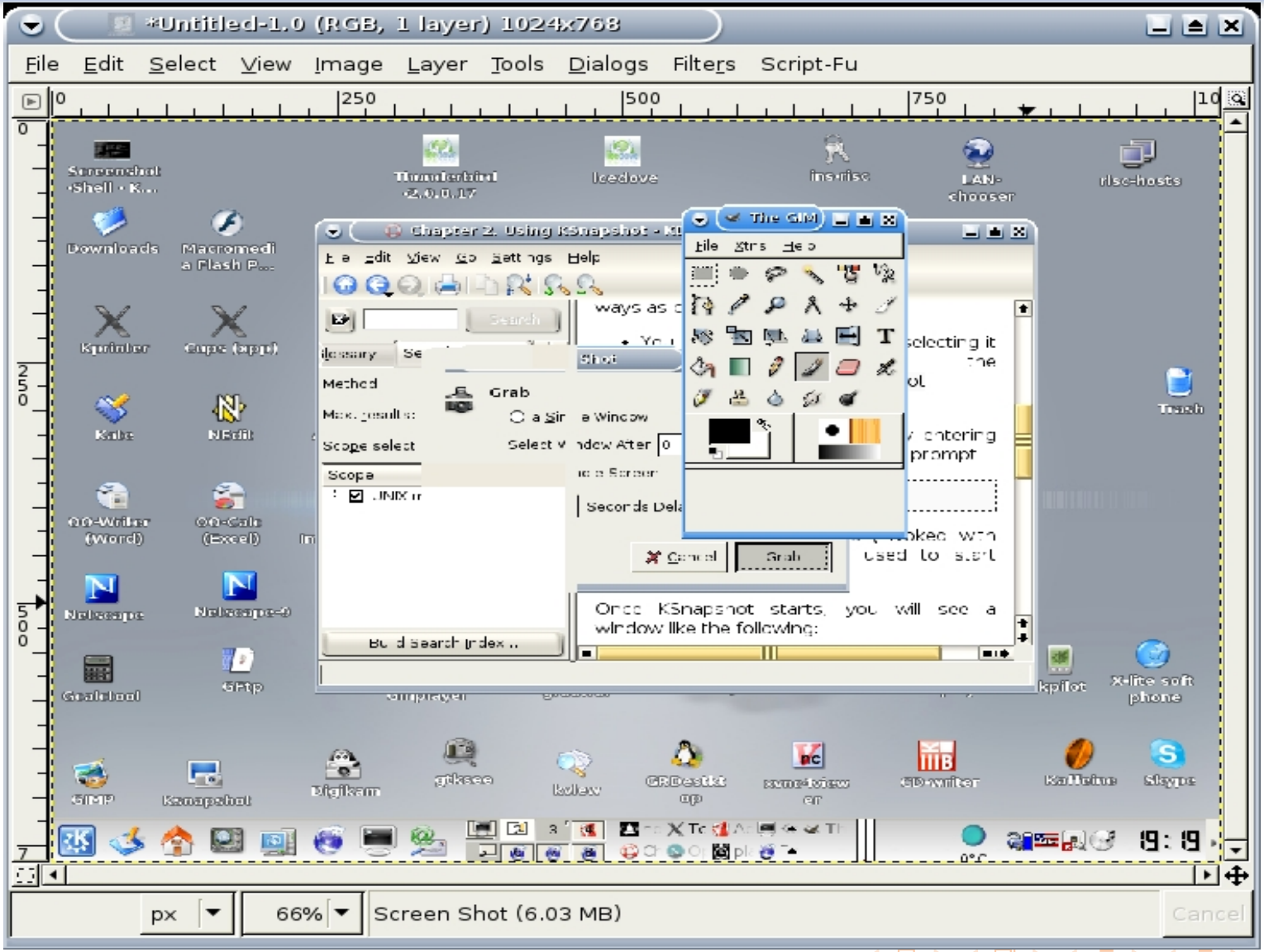


Screenshot with GIMP

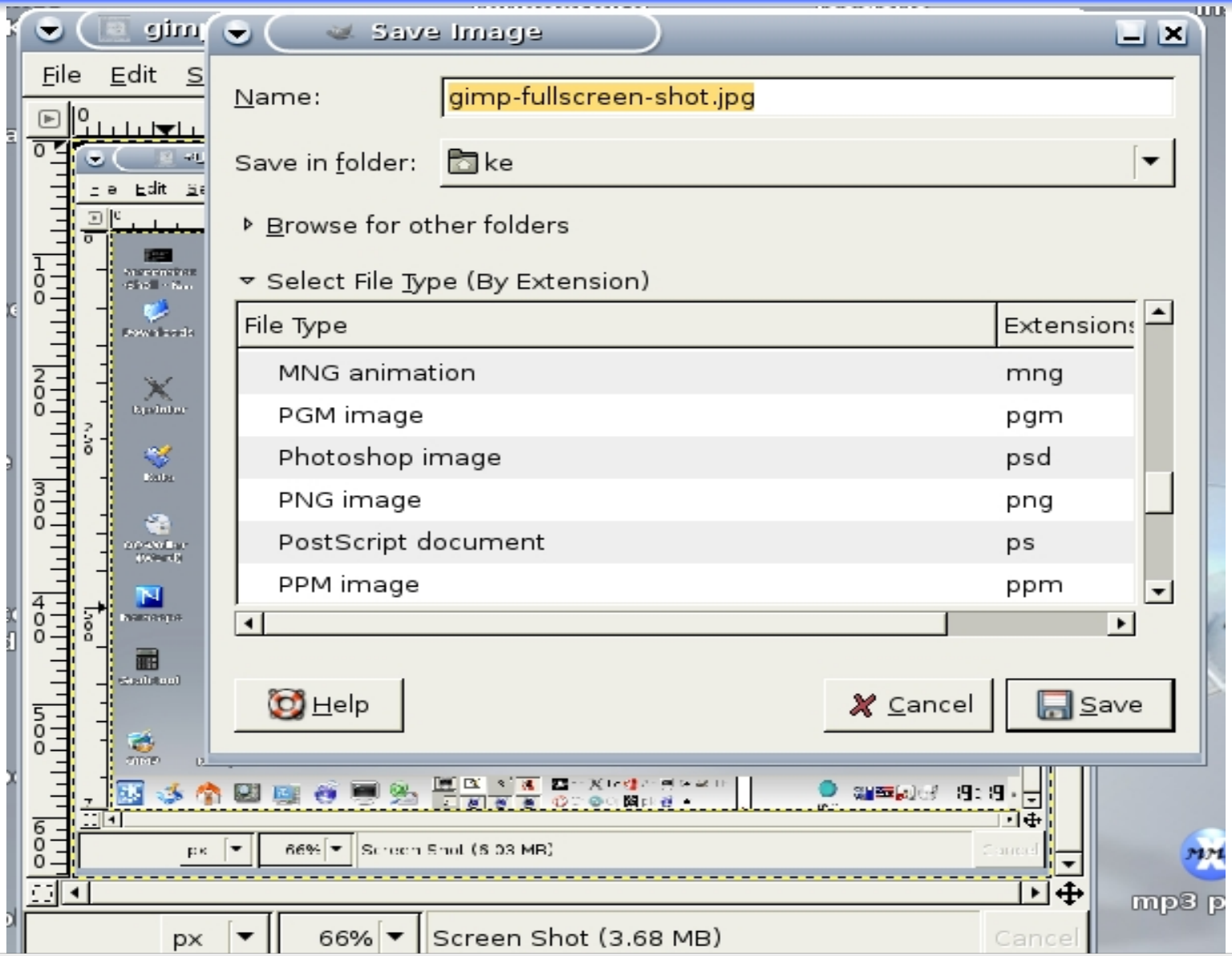
How to get menu lists by aquire



Full screen snapshot



Full screen shot - filetypes



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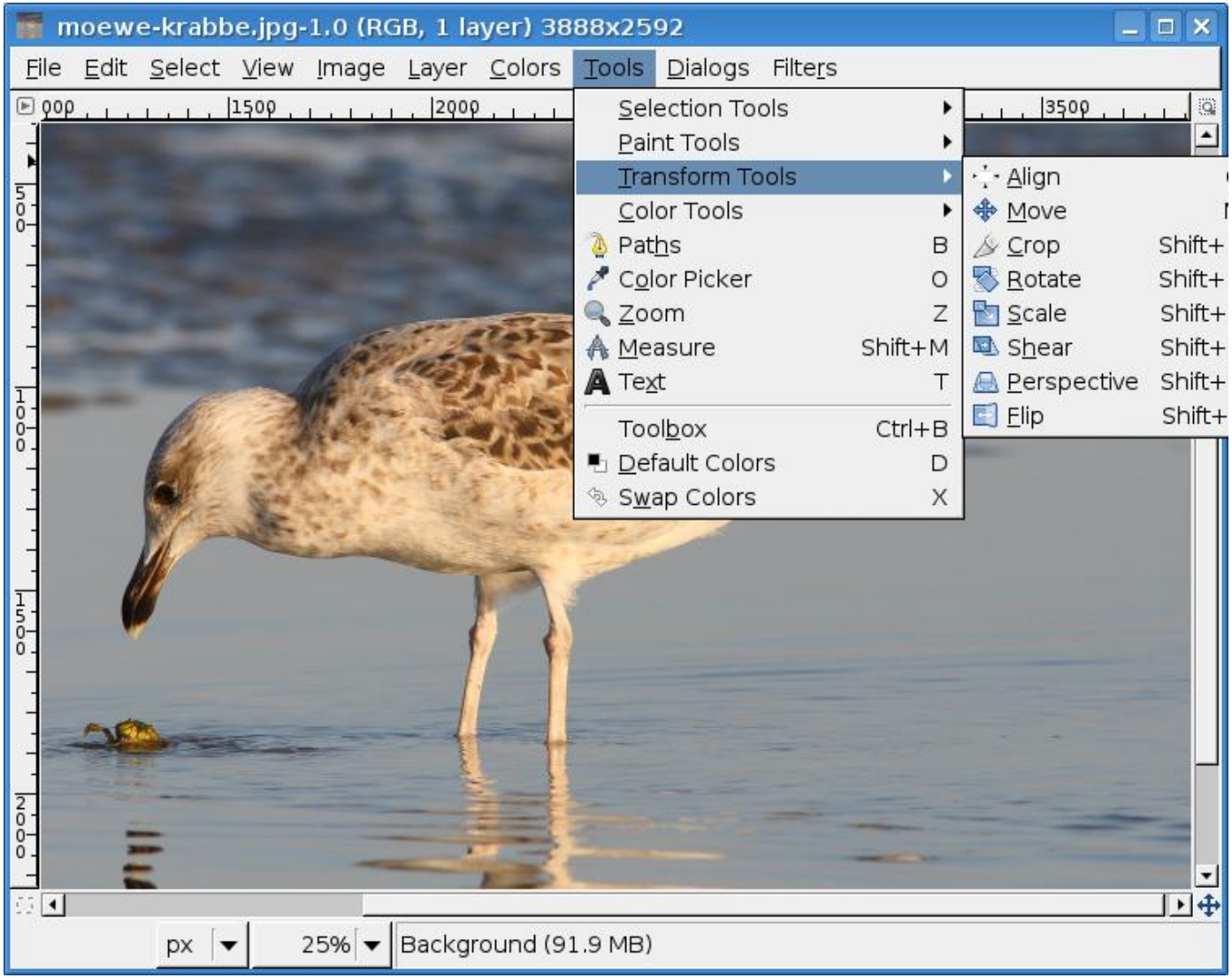
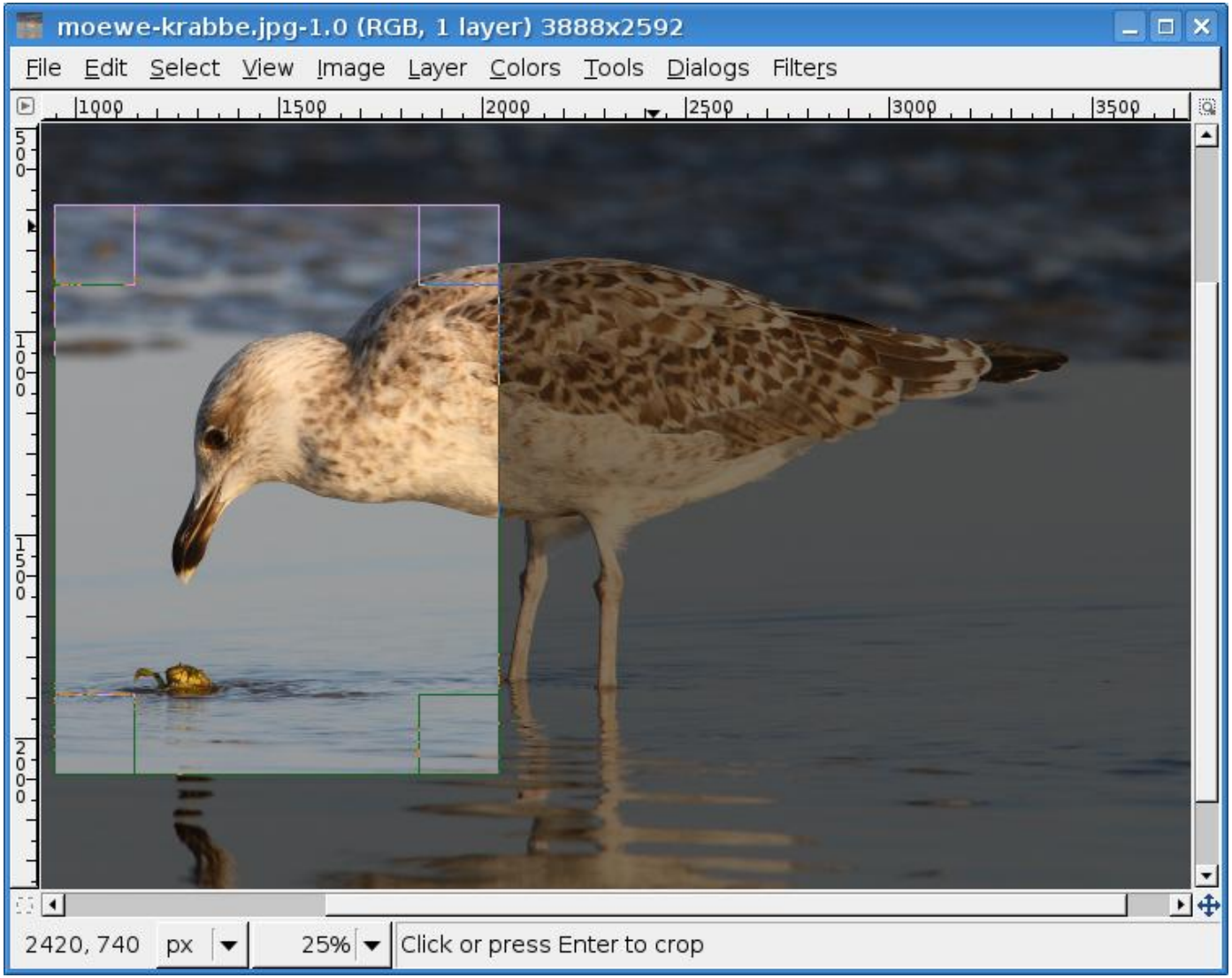
Cropping

Select Crop



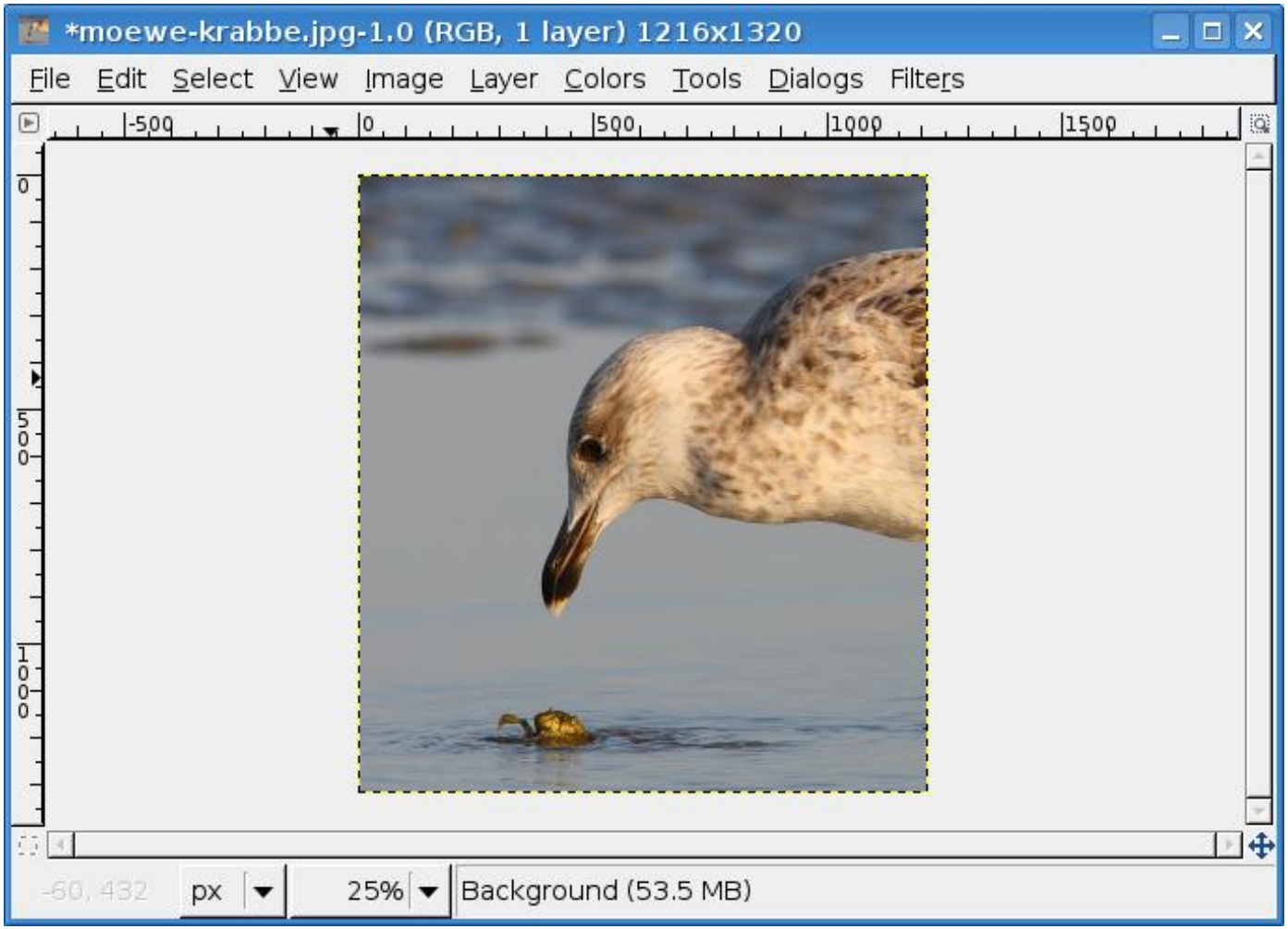
Cropping

Choose area to crop



Cropping

crop now - final image



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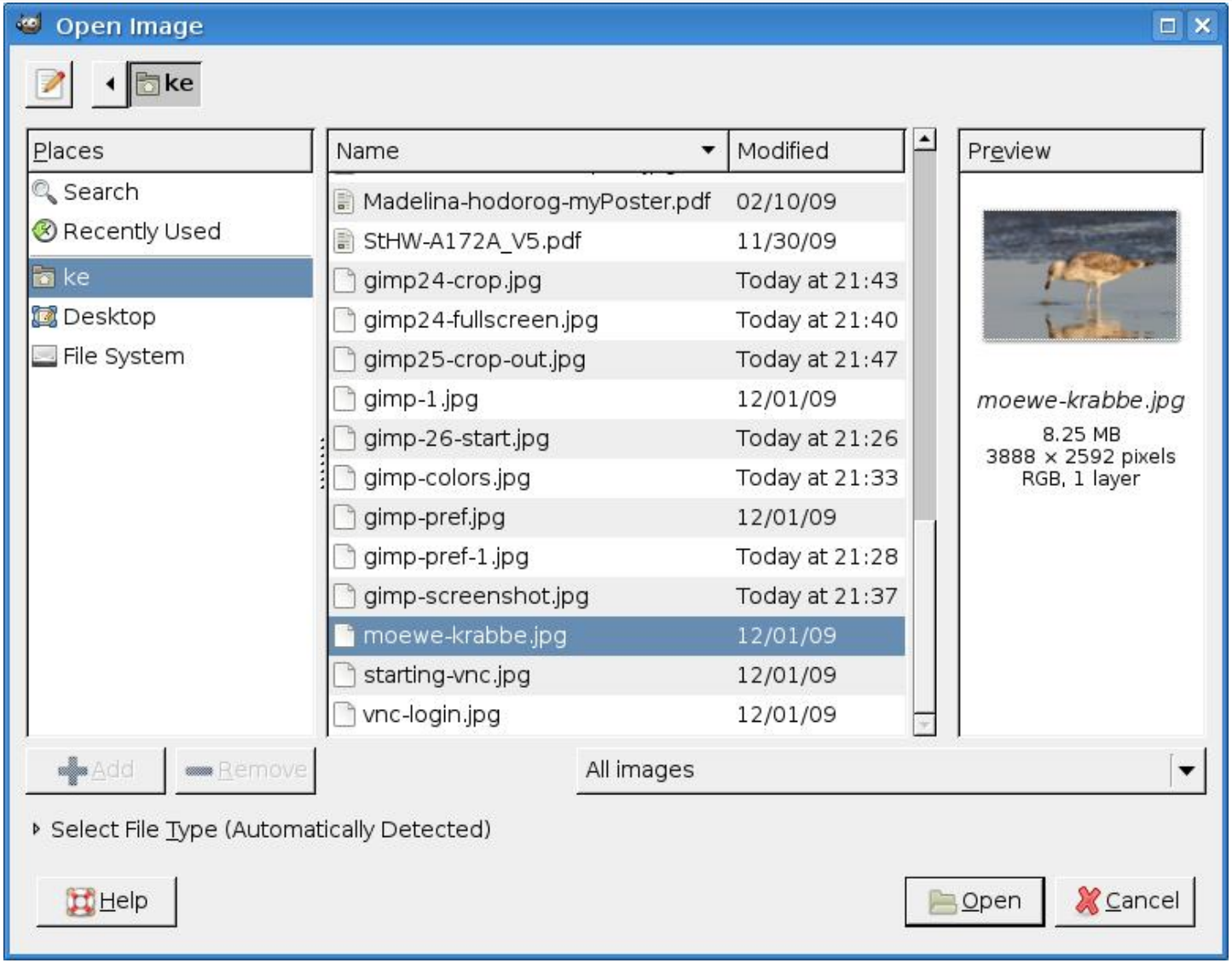
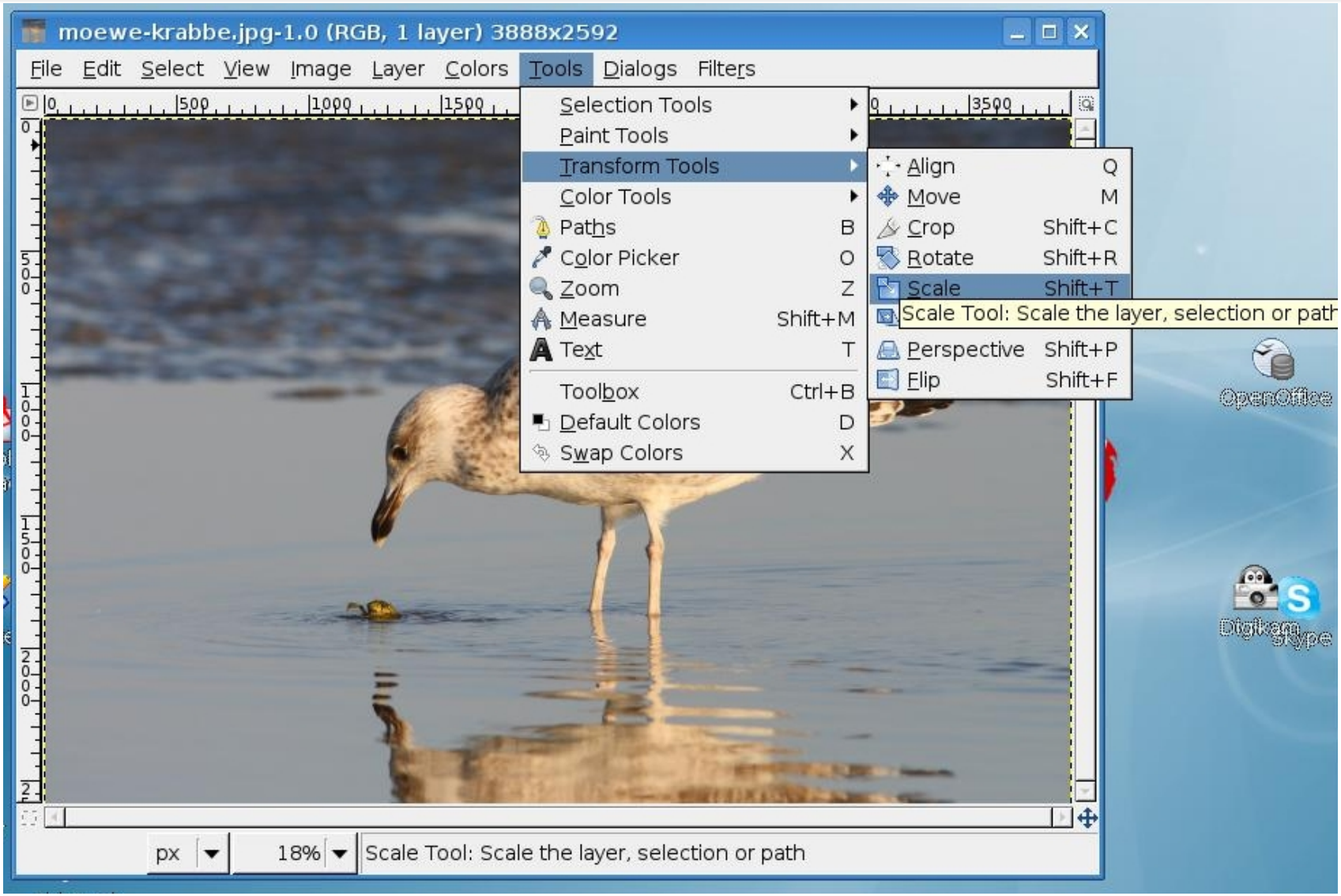
Scaling in GIMP

Open file



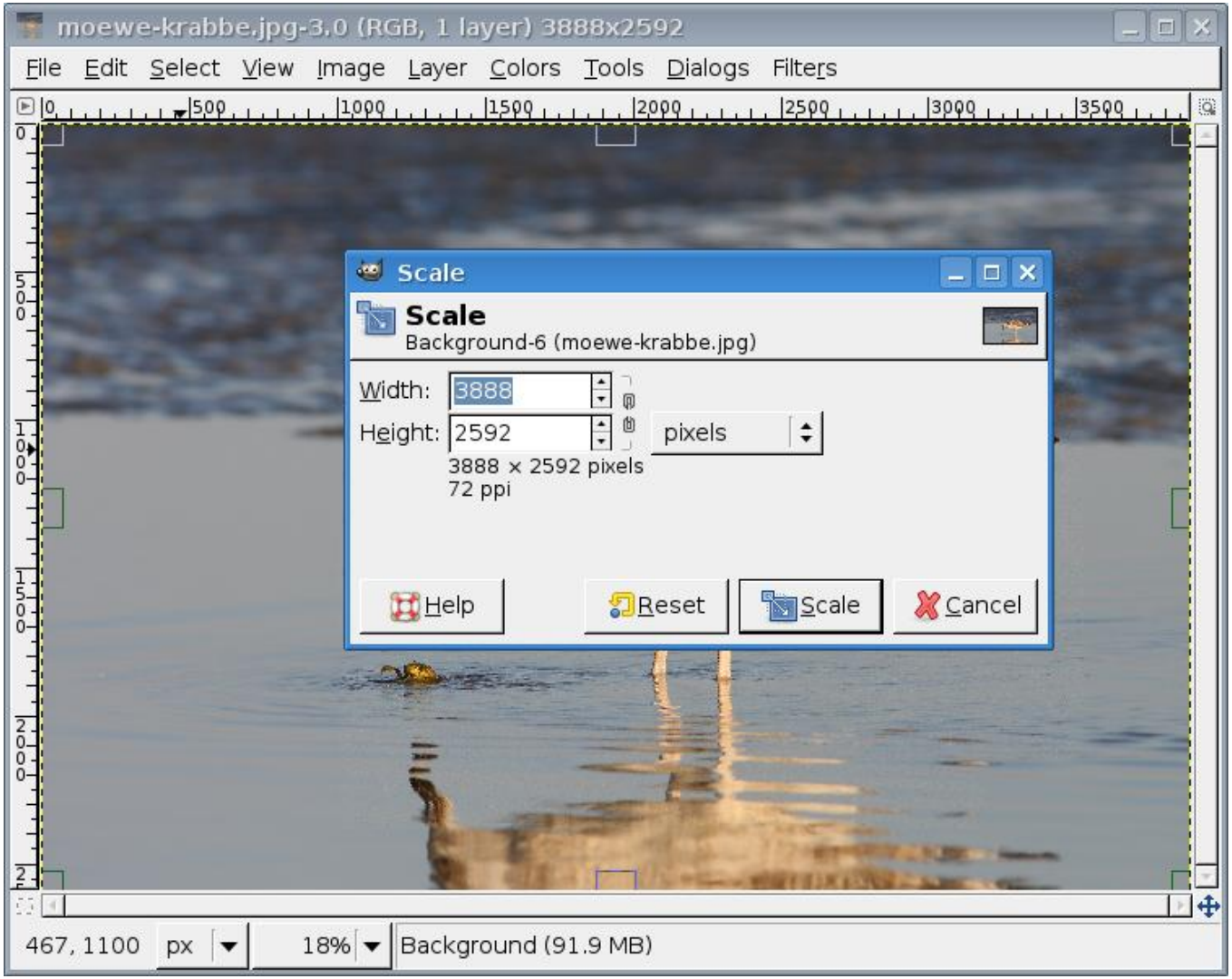
Scaling in GIMP

Select: Scale Image



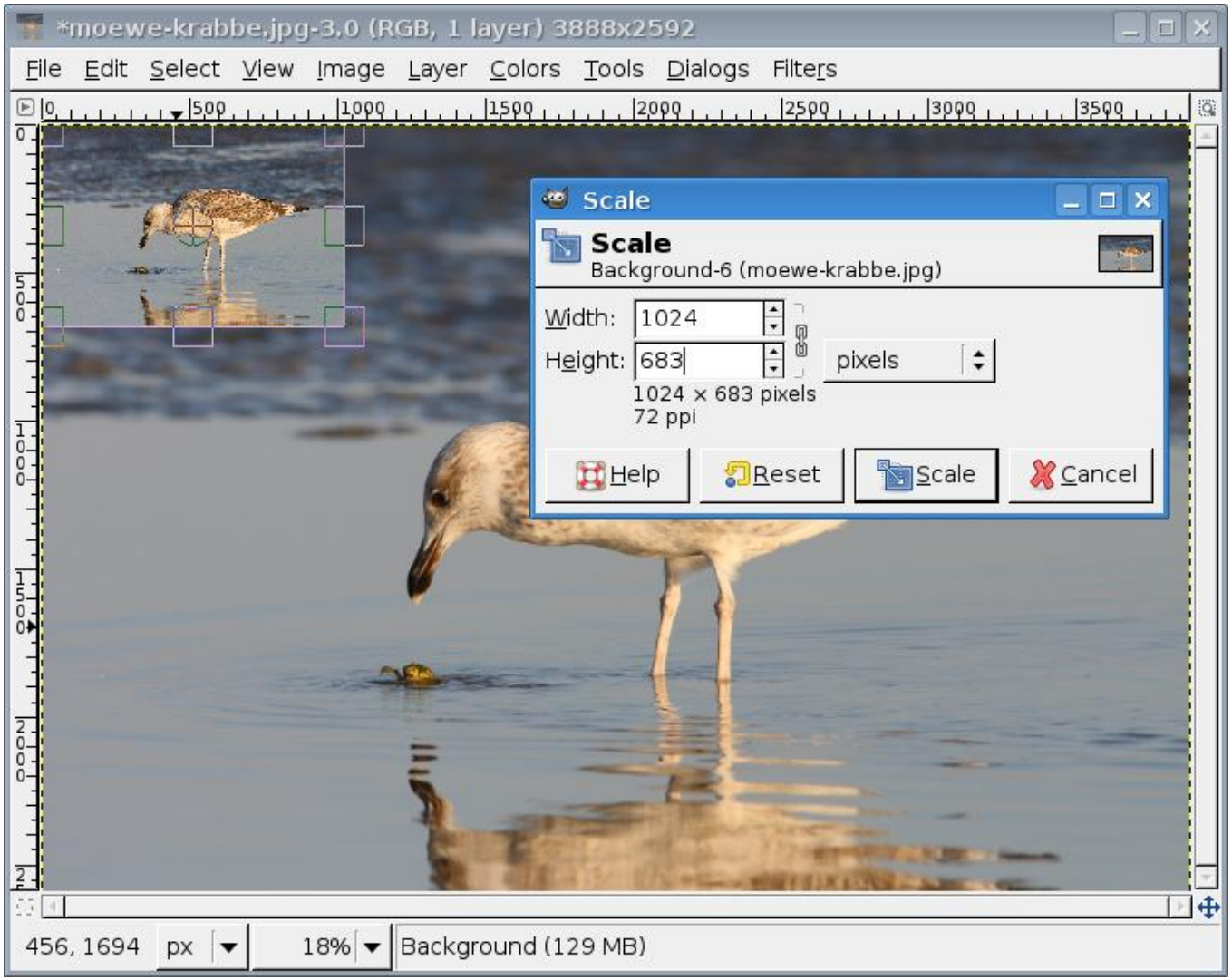
Scaling in GIMP

Image - Scale Image



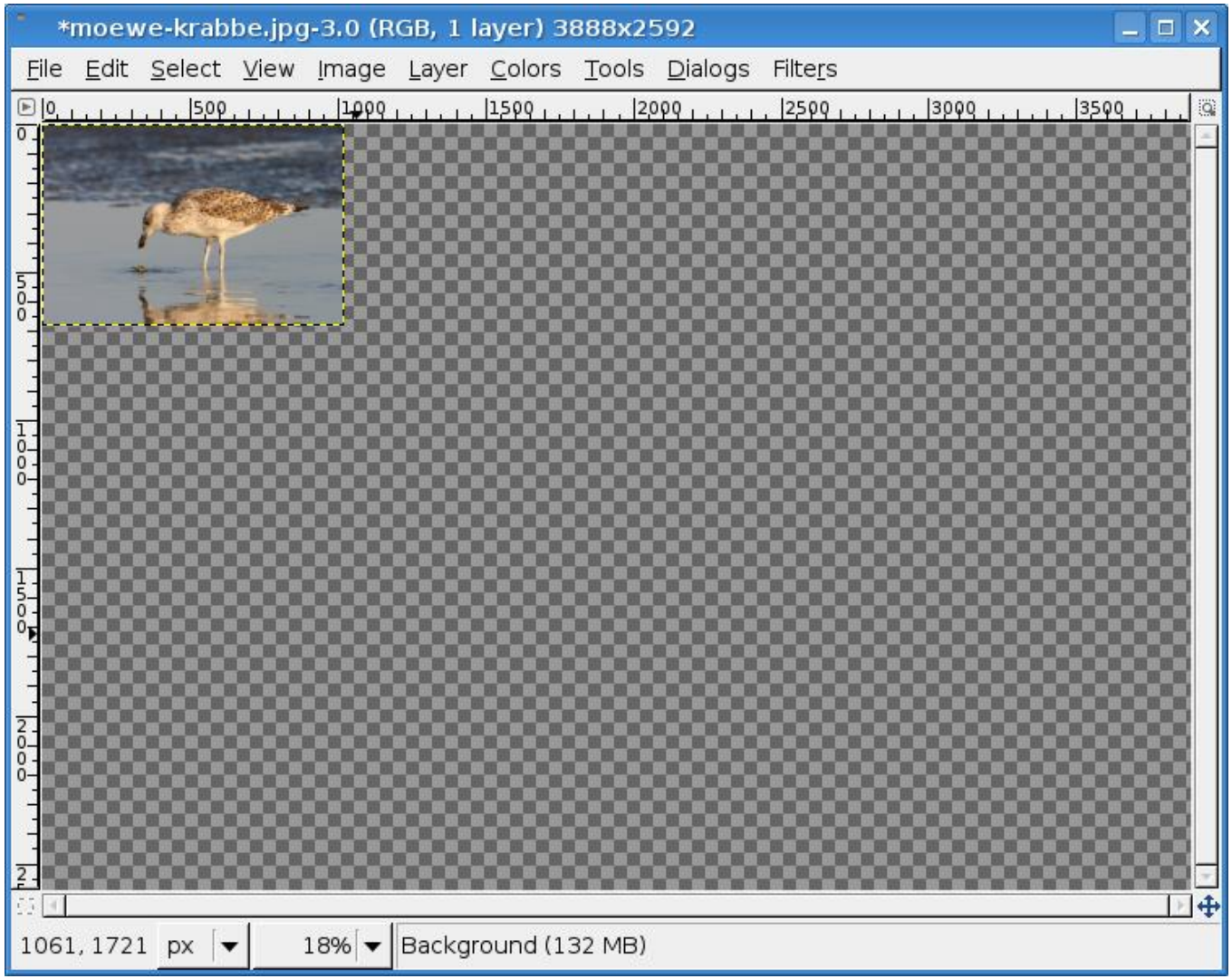
Scaling in GIMP

Window for new dimensions - set them



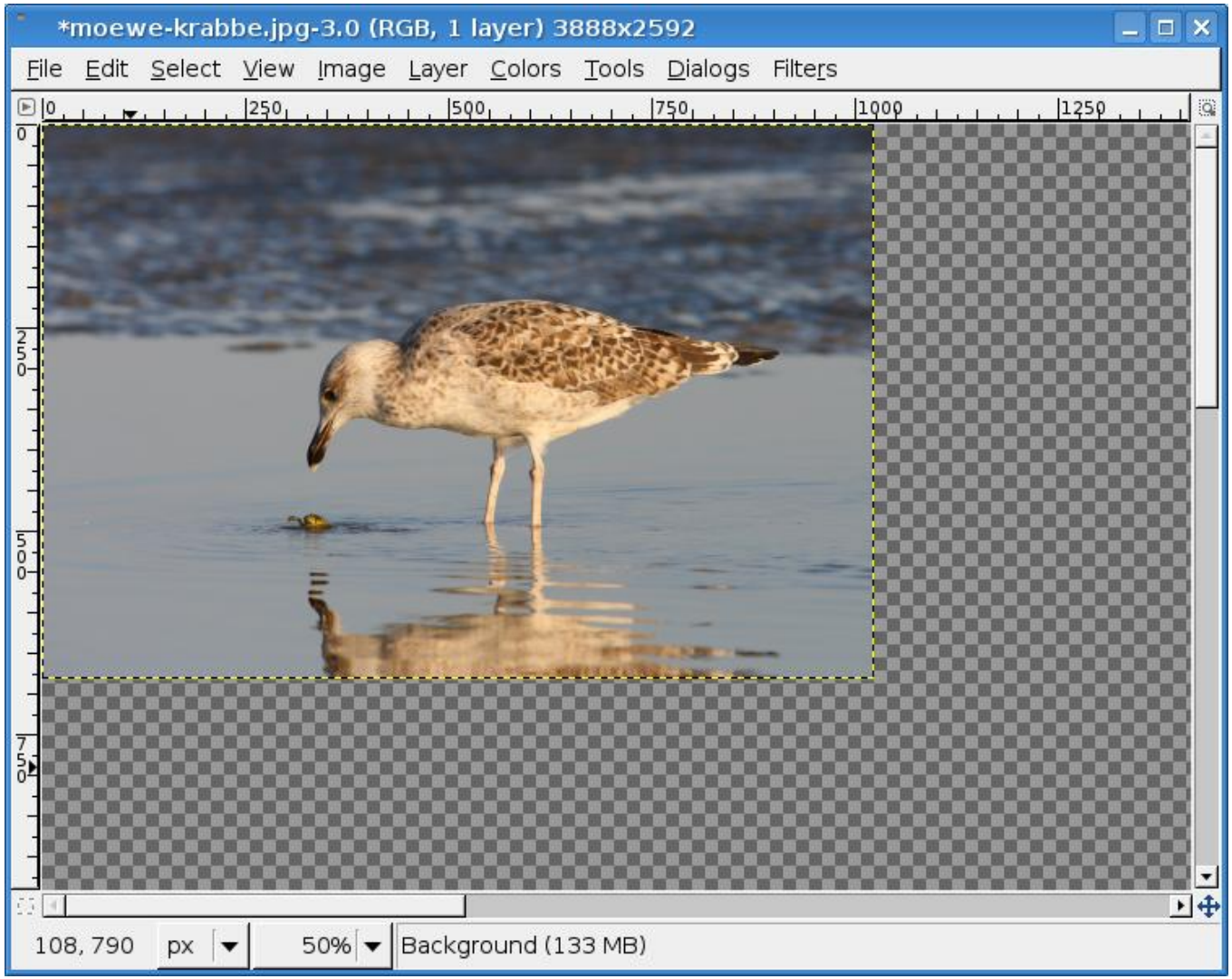
Scaling in GIMP

Carry out scaling



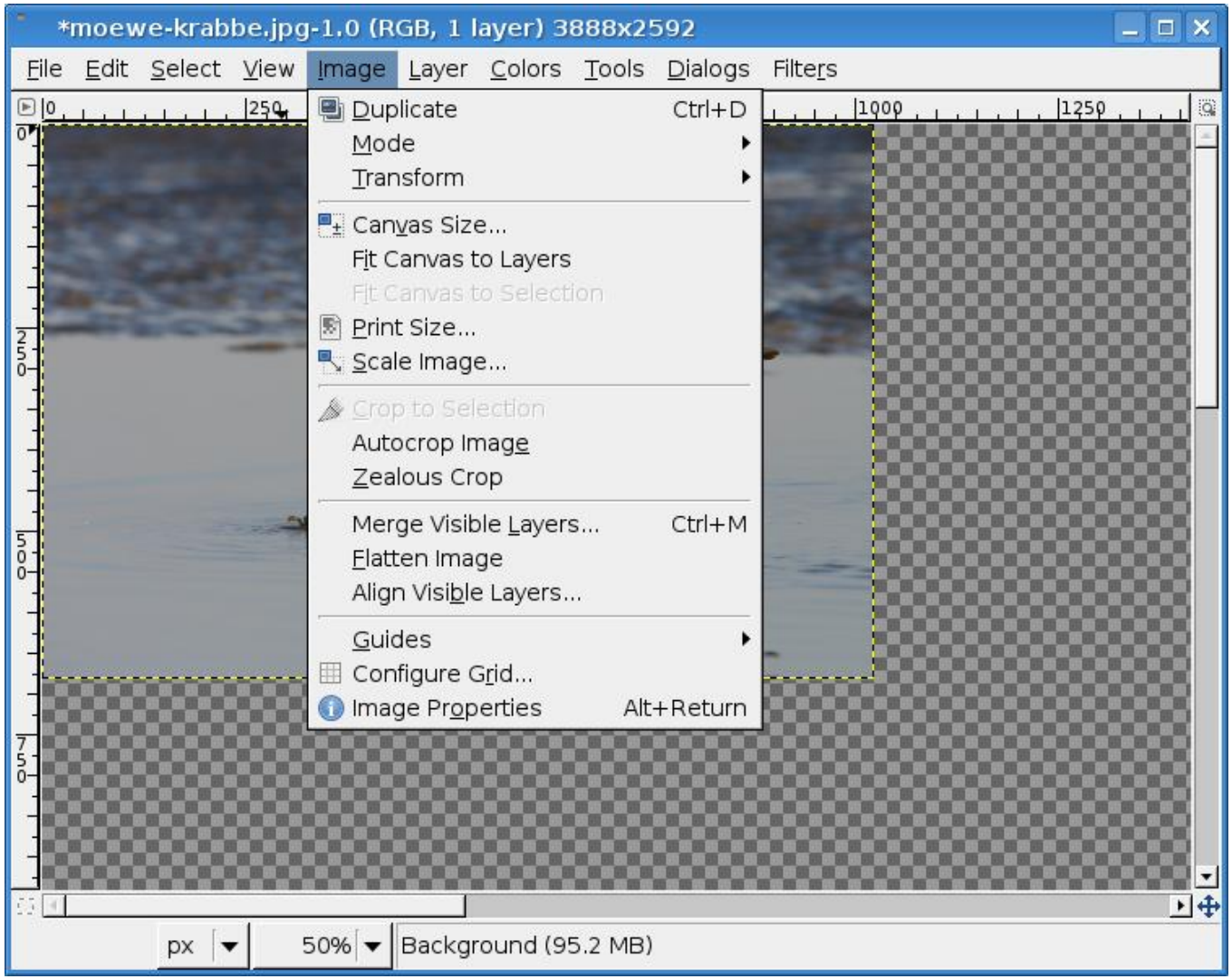
Scaling in GIMP

Scaled image



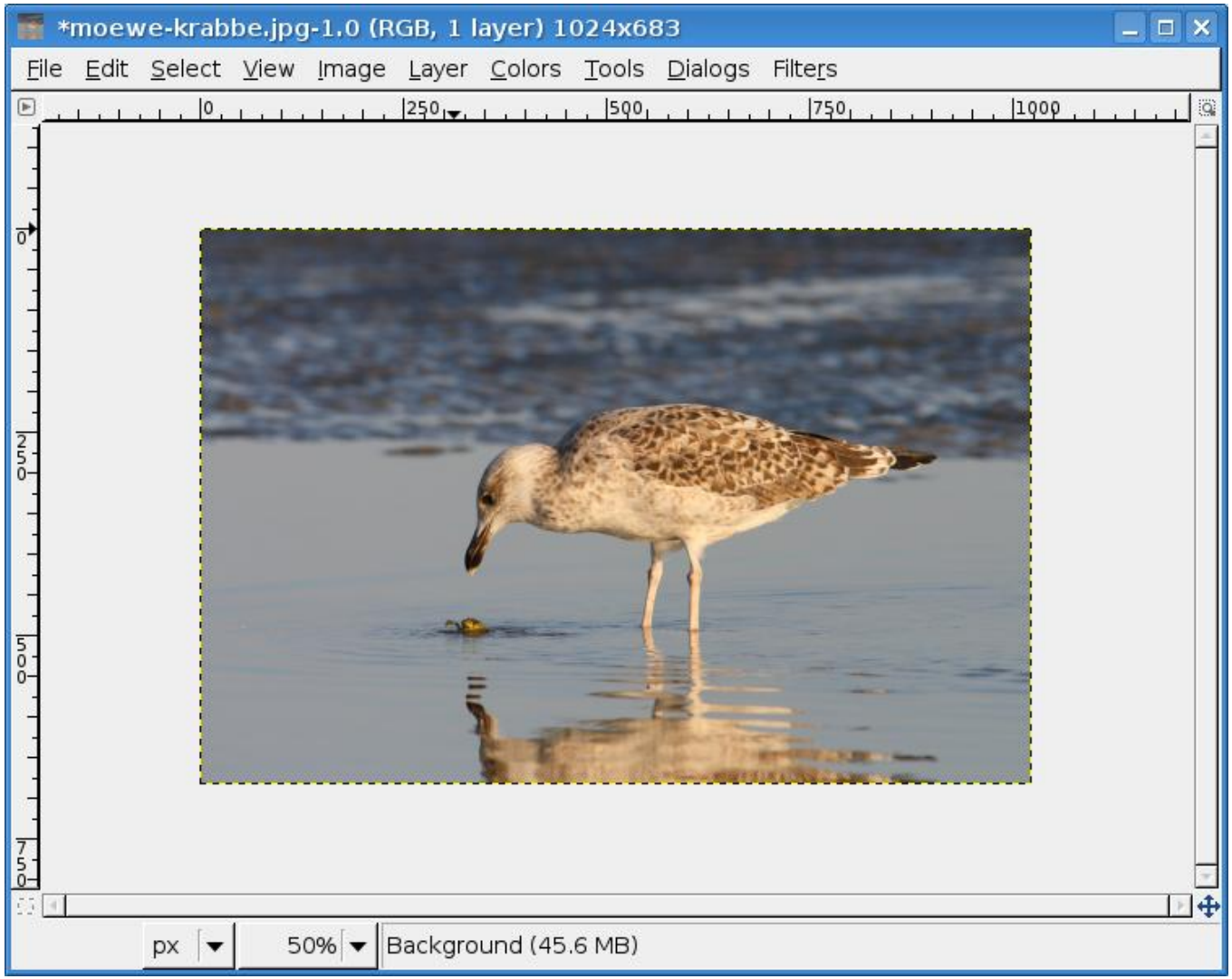
Scaling in GIMP

Now autocrop the picture



Scaling in GIMP

Final state - the 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, heigth 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

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}
\includegraphics[width=0.4\textwidth]{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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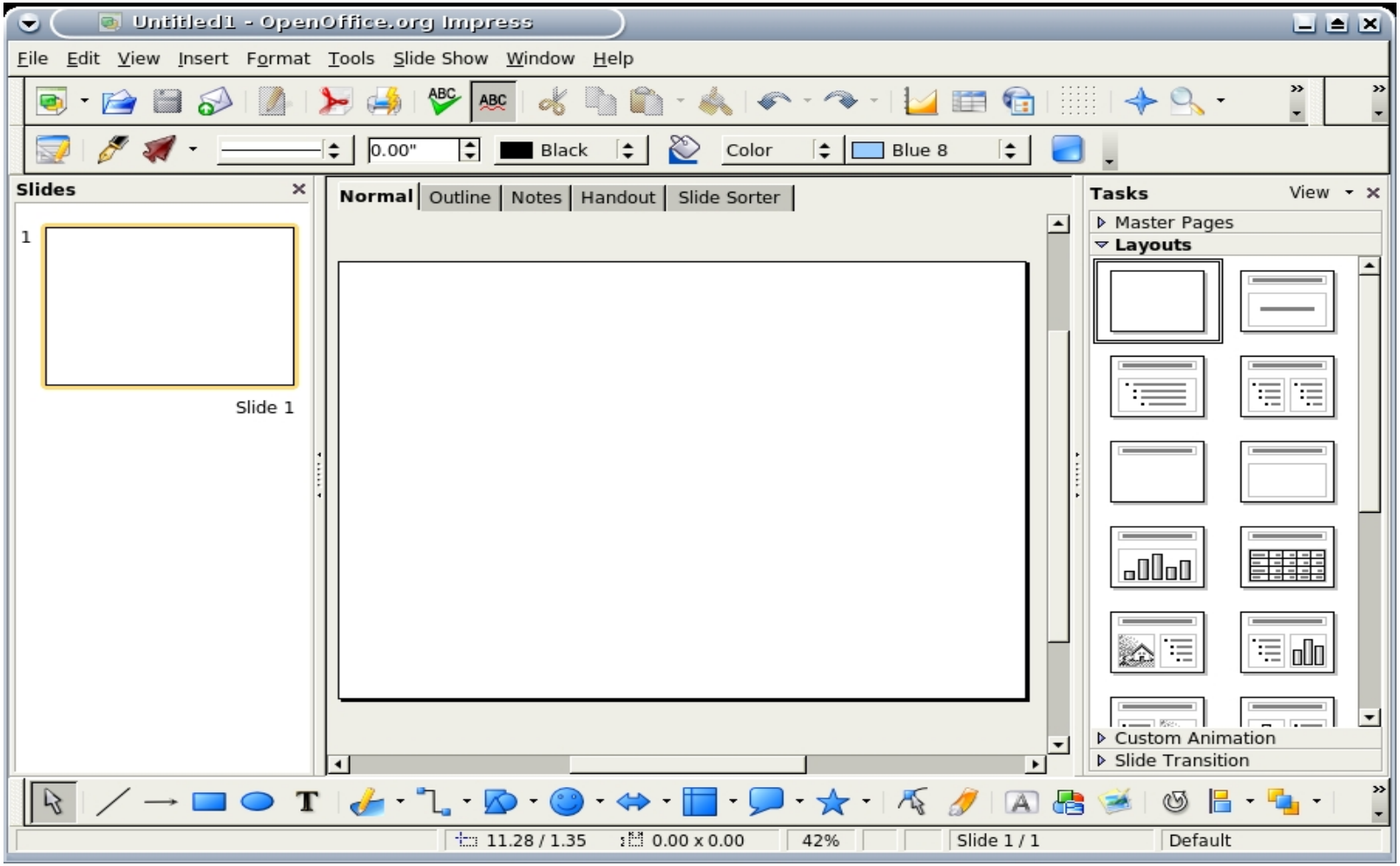
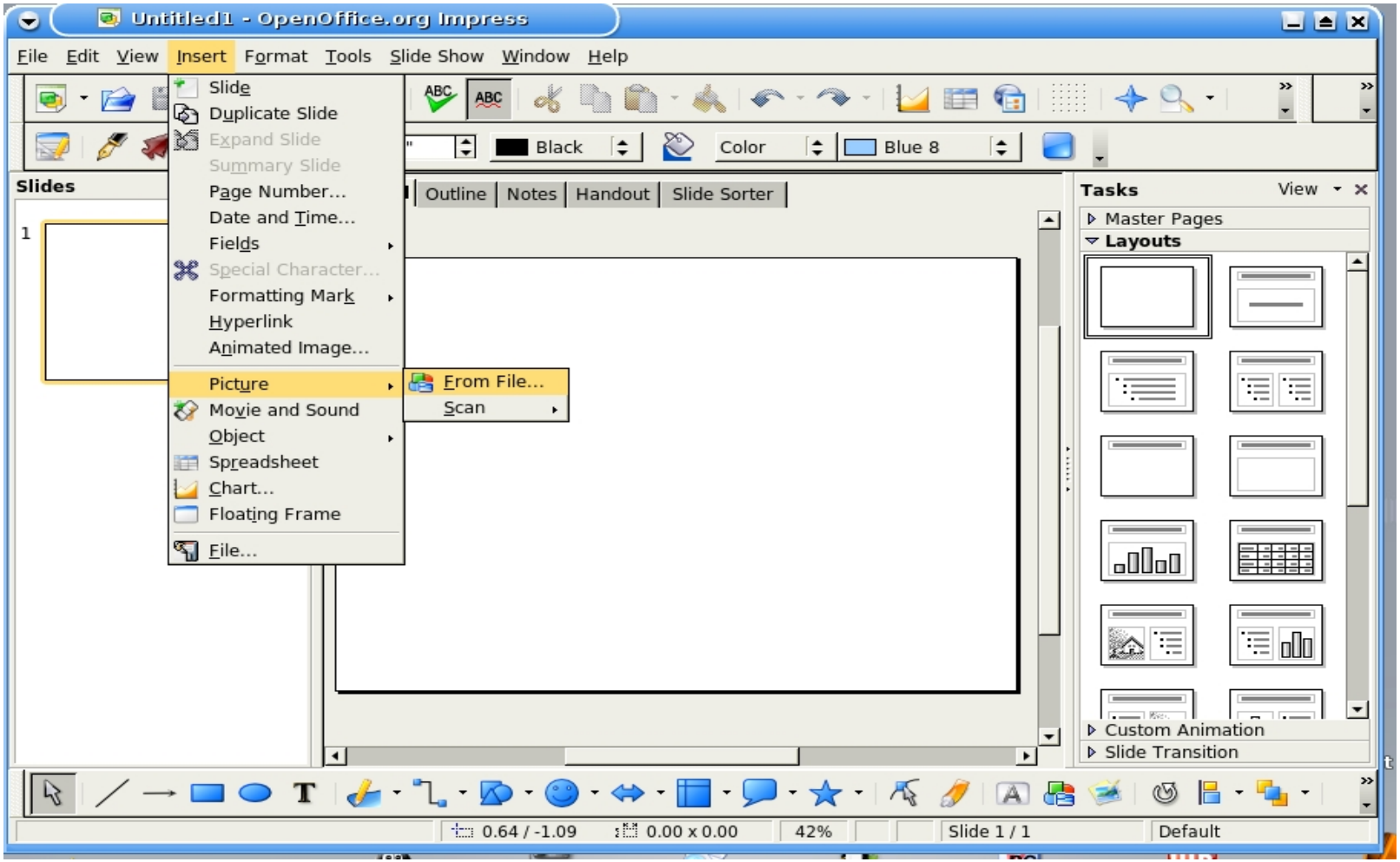
Insert images in OpenOffice

Start new presentation



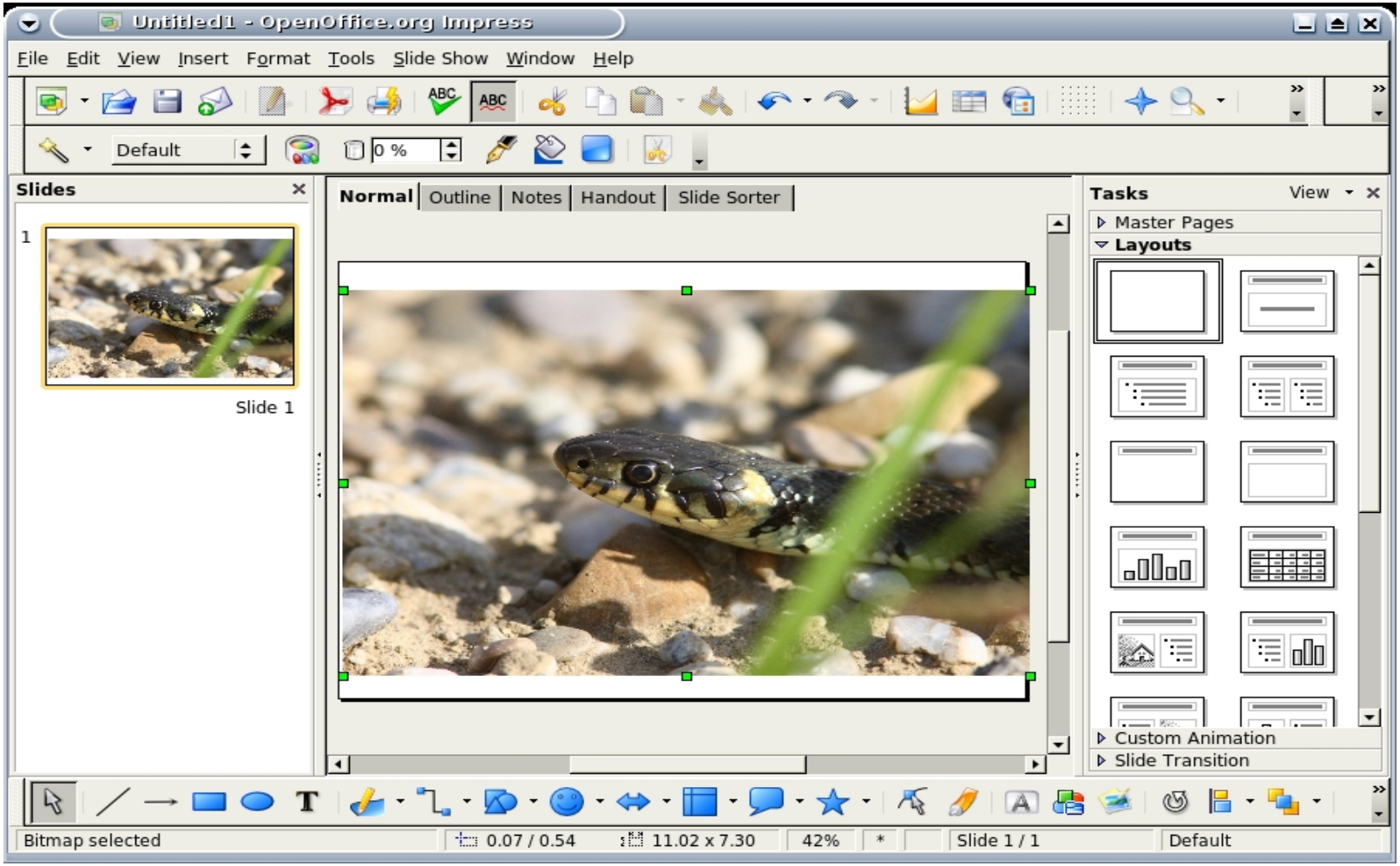
Insert images in OpenOffice

Insert image in the slide



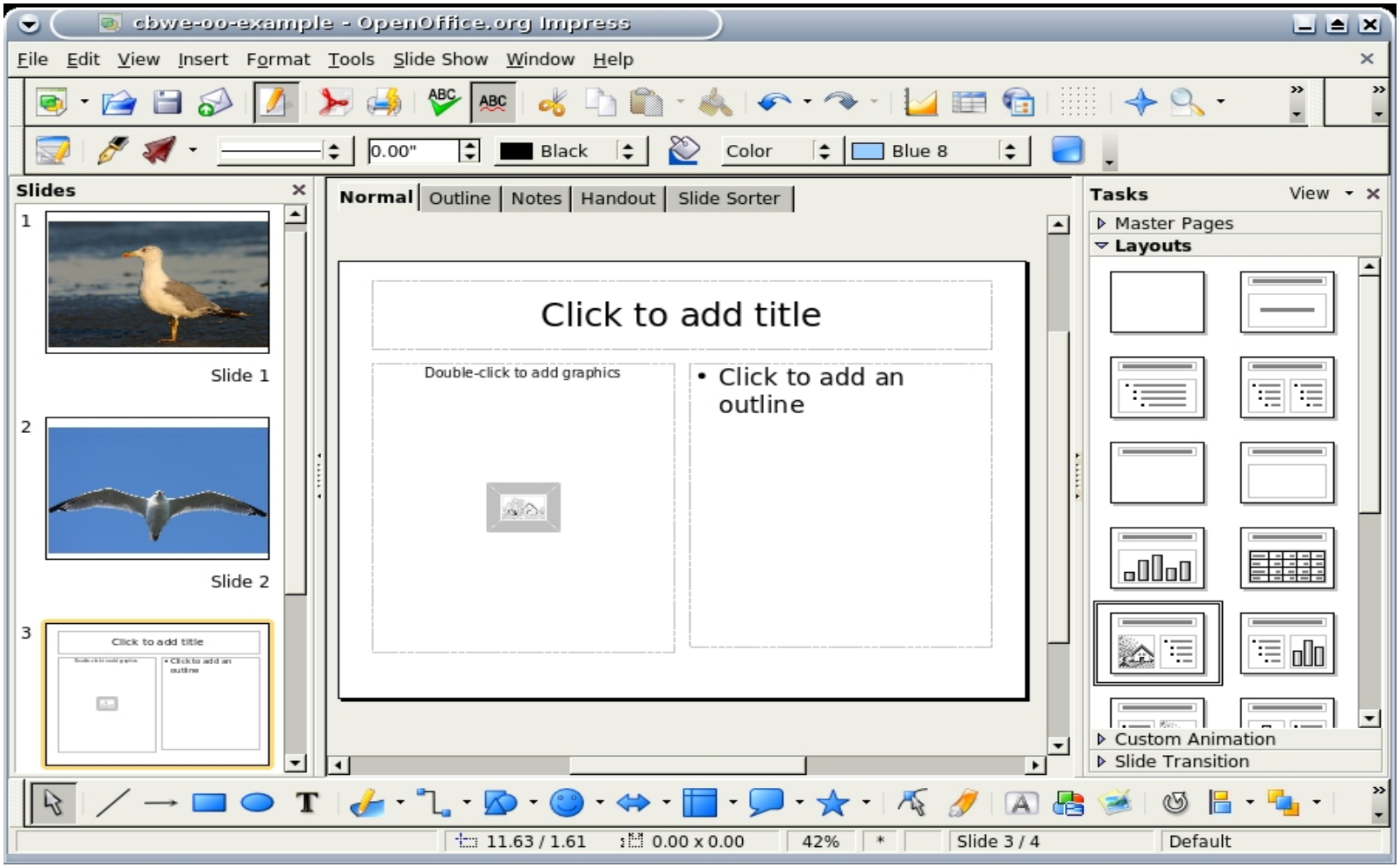
Insert images in OpenOffice

Image inserted



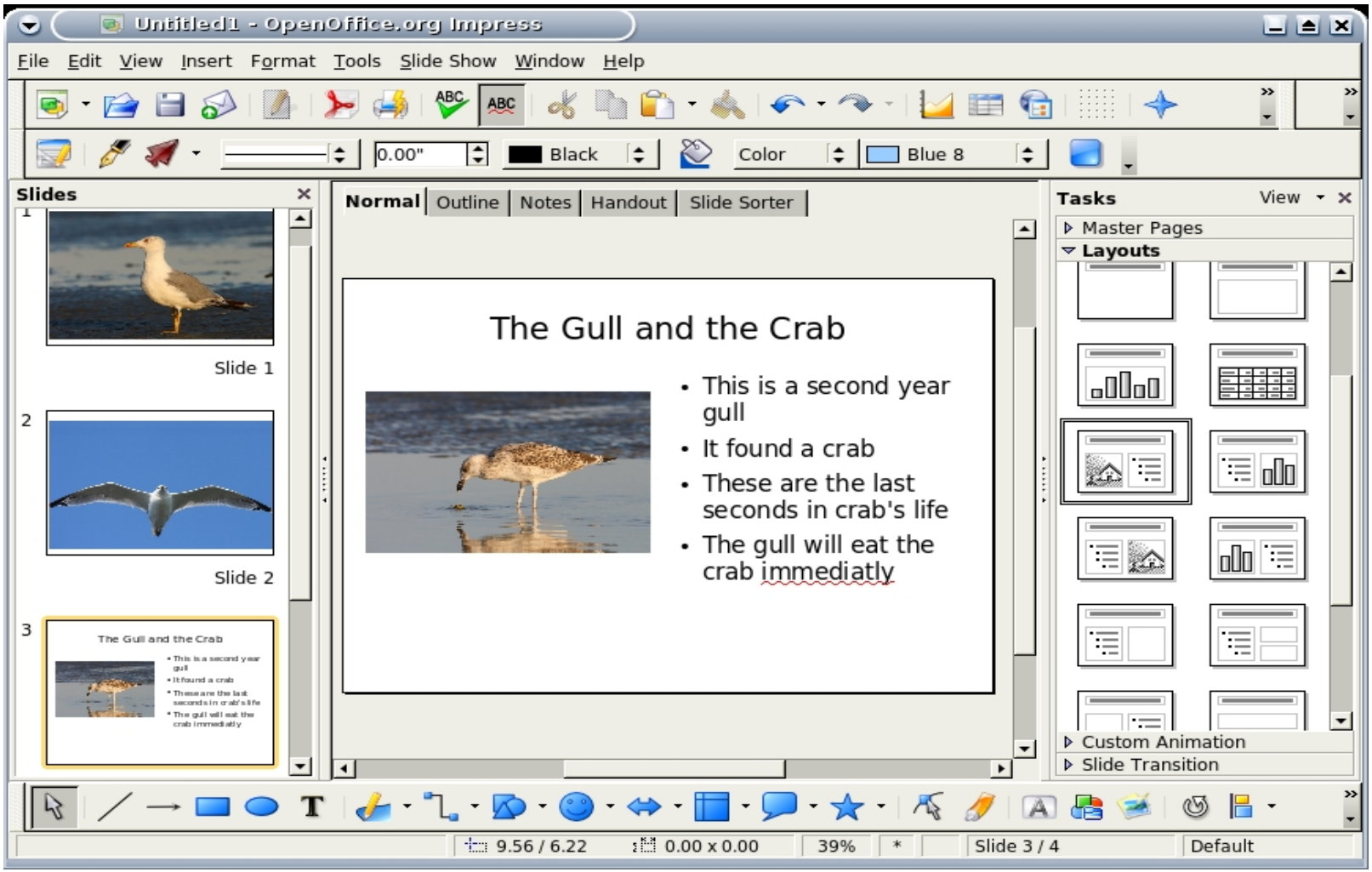
Insert images in OpenOffice

Use layouts



Insert images in OpenOffice

Layout filled with image and text



End of Basics of Image Processing

Thanks for your attention !