GIMP – GNU Image Manipulation Program

What is GIMP?

GNU is a free and open-source raster graphics editor used for image retouching and editing, free-form drawing, resizing, cropping, photo-montages, converting between different image formats, and more specialized tasks.

GIMP began in 1995 as the school project of two university students and now GIMP is a full-fledged application, available on all distributions of Linux, OS-X and Microsoft Windows. It is released under GPLv3 licenses and is freely distributed to (and by) anybody, who can look at its contents and its source code and can add features or fix problems.

GIMP is expandable and extensible, designed to be augmented with plugins and extensions in order to improve its functionality. This is implemented through the use of a scripting interface.

GIMP was originally released as the General Image Manipulation Program but later the acronym was changed from General to GNU. The first public release of GIMP (0.54) was made in January 1996 that supported UNIX systems, such as Linux, SGI IRIX and HP-UX. It is primarily developed by volunteers as a free software project under the banner of the GNU Project. Development takes place in a public git source code repository, on public mailing lists and in public chat channels on the GIMPNET IRC network.

User Interface

GIMP is presented in two forms:

(i) **Single mode**, and

(ii) **Multiple window mode**

In multiple window mode, a set of windows contains all GIMP's functionality. By default, tools and tool settings are on the left and other dialogues are on the right. A layers tab is often to the right of the tools tab, and allows a user to work individually on separate image layers. Layers can be edited by right-clicking on a particular layer to bring up edit options for that layer. The tools tab and layers tab are the most common dockable tabs. *GIMP 2.8 defaults to the multiple window mode.* GTK+ (GIMP tool kit) is used to create the graphical user interface.

Features

(i) Functional Features

1. **Color :** There are several ways of selecting colors, including palettes, color choosers and using an eyedropper tool to select a colour on the canvas. The built-in color choosers include **RGB/HSV** selector or scales, water-color selector, **CYMK** selector and a color-wheel selector. Colors can also be selected using hexadecimal color codes as used in HTML color selection. GIMP has native support for indexed colour and RGB spaces. Other color spaces are supported using decomposition where each channel of the new color space becomes a black-and-white image. CMYK, LAB and HSV (hue,

saturation, value) are supported this way. Color blending can be achieved using the Blend tool, by applying a gradient to the surface of an image and using GIMP's color modes. Gradients are also integrated into tools such as the brush tool, when the user paints this way the output color slowly changes. There are a number of default gradients included with GIMP. A user can also create custom gradients with tools provided. Gradient plug-ins are also available.

2. **Selections and paths :** GIMP selection tools include a rectangular and circular selection tool, free select tool, and fuzzy select tool (also known as magic wand). The advanced select by color tool for selecting contiguous regions of color—and the scissors select tool, which creates selections semi-automatically between areas of highly contrasting colors.

Quick Mask Mode

GIMP also supports a **quick mask mode** where a user can use a brush to paint the area of a selection. Visibly this looks like a red colored overlay being added or removed.

Simple Interactive Object Extraction (SIOX)

The **foreground select tool** is an implementation of Simple Interactive Object Extraction (SIOX) a method used to perform the extraction of foreground elements, such as a person or a tree in focus.

Paths Tool

The Paths Tool allows a user to create vectors (also known as Bézier curves). Users can use paths to create complex selections, including around natural curves. They can paint (or "stroke") the paths with brushes, patterns, or various line styles. Users can name and save paths for reuse.

3. **Image Editing :** There are many tools that can be used for editing images in GIMP. The more common tools include a *paint brush, pencil, airbrush, eraser and ink tools* used to create new or blended pixels.

Bucket Fill tool

The Bucket Fill tool can be used to fill a selection with a color or pattern. The Blend tool can be used to fill a selection with a color gradient. These color transitions can be applied to large regions or smaller custom path selections.

GIMP also provides **"smart" tools** that use a more complex algorithm to do things that otherwise would be time consuming or impossible. These include:

- **Clone tool**, which copies pixels using a brush
- **Healing brush**, which copies pixels from an area and corrects tone and color
- **Perspective clone tool**, which works like the clone tool but corrects for distance changes
- **Blur and sharpen tool** blurs and sharpens using a brush
- The **Smudge tool** can be used to subtly smear a selection where it

stands.
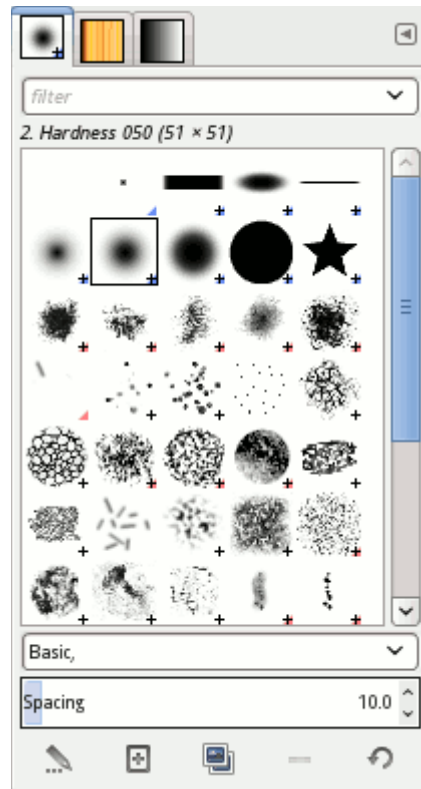- **Dodge and burn tool** is a brush that makes target pixels lighter (dodges) or darker (burns)

Figure 1. The toolbox in a GIMP environment

4. Layers, layer masks and channels : An image being edited in GIMP can consist of many layers in a stack. Each layer in an image is made up of several channels.

In an RGB image, there are normally 3 or 4 channels, each consisting of a red, green and blue channel. Color sublayers look like slightly different gray images, but when put together they make a complete image.

The fourth channel that may be part of a layer is the alpha channel (or layer mask). This channel measures opacity where a whole or part of an image can be completely visible, partially visible or invisible. Each layer has a layer mode that can be set to change the colors in the image.

Text layers can be created using the text tool, allowing a user to write on an image. Text layers can be transformed in several ways, such as converting them to a path or selection.

5. File Formats : GIMP supports importing and exporting with a large number of different file formats. GIMP's native format XCF is designed to store all information GIMP can contain about an image. *XCF is named after the eXperimental Computing Facility where GIMP was authored.* Import and

export capability can be extended to additional file formats by means of plug-ins.

Privilege	Formats
Import and export	BMP, JPEG, PNG, GIF, TIFF, Autodesk flic animations, Corel PaintShop Pro images and Adobe photoshop documents, bitmap image, xwd, Zsoft PCX, r/w path info from SVG files and r/w ICO windows icon files.
Import only	PDF documents, can read raw image formats used by many digital cameras
Export only	MNG layered files (Linux Version only) HTML (as a table with colored cells), C source code files (as an array) and ASCII Art (using a plug-in to represent images with characters and punctuation making up images), though it cannot read these formats.

(ii) Non-Functional Features

1. **Automation, scripts and plug-ins :** GIMP has approximately 150 standard effects and filters, including Drop Shadow, Blur, Motion Blur and Noise.

   GIMP operations can be automated with scripting languages. The Script-Fu is a Scheme-based language implemented using a TinyScheme interpreter built into GIMP. GIMP can also be scripted in Perl, Python (Python-Fu), or Tcl, using interpreters external to GIMP. New features can be added to GIMP not only by changing program code (GIMP core), but also by creating plug-ins. These are external programs that are executed and controlled by the main GIMP program. MathMap is an example of a plug-in written in C.

   There is support for several methods of sharpening and blurring images, including the blur and sharpen tool. The unsharp mask tool is used to sharpen an image selectively — it only sharpens areas of an image that are sufficiently detailed. The Unsharp Mask tool is considered to give more targeted results for photographs than a normal sharpening filter. The Selective Gaussian Blur tool works in a similar way, except it blurs areas of an image with little detail.

2. **GEGL :** GIMP can use GEGL to perform high bit-depth color operations; because of this less information is lost when performing color operations. When GEGL is fully integrated, GIMP will have a higher color bit depth and better non-destructive work-flow. Current distribution versions of GIMP only support 8-bit of color, which is much less than what e.g. digital cameras produce (12-bit or more).

3. **GIMP Paint Studio (GPS) :** A collection of brushes and accompanying tool presets, aimed at artists and graphic designers. It speeds up repetitive tasks and can save tool settings between sessions.
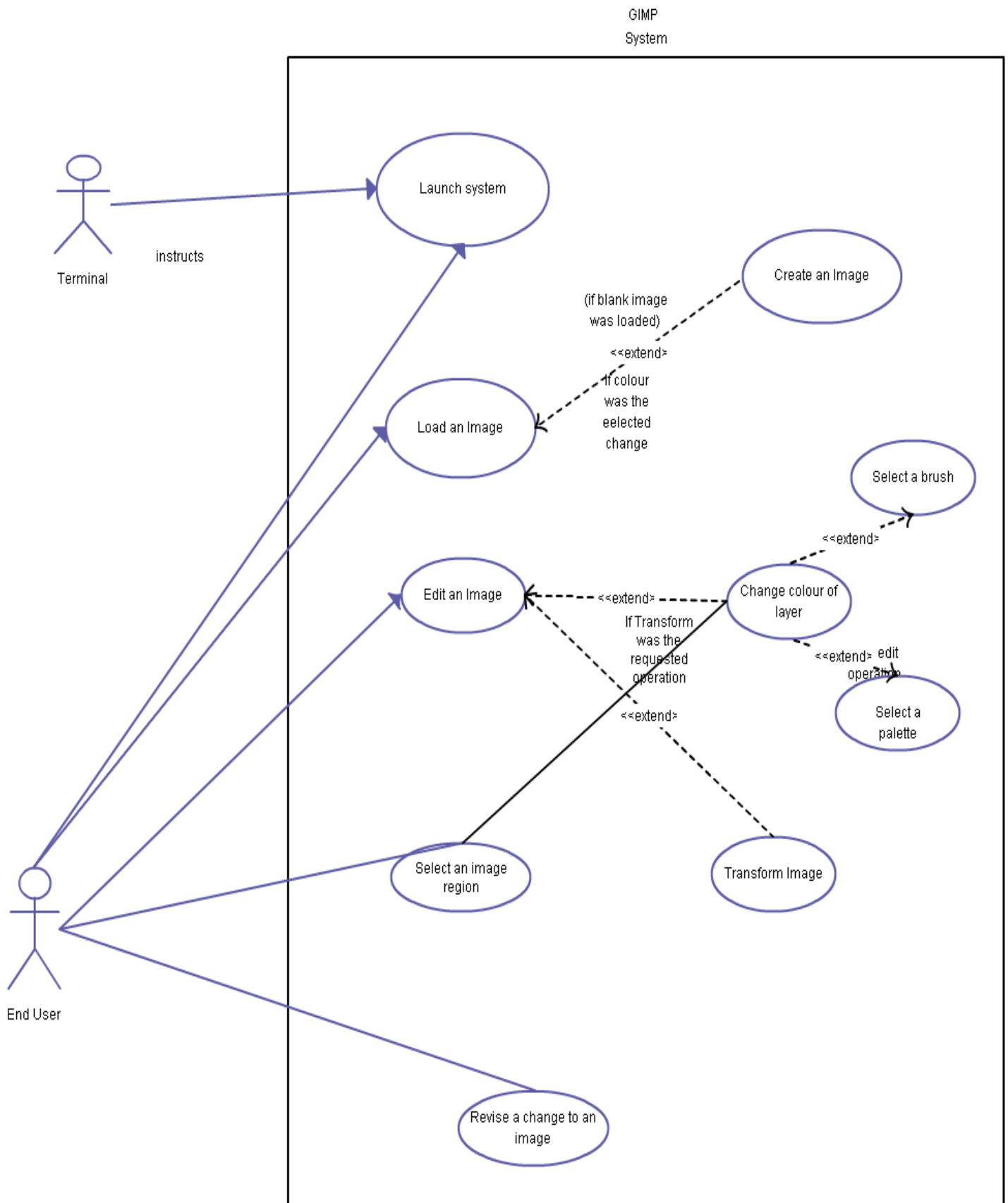
Diagrams and Representations

GIMP
System

Launch system

Create an Image

Terminal

instructs

(if blank image
was loaded)

<<extend>

If colour
was the
eelected
change

Load an Image

Select a brush

<<extend>

Edit an Image

<<extend>

Change colour of
layer

If Transform
was the
requested
operation

<<extend> edit
operation

<<extend>

Select a
palette

Select an image
region

Transform Image

End User

Revise a change to an
image

Figure 1. Use case diagram for GIMP system

Work Flow

The above diagram explains the work flow for editing an image in GIMP editor. We will step-by-step go through each of them

Launch System : The primary actor for this use case is the user itself.

Create Image : This use case is triggered by the the GIMP system. If a blank image is loaded then the process is redirected to Loan an Image use case.

Load an Image : The user is the primary actor for this use case. This is an extended use case of *Create Image*.

Edit an Image : Once the system is launched and the canvas is ready, the user can start editing the image. In the process of editing an image, the user may need different filtering, cropping, and enhancement tools. We will see them all in the below use cases.

Select an Image Region : The user can select any desired region from the image which he wants to edit.

Change color of the layer : This is an extended use case of *Select an Image Region use case.* The user may then set the desired colour to the current layer. The user can also choose a color from the palette.

Select a Palette : This is the extended use case of *Change color of the layer.* The user can select the palette and can make desired modifications.

Select a brush : This use case is again an extended use case of *Change color of the layer*. The user can also select a brush to fill colors into the image.

Transform Image : If the user requests the system to transfor the image, he could do it here. This is an extended use case of *Edit an Image.*

Revise a change to an image : The user can now save the changes to the image file whatever he has done till now.

My Design

GIMP is a powerful image editor and has many potential applications but still lacks in feature when compared to adobe photoshop.

1. The enhancement tools can be better than what they are.

2. The GIMP system should allow to save files in PSD (photoshop document) format.