Sheffield Astronomical Society
Beginner's Meeting

Digital Imaging with Free Software

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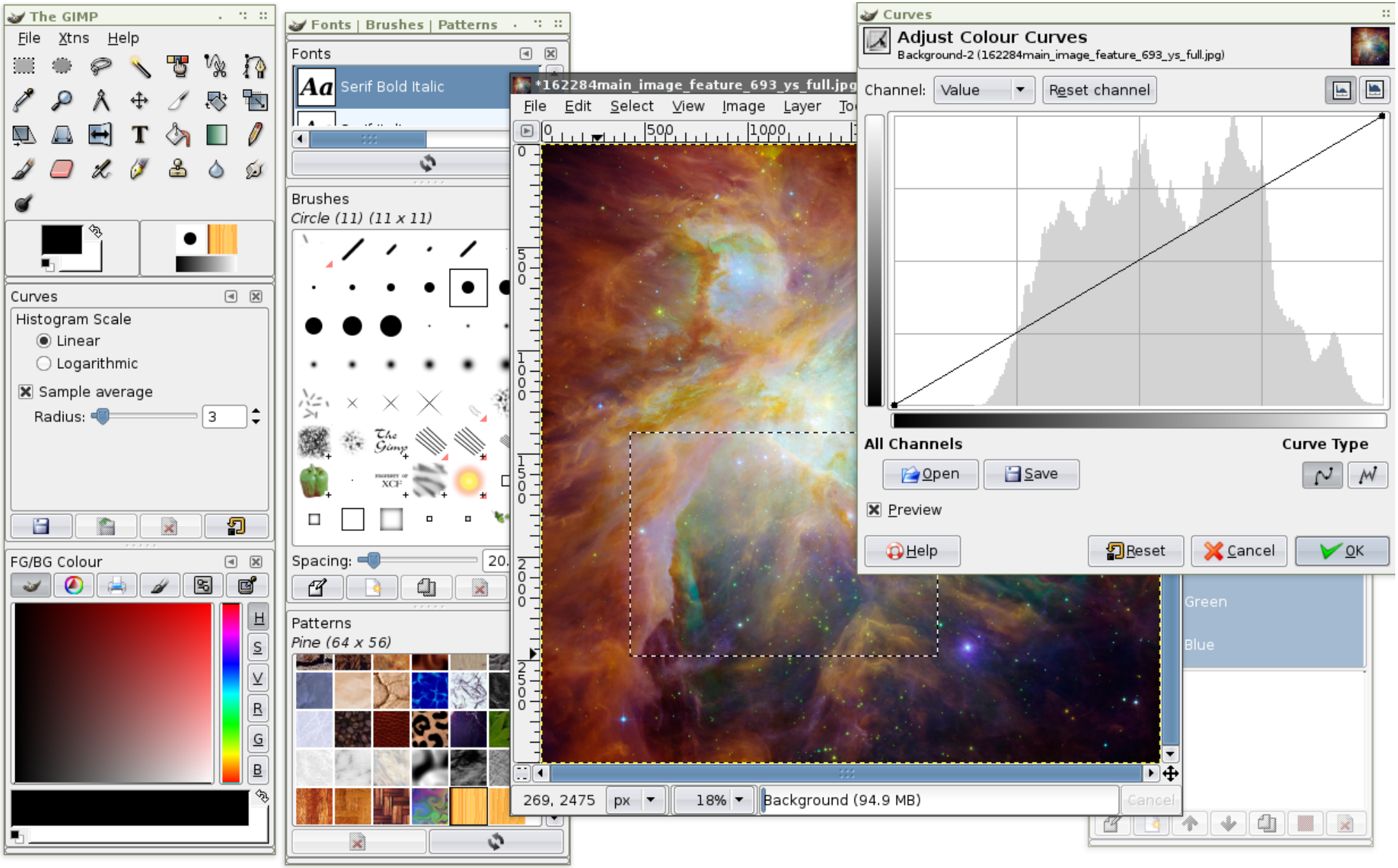
Monday, January 19th 2009


21:32:07
Stellarium 0.8.2 (Earth, Unknown observatory @ 0m)
FOV=270°
http://www.stellarium.org/
N
E
W
S
Deneb
Saturn
Capella
Regulus
Pollux
Aldebaran
Procyon
Betelgeuse
Rigel
Sirius

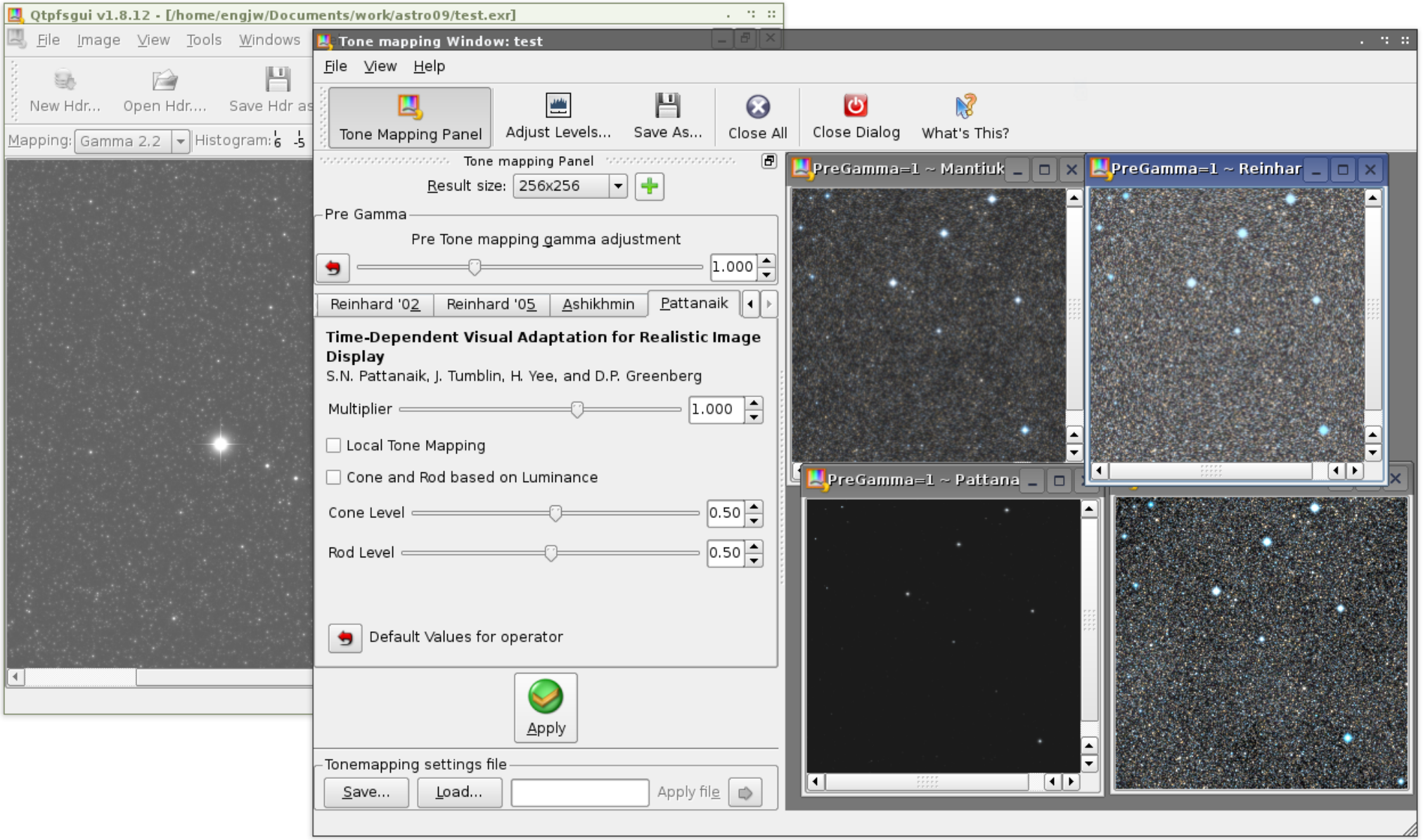
The GIMP (The GNU Image Manipulation Program)

http://www.gimp.org/



QtPfsGui (High Dynamic Range Imaging)

http://qtpfsgui.sourceforge.net/



Kubuntu 8.04 (Distribution of GNU/Linux)

http://www.kubuntu.org/

Free Software

Free Software Definition

freedom 0: run the program, for any purpose

freedom 1: study how the program works, and adapt it to your needs

freedom 2: redistribute copies so you can help your neighbor

freedom 3: improve the program, and release your improvements to the public, so that the whole community benefits

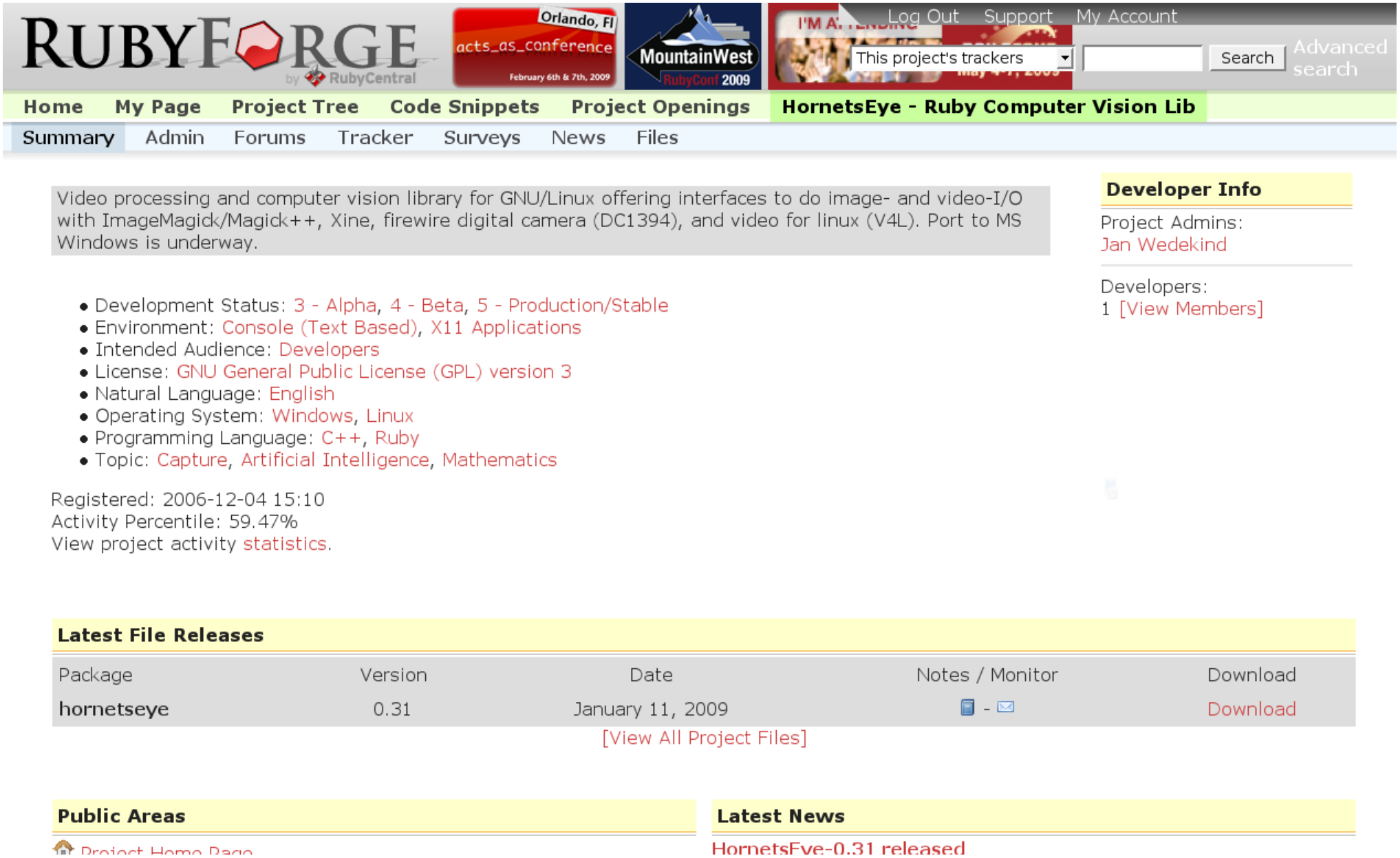
Richard Stallman - Free Software Foundation

"Imagine if you will for a moment a society in which mathematics has become property, and it's owned by people. Now every time you want to do anything useful ... your first stop is at the mathematics store to buy enough mathematics to complete the task which lies before you. ... You can predict that every other activity in society, whether undertaken for economic benefit or for the common good, will pay taxes in the form of mathematics payments."

Eben Moglen - Keynote at Plone Conference 2006

HornetsEye

http://rubyforge.org/projects/hornetseye/



Using Existing Free Software

Libraries Integrated

C++ Boost


libdc1394

DotGNU

FFTW

MPlayer

OpenEXR


Qt4-QtRuby

RMagick


NArray

libxine

Xorg, Mesa3D

Tools in Use


Bazaar

GCC


make, automake, autoconf

NaturalDocs

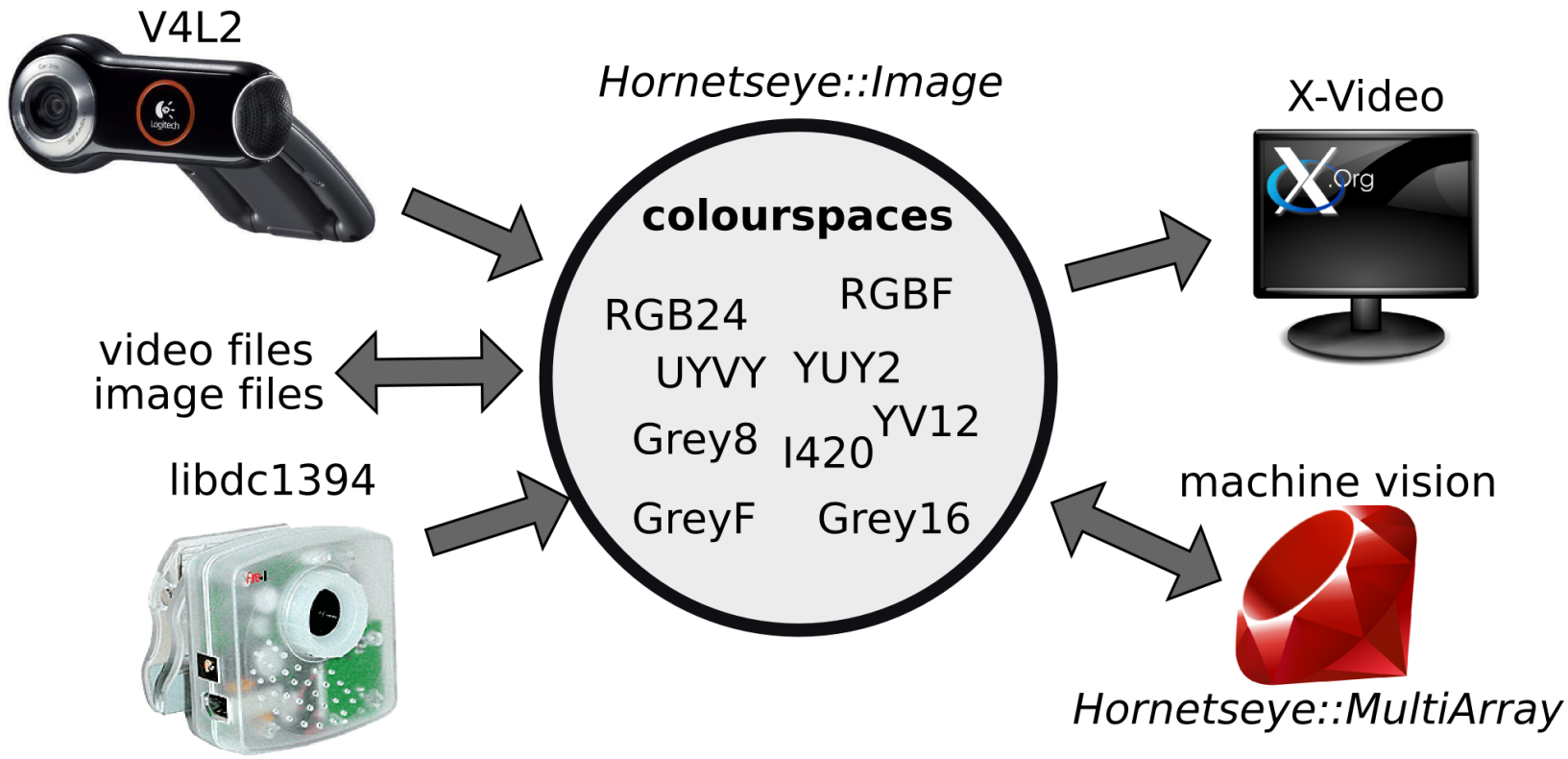
NSIS


Ruby

Cross-Platform Support

 / 	
V4LInput	VFWInput
V4L2Input	DShowInput
DC1394Input	—
XineInput	—
MPlayerInput	MPlayerInput
MEncoderOutput	MEncoderOutput
X11Display	W32Display
X11Window	W32Window
XImageOutput	GDIOutput
OpenGLOutput	—
XVideoOutput	—

Input/Output and Colourspace Conversions



$$\begin{pmatrix} Y \\ C_b \\ C_r \end{pmatrix} = \begin{pmatrix} 0.299 & 0.587 & 0.114 \\ -0.168736 & -0.331264 & 0.500 \\ 0.500 & -0.418688 & -0.081312 \end{pmatrix} \begin{pmatrix} R \\ G \\ B \end{pmatrix} + \begin{pmatrix} 0 \\ 128 \\ 128 \end{pmatrix}$$

also see: `http://fourcc.org/`

Opening Webcam/Framegrabber

```
# Open V4L2-compatible Video Device
require 'hornetseye'
include Hornetseye
input = V4L2Input.new
img = input.read
img.display
```

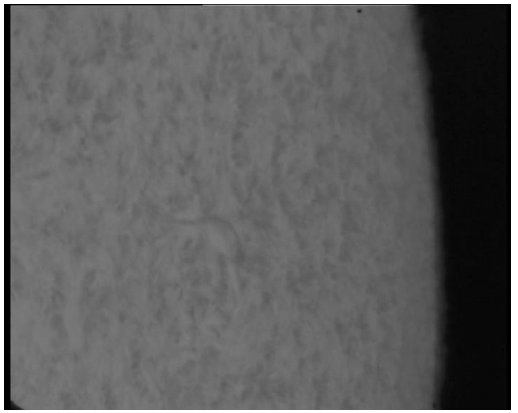
Capture Image

```ruby
# Capture Image
require 'hornetseye'
include Hornetseye
input = V4L2Input.new
img = nil
X11Display.loop { img = input.read }
img.save_rgb24 'test.png'
```

Capture Video

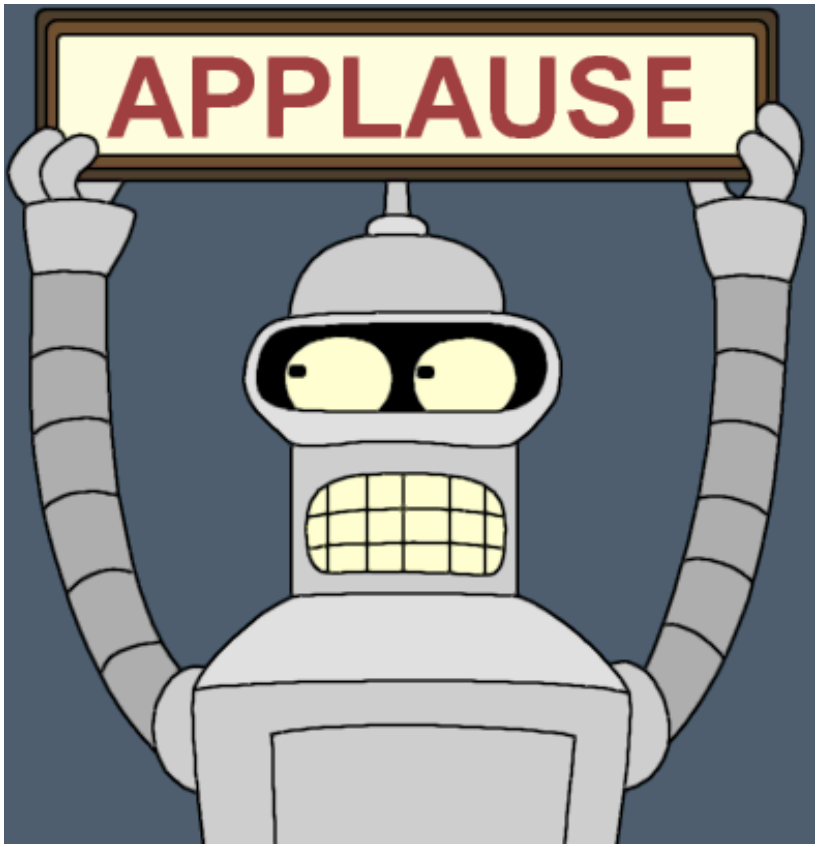
```ruby
# Capture Video
require 'hornetseye'
include Hornetseye
output = MEncoderOutput.new( 'test.avi', 10,
  '-ovc lavc -lavcopts vcodec=msmpeg4:vhq:vbitrate=4000' )
X11Display.loop do
  img = input.read
  output.write( img )
  img
end
output.close
```

Averaging Frames



```
# Averaging Frames
require 'hornetseye'
include Hornetseye
input = XineInput.new 'solar.avi'
arr = []
X11Display.loop do
  img = input.read_grey8
  arr.push( img )
  arr = arr[ 1..-1 ] if arr.size > 25
  result = arr.inject { |a,b| a.to_lint + b }
  result.normalise
end
```

Questions?



http://vision.eng.shu.ac.uk/jan/astro09.pdf

http://tinyurl.com/9876fr