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Image Tools for UNIX

David Banks, ICASE

There are many tools available for digital image processing in the UNIX environment. This talk features two tools that are simple and useful: xv and pbmplus.

The xv image viewer runs under the X window system. It reads images in a number of different file formats and writes them out in different formats. The view area supports a pop-up control panel (activated by pressing the right-most mouse button). This control panel has a file selector, a menu bar, and several buttons at the bottom. The "Algorithms" menu item lets you blur an image. Why would you want to blur an image? One reason to blur is that you might wish to shrink the image. Without blurring first, a "shrink" operation generally obliterates any of the fine details that are in the full-size image. The bottom buttons let you flip, crop, and resize an image.

The "xv" control panel can also activate the Color Editor. The Color Editor displays the image's colormap (if it has one). You can select individual elements of the colormap and change their color. This is especially useful if the image has a solid-color background that you wish to change. The Color Editor also applies global changes to the image color. These changes include re-mapping the hues, setting the white-balance, setting the color saturation, and changing the overall intensity mapping. These operations are useful for preparing an image to be printed on a medium that has special color characteristics. As a simple example, color monitors have a wide range of brightness characteristics. An image can be adjusted to match the settings on different display devices.

The xv image viewer is available from the internet at various ftp sites. A postscript manual is available on the world wide web (WWW). It describes a licensing arrangement with the author (at $25 per machine), but his phone number is no longer valid and neither is his e-mail address. Previous versions of the viewer (before version 3.0) did not mention a license.

The "pbmplus" package is a set of tools designed to perform image processing jobs from within a UNIX shell. The acronym "pbm" stands for "portable bitmap." A bitmap is a straightforward encoding of a black-and-white image. In a pbm file, zeros and ones represent black and white dots in a rectangular array. A portable graymap uses a larger set of values to encode different levels of gray from black to white. A portable pixmap uses triples of integers to encode the red, green, and blue components of each pixel in an image. A portable anymap encodes any prescribed number of integer values for each pixel.

Like "xv", the pbm tools can convert images from and to many different file formats. There are more than 100 individual executable programs in the toolkit; most of them convert images from one format to another. The "pbm" tools do not provide a stand-alone interactive program like "xv" does. Instead they act as filters, taking images as input and producing images as output.

The source code and man pages for "pbmplus" are available by ftp. This software is in the public domain.

Image Tools For UNIX

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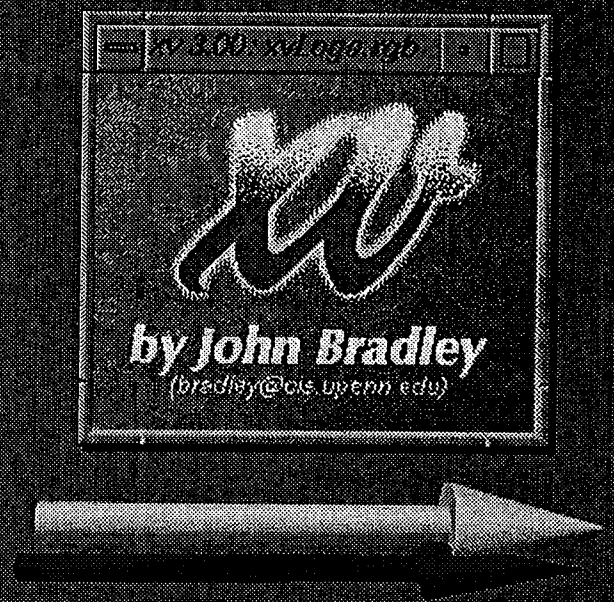
The xv Image Viewer

- Converts file formats
- Edits colors
- Performs image operations

xv Converts File Formats

gif
pbm
x11
sun

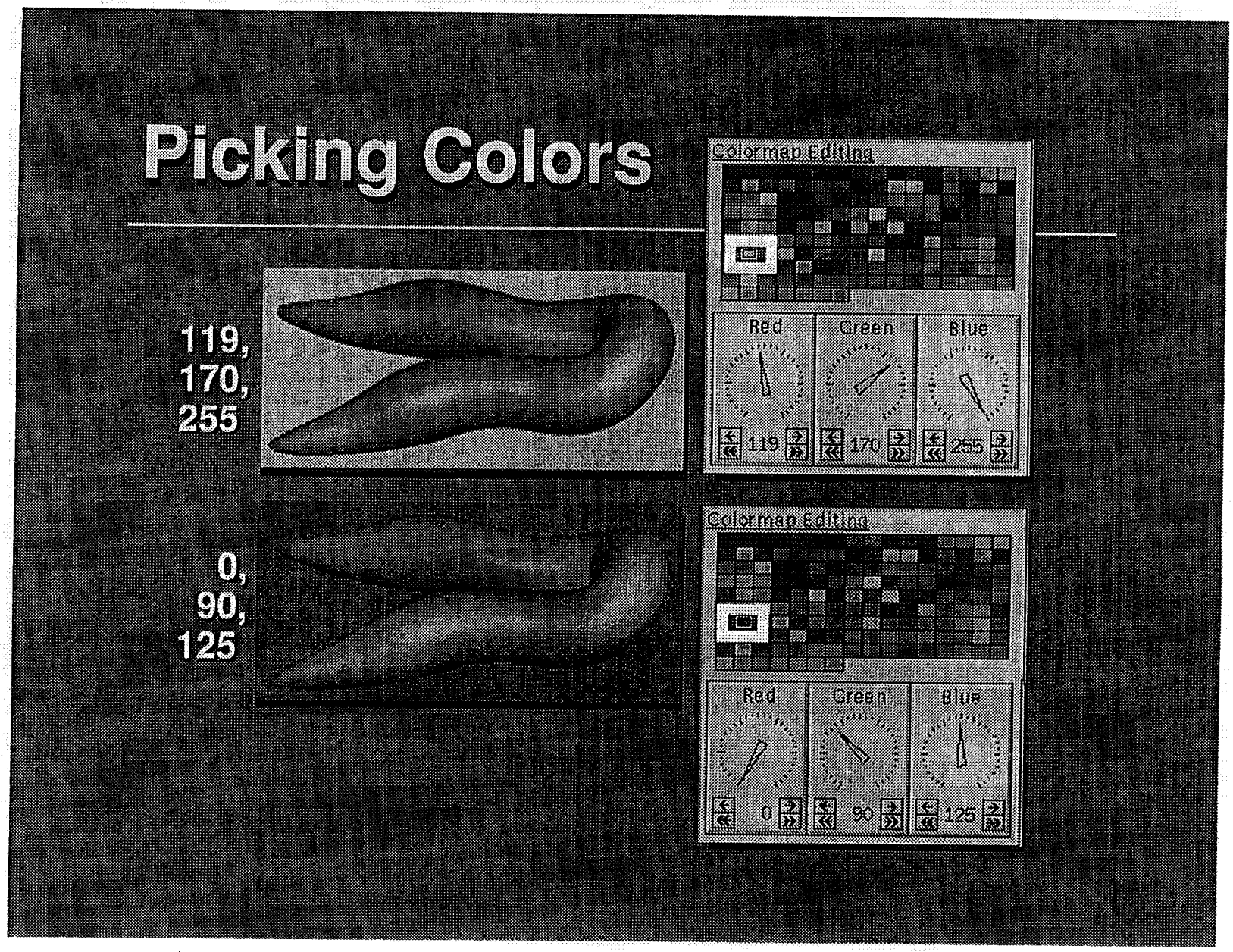
rgb
jpeg
tiff



gif
pbm
x11
sun
ps
rgb
jpeg
tiff

XV Edits Colors
Color map
Color value
Color ops
xv 3.00
Colormap Editing
Undo
Revert
RGB/HSV
Grey
RevVid
Random
Red
Green
Blue
Apply
Brite
Reset
Undo
Normal
Dim
1
2
Norm
Sharp
3
4
Curves
History
Dull
Set
Close
Display with HSV/RGB mode
Auto-apply HSV/RGB mode
Auto-reset on new image

Picking Colors

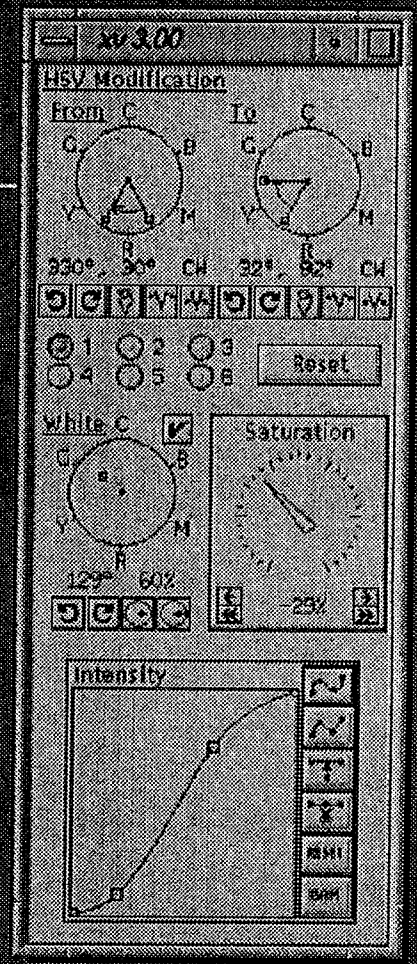


xv Edits Colors

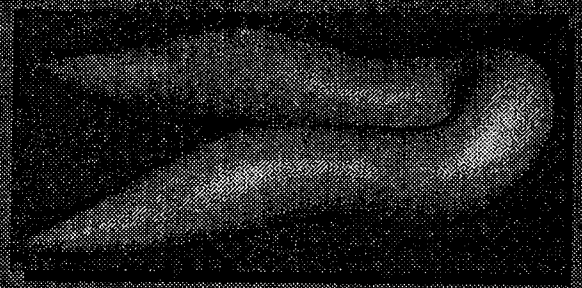
Hue shift

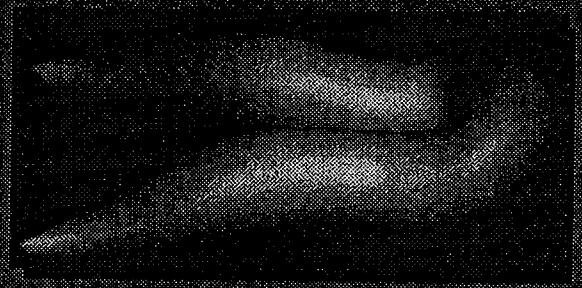
Balance & saturation

Intensity

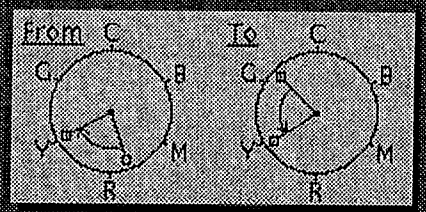


Shifting the Hue

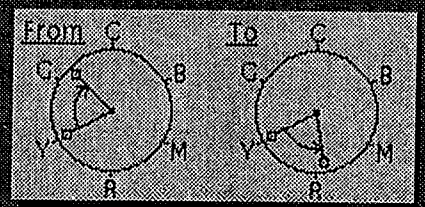




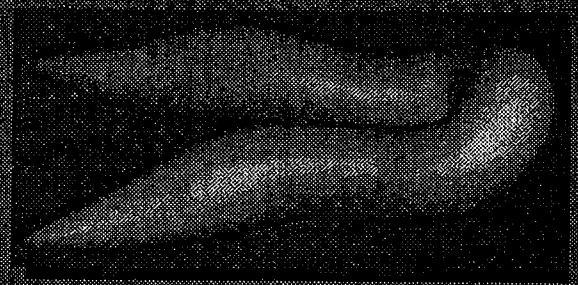
Red to Green



Green to Red



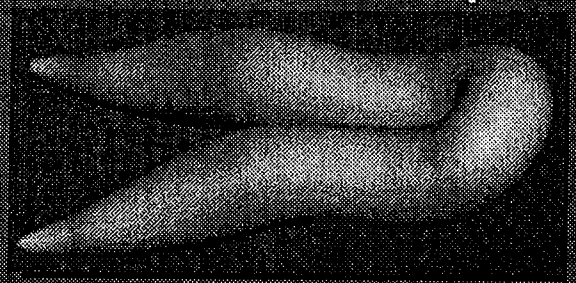
Balance, Saturation, Intensity



Original

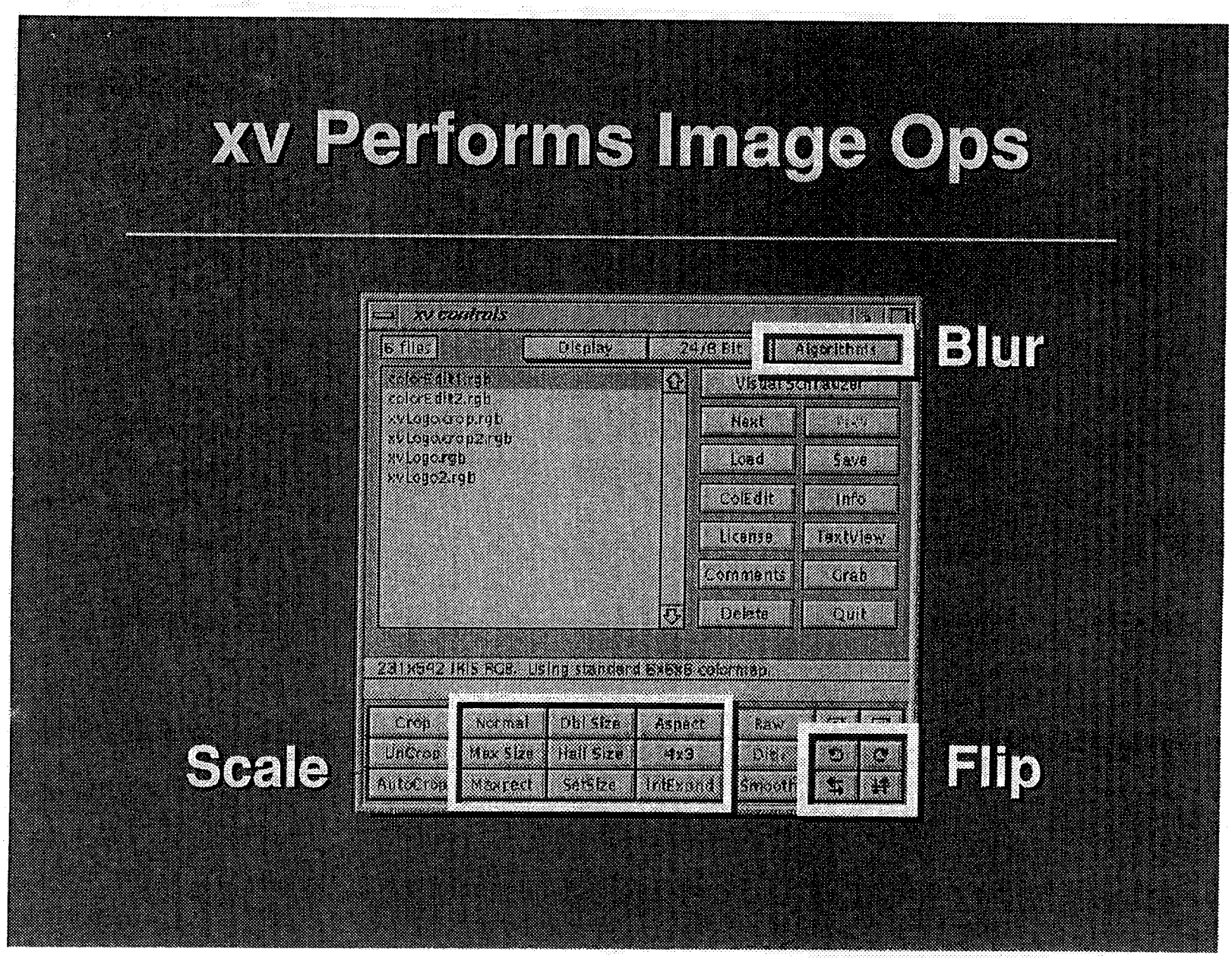
Unsaturated

White balance = sepia



Highlights reduced

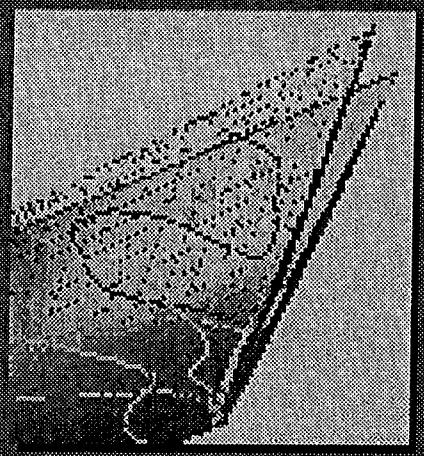
xv Performs Image Ops



Why Blur an Image?

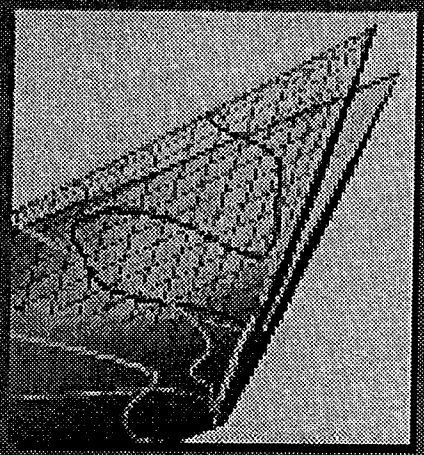
Shrinking obliterates fine details

Blurring extends fine details



reduce only

blur & reduce



xv From the Net

Available via ftp

ftp.x.org/contrib

Postscript manual on WWW

http://www.cm.cf.ac.uk/Applications/xvdocs.html

pbmplus

pbm = "portable bitmap"

Converts file formats

Performs image operations

Evolution of pbmplus

pbm = "portable bitmap"

pgm = "portable graymap"

ppm = "portable pixmap"

pnm = "portable anymap"

pbmplus Converts Formats
gif
pbm
x11
sun
rgb
jpeg
tiff
pbmplus
85 of 129 routines
gif
pbm
x11
sun
ps
rgb
jpeg
tiff

p?m Text Format

```
p2      This designates a pgm file
4  3    The image's x and y dimensions
255     The maximum intensity

  g     g     g     g
128   128   128   128
128   128   128   128
128   128   128   128
```

p?m Text Format

p3 *This designates a ppm file*
4 3 *The image's x and y dimensions*
255 *The maximum intensity*

r	*g*	*b*	*r*	*g*	*b*	*r*	*g*	*b*	*r*	*g*	*b*
0	0	255	0	0	255	0	0	255	0	0	255
0	0	255	0	0	255	0	0	255	0	0	255
0	0	255	0	0	255	0	0	255	0	0	255

Examples

pnmsmooth big.ppm > blur.ppm

blur a color image ...

pnmscale 0.5 blur.ppm > small.ppm

... shrink it ...

ppmtopgm small.ppm > small.pgm

... make it grey ...

ppmtogif small.pgm > small.gif

... and convert it to gif

pbmplus From the Net

Available via ftp

ftp.ee.lbl.gov
ftp.x.org/contrib
gatekeeper.dec.com/pub/graphics

Tar file includes man pages