Retouching with Perl

COLOR PLAY

In many cases, whole series of digital images need the same kind of modifications, which forces the photographer to repeat the same steps time and time again in GIMP. Have you ever considered retouching in Perl?

BY MICHAEL SCHILLI

Before posting snapshots I've taken with my digital camera to the web, I used to go through the same old steps with GIMP. First, I'd reduce the image size to a width of 1,000 pixels because the image size my Nikon D70 gives me is just too much for the web and uploading the images takes too long. Also, to improve the contrast, correct any color casting, and make images tack-sharp with GIMP's *Sharpen* function, I typically select a value of *20*.

As you might know, GIMP has a convenient scripting interface that lets users automate recurring tasks, and you can even run it at the command line without launching the GUI. GIMP developers have made some fairly significant changes to the whole API and nothing works the way it used to. Fortunately, GIMP documents the functions completely and thoroughly in the *Xtns | Procedure Browser* menu.

The standard interface is implemented in the rocket scientist's favorite programming language, Scheme.

Perl Module

Thank goodness there is a Perl module. I needed a couple of tricks to install it on Ubuntu 7.10, and I'll explain the steps later. After the install, you can run the *picfix* script (Listing 1) at the command line by typing *picfix file.jpg*. Under the hood, the script calls GIMP (without the GUI) and then invokes *register()* to register the *picfix()* function.

Strangely, the GIMP interface insists on scripts that run at the command line, creating a menu entry, and *picfix* has no option but to comply. Line 49 of the script calls the *main()* function that branches off to GIMP and returns after completing its chores, and *exit* makes sure that the script gives the return code from *main()* before quitting.

Figure 1 shows the original image, a picture taken from my balcony in San Francisco with the early evening sun lighting up the city nicely. Despite this, I still wasn't happy with the colors in the original.

Picfix

Running *picfix* gave me the results you can see in Figure 2. The contrast is vastly improved and the colors are far more realistic.

The *picfix()* function defined in lines 52ff., which GIMP executes as a callback, runs the *gimp_file_load()* function that loads the digital image from a given file on disk. A call to *image_scale()* (line 134) scales the image to a width of 1,000 pixels.

The *gimp_levels_stretch()* function (line 74) then simulates the *Auto* button in the GIMP *Levels* dialog and maximizes the contrast by distributing the

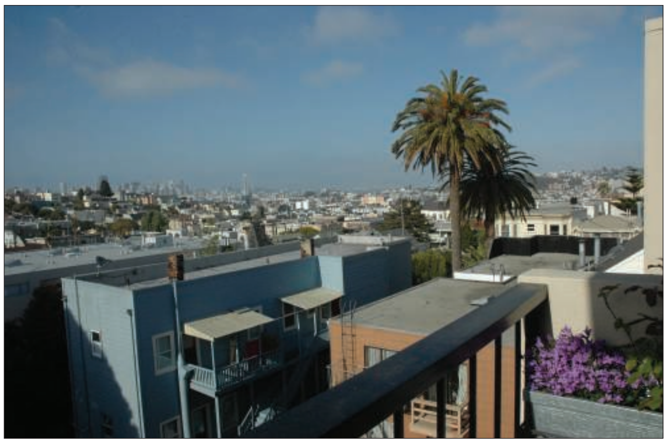


Figure 1: The original image is color cast and the contrast could be better.

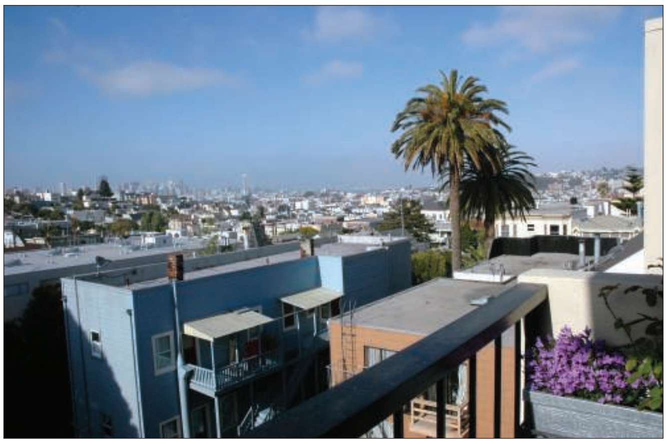


Figure 2: After retouching with picfix, the colors are far more natural and the contrast is much improved.

color values used in the image across the whole of the available bandwidth.

The *plug_in_sharpen()* method (line 90) with a parameter of 20 then improves the focus, then *gimp_file_save()* (line 97) saves the file as *file-1.jpg* using the original format. Whether the image is a JPEG or PNG makes no difference; internally, the load/save methods hand control over to the GIMP routines for the format in question.

Loading the supporting modules by calling *use Gimp qw(:auto)* and *use Gimp::Fu* has the practical side effect of loading all of GIMP's functions into the script's namespace. Programmers will be happy to hear that the *:auto* tag also includes GIMP constants, such as *RUN_NONINTERACTIVE*.

Options

Image rescaling defaults to a width of 1,000 pixels; however, the *-s* (size) command-line option supports arbitrary values. A command line of *picfix -s 500 file.jpg* reduces the maximum image width to 500 pixels, for example, with the maximum size relating to the width in landscape images, but to the height in portrait format. The *scale_image_down()* subroutine in line 109ff. provides the If/Else logic for this.

If you prefer to check the results of your scripted actions on the image, you can set the *-x* (for X Window) option to view the image in the viewer set as a default in line 13 (in this case, Eye of Gnome, *eog*).

To disable the Autolevel function, which does not always return satisfactory results, set the *-l 0* option.

Color Cast

If you have a photo that is too green, too red, or too blue, you can assume that something is wrong with the color balance. A white object in a scene you photograph really should be white. The

Listing 1: picfix (continued on p72)

```
001 #!/usr/bin/perl
002 # Mike Schilli, 2008
003 # (m@perlmeister.com)
004 use warnings;
005 use strict;
006
007 use Gimp qw(:auto);
008 use Gimp::Fu;
009 use ColorCast;
010 use Getopt::Std;
011 use Log::Log4perl qw(:easy);
012
013 my $viewer = "eog";
014
015 Log::Log4perl->easy_init(
016   $DEBUG);
017
018 getopts("xl:c:a:s:",
019   \my %opts);
020
021 $opts{a} ||=
022     "green";     # color adjust
023 $opts{s} ||= "1000";    # size
024 $opts{l} ||= 1;    # autolevel
025
026 DEBUG "Starting up";
027
028 my $menu =
029 "<Toolbox>/Xtns/Perl-Fu/
    Picfix";
030
031 my $file = $ARGV[0];
032 die "No file"
033   unless defined $file;
034
035 register(
036  "perl_fu_picfix",     # Name
037  "Fix Colors and More"
038  ,           # Explain
039  "",         # Help
040  "",          # Author
041  "",          # Copyright
042  "",          # Date
043  $menu,       # Menu
044  "*",         # Images accepted
045  [undef],     # No parameters
046  \&picfix     # Function
047 );
048
049 exit main();
050
051 ###############################
052 sub picfix {
053 ###############################
054
055  my $img =
056    gimp_file_load(
057   RUN_NONINTERACTIVE, $file,
058   $file);
059
```

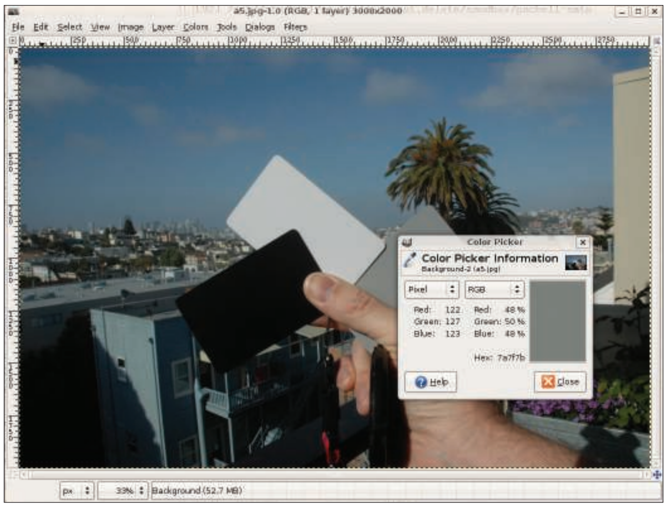
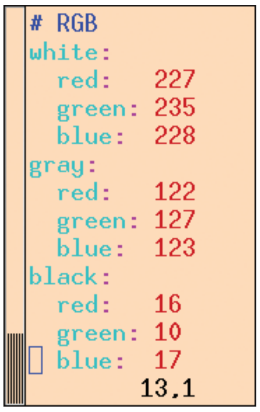


Figure 3: A set of white, gray, and black cards makes it easier to locate control points.



```
# RGB
white:
  red:   227
  green: 235
  blue:  228
gray:
  red:   122
  green: 127
  blue:  123
black:
  red:   16
  green: 10
  blue:  17
              13,1
```

Figure 4: The file colorcast.yml stores the color values I measured for the black, gray, and white cards.

same principle applies to gray or black objects. However, if you have not adjusted your camera's white balance – something professional photographers always do – you could experience unnatural-looking colors. Later, you can correct color casting in the digital image by a method described in *Grokking the GIMP* [2]. Although the JPEG format used by many low-budget cameras restricts your options here, you can typically achieve fairly satisfactory results.

One problem is that many photos simply do not contain pure white, black, or gray elements; however, photographic equipment retailers have plastic cards that can help you. Simply place the cards somewhere in a test shot, and then use the measured values to compensate any further shots you take of the same scene.

Of course, if the lighting changes – if, for example, the sun comes out from behind a cloud – you will need to take another test shot with the cards before you continue.

In Figure 3, I used the GIMP's Color Picker tool to measure the color values of the gray card. The results were Red: *122*, Green: *127*, and Blue: *123*. For a perfect picture, all three color channels should have identical values. The same thing applied to the white and black cards: the values I got here were 227/235/228 and 16/10/17, respectively.

Listing 1: picfix (continued from p71)

```
 die "Can't load $file"
   unless $img;

 my $layer =
   image_get_active_layer(
  $img);

 scale_image_down($img,
  $opts{s});

 $layer =
   $img->get_active_layer();
 if ($opts{l}) {
  DEBUG "Autolevel [$file]";
  gimp_levels_stretch(
   $layer);
 }

 if ($opts{c}) {
  my $colorcast =
    ColorCast->new(
   yml_file => $opts{c},
   drawable => $layer,
    );
  $colorcast->load();
  $colorcast->adjust_to(
   $opts{a});
 }

 DEBUG "Sharpening $file";
 $img->plug_in_sharpen(
  $layer, 20);

 $file =~ s/\./-1./g;
 $file =~ s/\.nef$/.png/g;

 DEBUG "Saving $file";
 gimp_file_save(
  RUN_NONINTERACTIVE,
  $img,  $layer,
  $file, $file
 );

 system("$viewer $file")
   if $opts{x};
 return $img;
}

#################################
sub scale_image_down {
#################################
 my ($img, $size) = @_;

 my $w = $img->image_width();
 my $h =
   $img->image_height();

 if ($w >= $h) {
  if ($w > $size) {
   $h = int($h * $size / $w);
   $w = $size;
  } else {
   return 1;
  }
 } else {
  if ($h > $size) {
   $w = int($w * $size / $h);
   $h = $size;
  } else {
   return 1;
  }
 }

 DEBUG "Resizing to $w x $h";
 $img->image_scale($w, $h);
}
```

The *colorcast.yml* file (Figure 4) shows the values GIMP returned in YAML format. The script parses these values from a file whose name you pass in at the command line, as in *picfix -c colorcast.yml file.jpg*. This lets the script adjust any number of images of the same scene. To do so, it has to transform all the colors used in the image in such a way that it removes color components in those sections of the image that are actually colorless.

To allow this to happen, I needed to define a transition function with a graph that covers the known measuring points, and performs spline-style interpolations for all other values. GIMP's *Curves* dialog from the *Tools* | *Color Tools* menu supports this. All you must do is set the color that needs adjustment in the dialog's selection box at the top and then make a dent in the graph, which is initially straight, so that the line touches the control values that you determined.

If you assume the gray card gives values of Red: *122*, Green: *127*, and Blue: *123*, to adjust the image, just set the values for the red and blue channels to the same value as green, *127*, which gives you a pure gray.

To do so, open the red channel in the *Curves* dialog and drag the straight line at the *122/122* point to *122/127*, which makes a slight dent into the graph as the curve auto-adjusts. While you are dragging the line, GIMP shows you the current coordinates at the top left-hand side. Then do the same for the blue channel, dragging *123/123* to *123/127*. The red and blue channels have slightly bumpy curves when you are done, as you can see in Figure 5.

Now repeat the process for the black and white cards; This gives you a total of three control points in the red and blue channels, all of which adjust the color balance.

Of course, you can script the whole process. Listing 2, *ColorCast.pm*, shows that its constructor expects two values: *yml_file*, the YAML file with the measured values, and *drawable*, the GIMP layer in which to perform the color transformation.

Listing 2: ColorCast.pm

```
package ColorCast;
# Mike Schilli, 2008
# (m@perlmeister.com)
use strict;
use warnings;

use YAML
  qw(LoadFile DumpFile);
use Gimp qw(:auto);
use Log::Log4perl qw(:easy);

my %channels = (
 red   => HISTOGRAM_RED,
 blue  => HISTOGRAM_BLUE,
 green => HISTOGRAM_GREEN,
);

################################
sub new {
################################
 my ($class, %options) = @_;

 my $self = {
  yml_file => undef,
  drawable => undef,
  ctrls    => undef,
  %options,
 };

 bless $self, $class;
}

################################
sub save {
################################
 my ($self) = @_;

 DumpFile $self->{yml_file},
   $self->{ctrls};
}

################################
sub load {
################################
 my ($self) = @_;

 $self->{ctrls} =
   LoadFile $self->
   {yml_file};
}

################################
sub adjust_to {
################################
 my ($self, $ref_channel) =
   @_;

 DEBUG
"Adjusting to $ref_channel";

 for my $channel (
  keys %channels)
 {

  next
    if $ref_channel eq
    $channel;

  my $ctrls = $self->{ctrls};

  my @points =
    (0, 0, 255, 255);

  for my $ctrl (keys %$ctrls)
  {
   push @points,
     $ctrls->{$ctrl}
     ->{$channel},
     $ctrls->{$ctrl}
     ->{$ref_channel};
  }

  gimp_curves_spline(
   $self->{drawable},
   $channels{$channel},
   \@points
  );
 }
}

1;
```

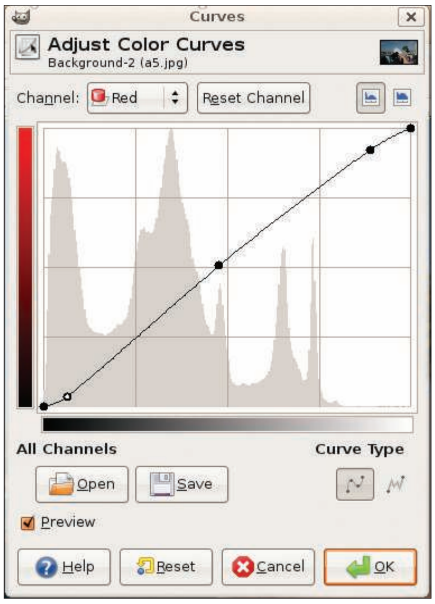


Figure 5: Correcting color casting in the Curves dialog. This example uses three control points to adjust the line for the red channel.

The *load()* method then parses the YAML values, which are stored in a hash of hashes. Starting in line 53, *adjust_to()* then accepts a channel (e.g., *green*), and it adjusts the values for the other two channels (*red*, *blue*) to match the green values. The GIMP function that handles this is *gimp_curves_spline()*, which accepts the active layer in the image to be modified and a series of control points as parameters.

On top of the control points, you need to pass *(0,0)* and *(255,255)* to *adjust_to()* to make sure that the graph starts at the bottom left-hand side and finishes at top right, as shown in Figure 5.

If you do not specify any values, the *picfix* script will not perform any color correction. The *-c* option passes in a YAML file that you created previously, and the *-a* (adjust) option accepts the channel name to which the other two channels will be adjusted. This defaults to *green*.

Tricky Install

By typing

```
sudo apt-get install libGIMP-perl
```

on Debian-based Linux distributions, you should be able to install the whole Perl GIMP enchilada.

Unfortunately, the Ubuntu 7.10 release goes haywire. Synaptic takes the insanity a step farther and even suggests uninstalling GIMP and the Ubuntu desktop to install *libgimp-perl*.

The reason for this madness seems to be a broken GIMP package, which contains a couple of files belonging to the libgimp-perl distribution, but not the required Perl modules.

Solution

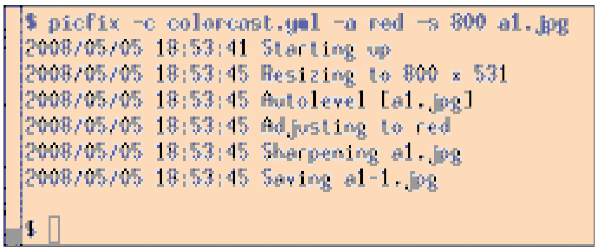
To work around this, use the steps outlined in the "Ubuntu Tricks" box: Download the libgimp-perl source code, rebuild, increase the version number by 1 (that is … *dfsg-2* becomes … *dfsg-3*), and go on to install.

This solution is quick and dirty and probably will not survive the next GIMP update, but it's good enough to get by for now. Ubuntu Hardy fixes the problem for good.

After the install, you will need the ColorCast.pm module in a path where *picfix* can find it; alternatively, you could hard code the *usr lib directory;* in *picfix* to match your ColorCast.pm installation directory.

The other Perl modules you need to get started are available from CPAN and can be installed in a CPAN shell or can be installed more conveniently in Ubuntu by typing *apt-get install libyaml-perl* and *liblog-log4perl-perl*.

Line 16 in *picfix* sets the logging level to *$DEBUG*, but you can switch to *$ERROR* if all this verbosity is bugging you (Figure 6).



```
$ picfix -c colorcast.yml -a red -s 800 a1.jpg
2008/05/05 18:53:41 Starting up
2008/05/05 18:53:45 Resizing to 800 x 531
2008/05/05 18:53:45 Autolevel [a1.jpg]
2008/05/05 18:53:45 Adjusting to red
2008/05/05 18:53:45 Sharpening a1.jpg
2008/05/05 18:53:45 Saving a1-1.jpg
$
```

Figure 6: If you keep the default Loglevel, the script will log its activities in detail.

Some Like It Raw

Digital SLR cameras, such as the Nikon D70, will store your images in raw format on request. Of course, doing so consumes vast amounts of card space, and you will need to install the Ubuntu *gimp-ufraw* package to allow GIMP to handle the raw data.

Although GIMP can read the *.nef* formatted raw data, it can't actually store files in this format, which explains why *picfix* changes the file suffix to *.png* shortly before writing to tell GIMP to save the results in PNG format. ■

Ubuntu Tricks

```
sudo apt-get install devscripts
sudo apt-get source libgimp-perl
sudo apt-get build-dep libgimp-perl
cd libgimp-perl-2.0.dfsg+2.2pre1.dfsg
sudo dch --newversion=2.0.dfsg+2.2pre1.dfsg-3 -- Version Bump
sudo dpkg-buildpackage -uc -us
cd ..
sudo dpkg --install --force-overwrite libgimp-perl_2.0.dfsg+2.2pre1.dfsg-3_i386.deb
```

INFO

[1] Listings for this article: *ftp://ftp.linux-magazin.com/pub/listings/magazine/94/*

[2] *Grokking the GIMP* by Carey Bunks: *http://gimp-savvy.com/BOOK/*

[3] Additional GIMP and photo-manipulation books: *http://gimp-savvy.com/EXTRAS/books.html*

[4] Tutorial on the GIMP Perl interface: *http://imagic.weizmann.ac.il/~dov/gimp/perl-tut-2.0/*

THE AUTHOR

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