Multimedia & Computer Visualization

Exercise #8

GIMP - editing, retouching, paths and their application

The aim of this exercise is to present the elements of digital photographs editing techniques and the application of so-called paths in editing and supporting drawing more complex graphic objects.

There will be considered the following three issues:

- Building an image from two photographs, as foreground and background and then retouching the result obtained.
- The concept of paths and its application to determine complex selections.
- Paths use for drawing.

1. A simple example of images merge

The task consists in replacing background in an image so as to obtain an effect similar to that shown on Fig. 1. As a new background for the left image (Fig. 1) will be used the image shown on Fig. 2. The outline of the aforementioned operation is fairly simple. The original image must be cut and paste as the foreground of the image containing the new background.

![Original image and edited image](image)

**Fig. 1. Original image (left) and the edited one (right)**
However, a proper implementation of the task requires usage of several not entirely banal activities and so you should examine them in detail. Of course, the final result depends on the precision of operations, diligence and also to some extent sense of art.

![A picture selected as background image](image)

**Fig. 2. A picture selected as background image**

Implementation of images editing can be divided into three stages. First, you need to prepare the background. The second step is the cut out of source image fragments to be left and placing them on the image with the background. The last stage of the procedure involves retouch of some image parts and getting rid of minor errors resulting from previous operations.

In the following description of the image editing procedure, attention will be paid only for new elements in relation to the tasks performed in previous exercises. Activities such as image resizing, cropping and improving quality will no longer be described in detail. In order to achieve the final result do the following:

1. Load up the source and background images from *Foto_1.jpg* and *Foto_2.jpg* files.
2. Read the source image parameters (size and resolution).
3. Crop the image containing the background, in order to get a picture with the appropriate portion of the image loaded up from *Foto_2.jpg* file and new image size and resolution were consistent with the parameters of the source one (loaded from *Foto_1.jpg* file). Processed background image save as a new file.
4. Improve the quality of the background image using the procedure more or less the same as in the previous exercise (color levels, color balance, brightness and contrast).
5. Pick the selection tool called the "magic wand" in the tool options, set the *Threshold* at about 20 and click on the source image in the place where the sky is white. The result should be like in Fig. 3.
Operation of "magic wand" made the selection a consistent area consisting of the points of a color similar to the point indicated by wand. Color similarity range is determined by the Threshold parameter chosen in the tool options. The size of the selected area obviously depends on Threshold value. For any specific case it is advisable to set Threshold value experimentally in order to get a selection closest to the desired one. If you do not get a satisfactory result, it can be improved by clicking Wand with SHIFT button pressed into areas that have not been selected and should have been (Fig. 3). The final selection effect after Wand use is shown on Fig. 4.

- Use commands Select, Invert in order to get "inverted" selection, to the one received after magic wand operation. This will cause the selected area will complement the highlighted area, namely we will get part of the image containing the foreground image.

- Improve the obtained selection using the commands Select, Rounded Rectangle, which will smooth the selection edges. Rounding radius can be selected in this manner by changing the shape of a selected area.

- After obtaining the desired selection you still need remove everything from the picture which on the outside of selection by pressing DELETE button. It clears everything except the selection itself.

- Copy the selected image content (selection).
Create a new layer on the image containing the background and paste the copied selection.

After any position and merge layers adjustments flatten the image using the commands **Image, Flatten Image**.

The effect of the work should be about the same as the right picture of Fig. 1 But the merged image still contains some errors. In the bottom left of the photo you can see not very realistic looking buildings (Fig. 5).

You can also easily see that some edges of pasted foreground are merged with the background in a way that at first glance is not natural (Fig. 6).
Both errors can be improved with retouching tools. The fundamental role is played here by the cloning stamp. This tool works so that a designated area of the picture is copied from part to another. All the same rules applies to cloning stamp as for all other painting tools, so you can choose the degree of opacity, blending mode, type of tip, etc.

The way to use a stamp, for example, to remove unwanted buildings from the image (Fig. 5) is as follows:

1. After selecting stamp and setting the appropriate tool options click with pressed CTRL portion of the image containing the waves. In this way the fragment with waves pattern will be selected. The size of the sample pattern is consistent with the size-selected in the tool tip options (option Brush).

2. Paint over unnecessary buildings with selected pattern. To get a better result pattern should be changed from time to time by taking new sample from another part of the image.

Using a stamp, you can also remove the adverse effects shown in Fig. 6. It should be noted that to clone stamp tool is very versatile and flexible, and when appropriate in the use of practice, you can very quickly reach the intended effects.

Retouching an image may also require the use of other tools.

2. Paths and their use

The exercises performed previously used objects such as selection, text, drawings or drawing tools are collections of images and thus pixels. The GIMP user has also available other type of objects that are not collections of pixels, but the effect of processing on the image of a mathematical description defining the shape. These types of objects in general are called vector objects and were called in GIMP - paths. Mathematical apparatus used in the
construction of paths is quite complicated. It has chosen a kind of polynomial curves called Bezier curves.

With the help of these curves it can be very easy, and in accordance with intuition, to build a smooth polygonal approximation determined by the successive points of the plane. From the mathematical point of view, the path can be regarded as connected segments described in the aforementioned Bezier curves.

In order to create and edit paths use a path tool. It allows you to create a path and almost any change in its shape. In addition, paths have very useful properties:
- path can be saved in a separate file,
- path can be converted into a selection,
- a selection can be converted to a path,
- path can be outlined using any drawing tool.

In practice, most paths are designed to "outline" image fragments to be selected that cannot be automatically selected, for example, using the "magic wand". Such areas after path "outlining" can be converted to the selection and use further, for example, in the image editing process. Another application is to create elements templates to be used repeatedly. Templates can be, with such a mechanism, defined virtually with any accuracy, saved to separate files and then used to create not just one image.

This technique will be illustrated by the use of paths with two examples. The first concerns the creation of a complicated selection while the second shows how the paths can help accurately draw images with recurring themes repeatedly.

**Use paths to selection**

The task is to "cut" from the image saved in Foto_3.jpg file (Fig. 7) fragment representing a flower. It is assumed that you cannot effectively do this using the "magic wand". In order to get the path – when you open an image choose Paths tool: create and edit, set the design mode and then (manipulating the left mouse button, respectively) indicate the mouse contour of successive points of the object. The path will be shown on image. While designing the path you must be abide the rule, where the greater curvature is, there next points defining the path must be placed more densely, and vice versa. After the whole path creation the image should look like in Fig. 8.
Fig. 7. The object intended for selection operation

Fig. 8. Object with path „outlined” edges
Obtained path can be extended and enhanced to achieve the desired result. When correcting the path, use the Edit and Design mode and the options available in these modes. You should also pay attention to the role of the SHIFT and CTRL keys. The result improved path fragment shown in Fig. 9. You can see that the various segments of the path segments are not straight but curves. These are precisely the above-mentioned Bezier curves.

![Fig. 9. Improved section of a path in high magnification](image)

Revised path can be saved to a file. In order to do this, go to command dialog box, select Paths tab and click right mouse button on the bar with the symbol of the path you created, select Export path to save it to a file with extension *.svg.

The path can also be converted into selection by using option Path to Selection and during further work the rules that apply to selections work with it. So for example one can copy and paste the selection into another image.

**Paths application for drawing**

The task, this time, is to draw the menu fragment shown on Fig. 10. As you can see the drawing is composed of five gradient-filled, upper side rounded rectangles, contained inscriptions and the yellow line surrounding the selected option. Of course, there are a number ways how to draw this picture. Algorithm procedure given below shows one of them using a technique based on the paths. Course of action is more or less:

- build path that describes the shape of the yellow line,
- created path use for the construction of paths describing the shape of a single bookmark menu

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- convert paths into selections, and after appropriate transformations build an image out of them.

Fig. 10. Sample menu with selected *Opcja_2* tab

Build a path defining *yellow line* shape from Fig. 10 can be achieved as follows:

1. Open a new blank image of size, for example, **800** by **600** pixels.

2. Select the rectangle with a width of **100** and height **80** pixels and then round off the corners of a selection using commands *Select, Rounded Rectangle*.

3. With the help of a tool to fill areas fill the selection with black color and yielding in effect a black rectangle with rounded corners.

4. On a new layer, draw in a similar manner as before, a black rectangle with a width of **500** and height **40** pixels.

5. By moving the drawn rectangle layer, lead to a situation that the image looks as shown in Fig. 11 and flatten the resulting image.

6. With the "*magic wand*" select black figure on the drawing and fill it with the background color.

7. Use commands *Select, To Path* to convert selection into the path. Open paths info box select *Paths tool: create and edit* tool and double-click in the box corresponding to path you created. You should see a picture such as in Fig. 12.

8. Finally, using *Paths tool: create and edit* tool remove the redundant path segments, in order to get the shape of yellow line from Fig. 10 (to remove path items use *tool with pressed *SHIFT* and *CTRL* keys) and save the created path to a file with the extension *.svg*. 

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The next step of the task will be creation bookmark shape path of menu entry. For this purpose you can use just created path, it is sufficient enough:

1. Open a new image and the previously saved file from the path corresponding to the yellow line.
With the help **Paths tool: create and edit** tool remove redundant segments from the loaded paths and then combine the first and last node a new segment (while holding down the **CTRL** key). Newly created path should look like on Fig. 13.

The path shall be saved to another **svg** file.

**Fig. 13. Tab template shown as a path**

Having already two templates in the form of paths describing the contours of the yellow lines and tabs, you can begin to create a drawing with menu. It is best to draw picture elements on separate layers. To draw first item on a figure:

- Open a new image and save the file with the path that describes the bookmark outline.
- Change the path to selection and inverse the selection obtained using commands **Select, Invert**.
- Select the gradient, and after setting its parameters, fill the selection.
- Add in the appropriate drawing place - text with a description of the bookmark.
- In the same way, draw the remaining tabs in successive layers. Bear in mind the proper placement of bookmarks drawings on consecutive layers. It is best to use translations of several layers using commands **Layer, Transform, Offset**.
- After drawing all bookmarks, flatten your drawing, receiving the background image as one shown on Fig. 14.
The last step will be adding yellow line surrounding the second, lighter tab. To do this:

1. Create new layer.

2. Load the path with shape description of the yellow line from previously created file (*.svg).

3. Outline the path, for example using a brush, with yellow line of appropriate thickness. For fast path outlining can use the corresponding button (second button from right at the bottom of the Paths window).

4. Finally, flatten the image and save it to a file.