



Image Manipulation for gITIP Input Using GIMP

July 22-24, 2005

The Department of Computer Science, HKUST

Outline



- Introduction
- Techniques for producing foreground mask
- Techniques for producing background image

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Introduction



- You have learnt how to use gITIP to create animation.
- You need to prepare the input image, as well as its foreground mask and background images.



Background image



Foreground mask



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Objectives



- In the following slides, we will discuss how the foreground mask and background image can be made using image manipulation software.
- We will demonstrate how to use different techniques to process different types of images
- In this workshop, the software used is GIMP (version 1.2)



Why GIMP ?



- It is an open source freeware.
 - Downloadable at <http://www.gimp.org>
 - The most updated version is 2.0 (with more features)
- GIMP is as powerful as those commonly used image processing applications.
 - It consumes fewer internal memory.
 - The operations are similar. If you get used to GIMP, you will probably learn how to use Photoshop© easily.
- There are plenty of resources for GIMP
 - Online tutorial
 - libraries

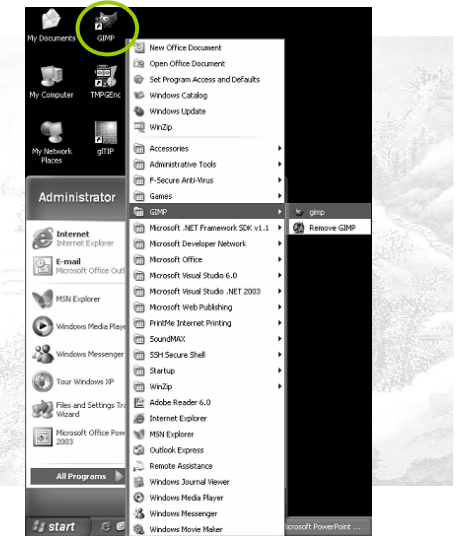
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Using GIMP 1.2.3



- To open the GIMP program,
 - click "Start" at the Menu Bar -> select "All Programs" -> "GIMP" -> "GIMP"
- You may click on the GIMP icon instead



Starting GIMP



- If you use GIMP for the first time, a setup window will pop up
- You can simply keep pressing the "Continue" button to move on.



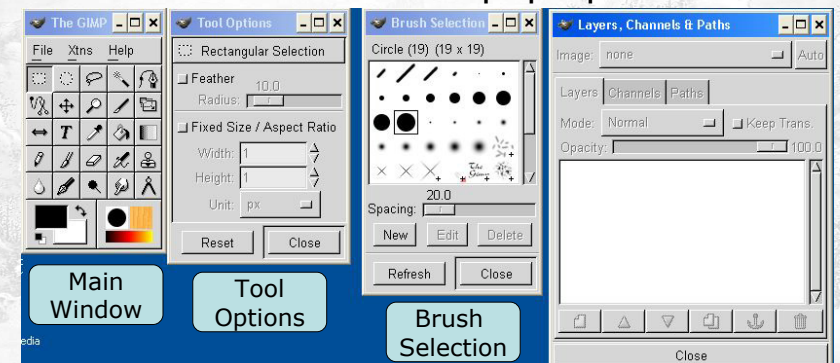
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Starting GIMP



- Several windows will be pop up.

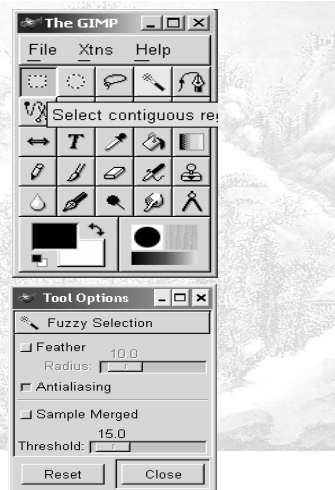


Layer, Channels & Paths

Main Window & Tool Options



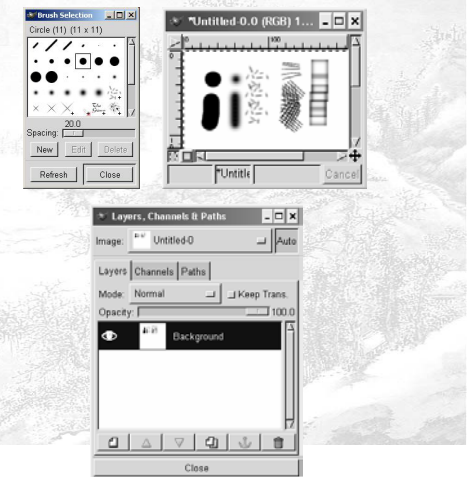
- Main window
 - Open / close the image to be edited
 - Choose the tools (operations to be performed)
 - Show the color of the background and the brush's style and color.
- Tool options
 - Adjust the parameters for the tools selected.



Brush Option & Layer



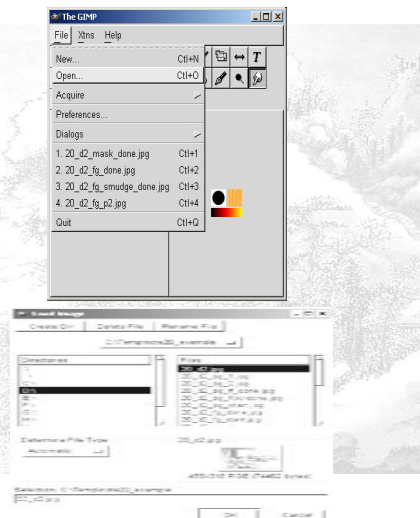
- Brush Option
 - Allows you to select the style of the brush.
- Layer
 - Allow you to view the status of the image you are working on (details will not be discussed)



Opening a file



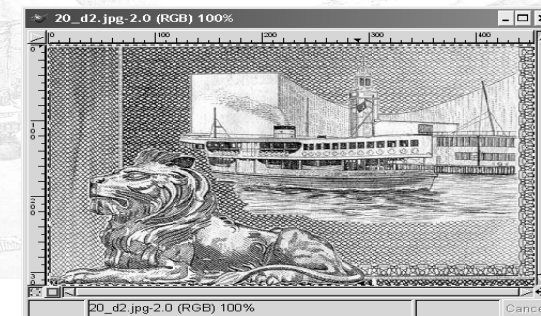
- To open an image, click "File" at the toolbar -> choose "open".
- A "Load image" window will appear.
- While you are selecting the file, you can click on the "preview" button to check if the file is the correct one.
- Exercise: Open the image "20_d2.jpg" at the "note20_example" folder



Opening a file (Cont'd)



- After you have opened the image, a new window showing the image will appear.
- The image is ready for editing.



Resize the image



- Normally speaking, the dimension of the photos taken from digital camera is too large for gTIP's input to run smoothly.
- You are suggested to reduce the image's size.
- Right click the image -> select "Image" -> "Scale Image ..."



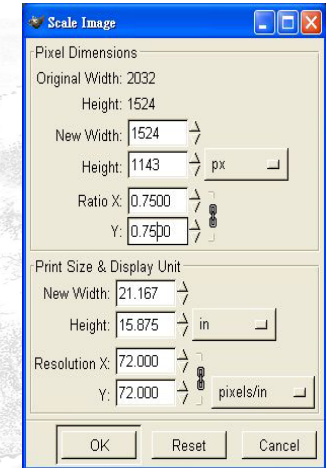
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Resize the image (Cont'd)



- Modify the ratio or the dimension of the longer side (e.g. *New Width* or *Ratio X*) so that the new dimension is around 1000 px (pixels).
- The shorter side (*New Height* or *Ratio Y*) will be scaled with the same ratio.
- Press "OK" to confirm.



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Save the image



- Right Click the image -> Select "File" -> "Save" to save the image.
- In the slides remained, techniques for making foreground mask and background image will be discussed.



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Outline



- Introduction
- Techniques for making foreground mask
 - Principle
 - Straight forward approach: Using eraser & hard edge.
 - Complete the foreground mask.
 - Alternative method 1: Use hand drawn region.
 - Alternative method 2: Use "Intelligent scissor"
- Techniques for making background image

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Creating the foreground mask



Principle:

- (Manually) identify the objects first.
- The Objects should be filled with white color.
- One white region represents one object.
- Fill the regions remained with black color.



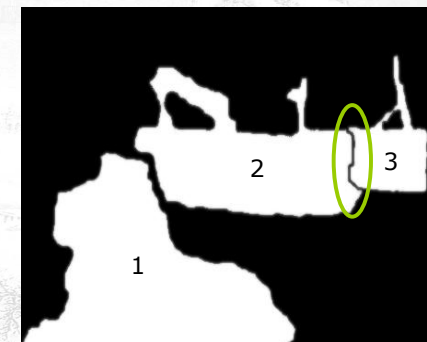
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TIPS for making the foreground mask



- If two objects are overlapped, you should try to de-attach them.
- Otherwise, they will be considered as 1 merged object.
- The 3D visual effect of the output animation will be degraded.



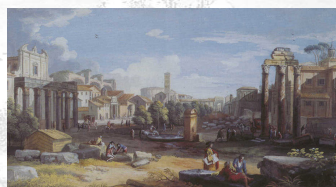
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TIPS for making the foreground mask



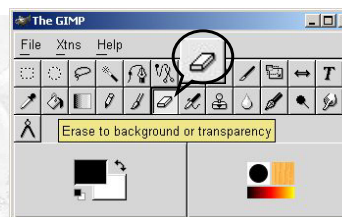
- In fact, the "foot" of the objects will be used to determine their distances from the viewpoint.
- If an object's "foot" is located at lower position, it implies that the object stands closer to the viewpoint.
- So, you may consider to merge two overlapped objects as one if they are close enough (in 3D space)
- It will save your processing time without scaring too much output quality.



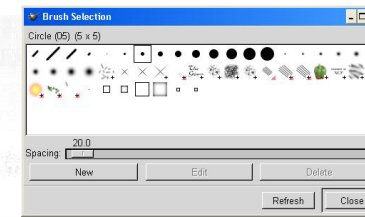
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A straight forward method to produce the foreground mask

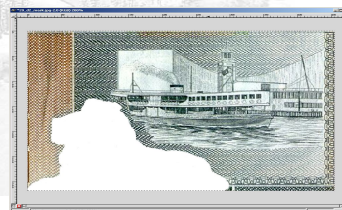


Click on the eraser button

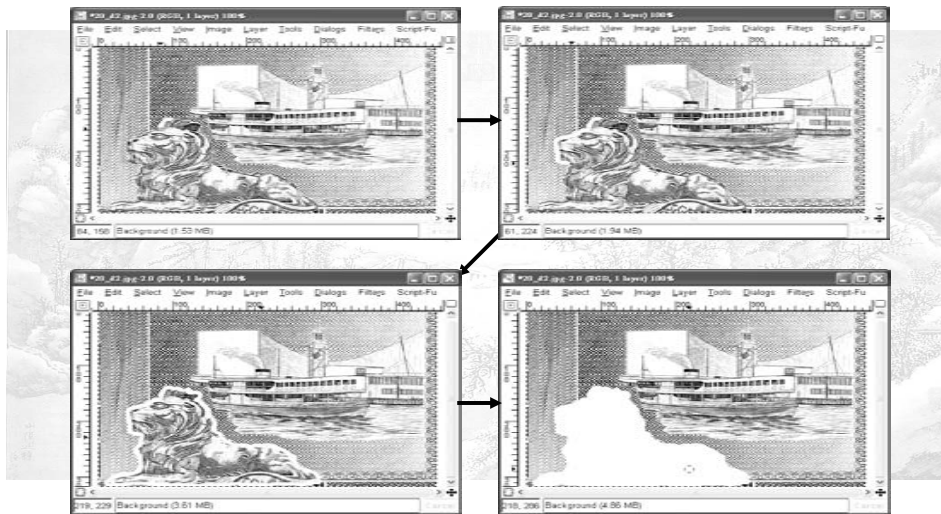


Select a smaller brush (solid)

- Left click on the image window
- Move the cursor to the 1st object
- Replace the color of the object's boundary by left click and *drag* the mouse around the object's boundary.
- Fill the interior part of the object with similar method.



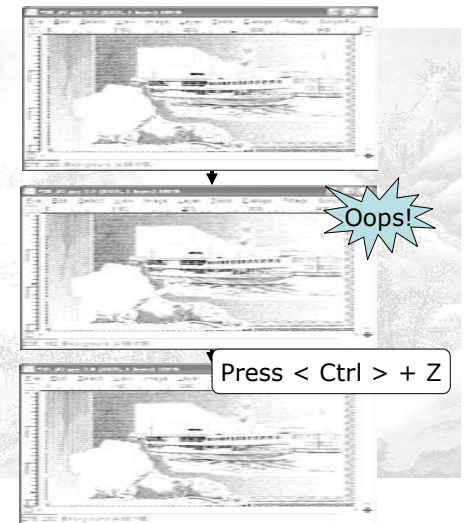
Example



Remarks



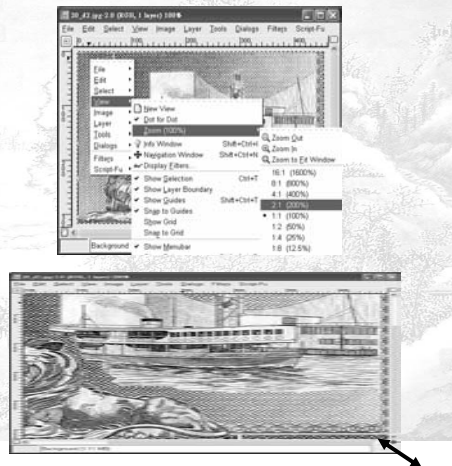
- You don't need to complete the step at one time
- Release the button and continue if needed.
- Press `<Ctrl>` with "z" buttons to *undo* one step if you are not happy with the result or you have made mistakes.



Suggestions:



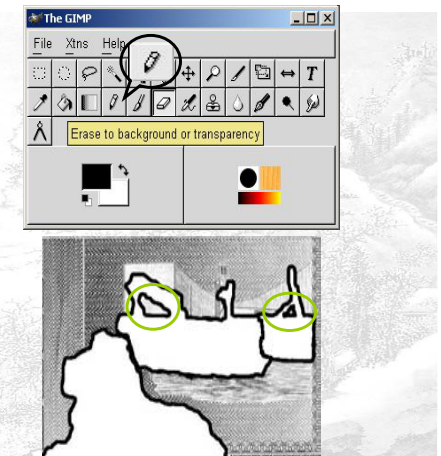
- Work on the zoomed image to obtain a more accurate result
- *Right Click* on the image area -> select "View" -> select "Zoom" -> select "2:1"
- *Left click and drag* the bottom right corner of the image window so that you can view a larger area.



Bound the objects



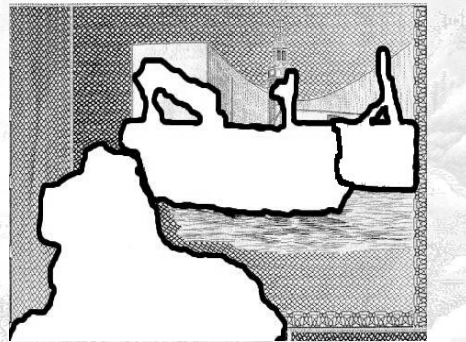
- Select the "Paint hard edge pixel" at the main window.
- Bound the exterior part of each object with black color
- Check carefully if the objects have "holes"



Save point



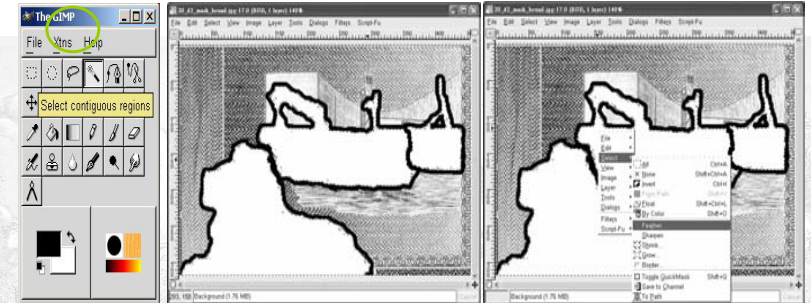
- Save the image to another filename after all the objects are marked.
- This intermediate result can be used for making the background image.



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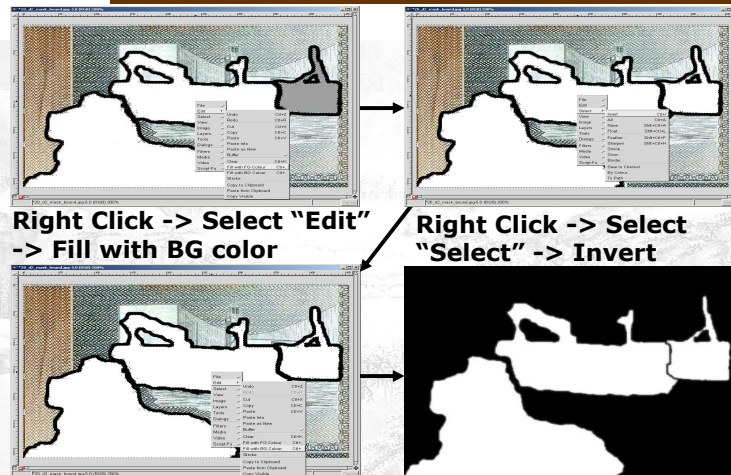
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Retouch the objects



- You may not completely filled the interior part of the object.
- To avoid this, you can ...
 - Select "Select contiguous regions" at the main window.
 - Hold the Shift button
 - Click on all objects with left mouse button, then all the objects identified will be selected.
 - Release the Shift button and right click the mouse.
 - Choose "Select" -> "Feather"

Retouch the objects & complete the foreground mask



Right Click -> Select "Edit"
-> Fill with BG color

Right Click -> Select
"Select" -> Invert

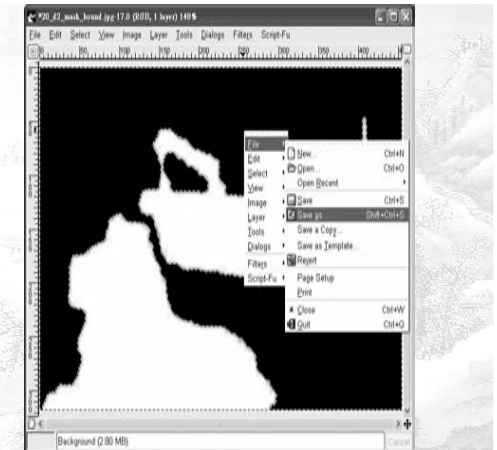
Right Click -> Select "Edit"
-> Fill with FG color

Done

Save point



- To save the foreground mask
 - Right Click the mouse button on the image area.
 - Select "File" -> "Save as ..."
 - Choose the proper directory and enter the file name (for example: 20_d2_fg.jpg)



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Alternative method to mark the object (1) - Use the "Hand Drawn Region Tool"



Select "Hand Drawn Region"

Select a smaller brush (solid)

Bound the object

Right Click -> Select Edit
-> Select "Stroke"

Alternative method 1 (cont'd)



Right Click -> Select Edit
-> Select "Fill with BG"

Done

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Alternative method to mark the object (2) - Use the "Intelligent scissor"



Suppose we want to mark the lamp pole as an object

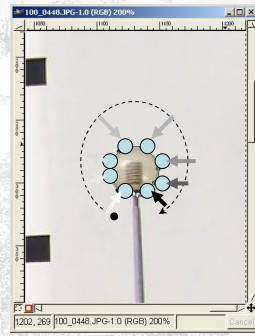
Alternative method 2 (cont'd)



- Goal: Construct a closed area to bound the object by introducing control points.
- Select "Select shapes from image".
- Left click on any place of the object's boundary as the starting point.

Alternative method 2 (cont'd)

- Insert other control points by *left-clicking* at the object's boundary.
- The program will trace the shape of the object for you based on color similarity.
- Selected points will then be connected with grey solid lines.
- More accurate result can be obtained by adding more control points, especially at the curved regions of the object.



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Alternative method 2 (cont'd)

- Use similar method to add control points to the pole.
- Finally, close the object's boundary by clicking on the first control point.



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Alternative method 2 (cont'd)

- To select the object, click its interior part.
- The grey solid lines will be changed to dashed line. The object is now ready for editing.

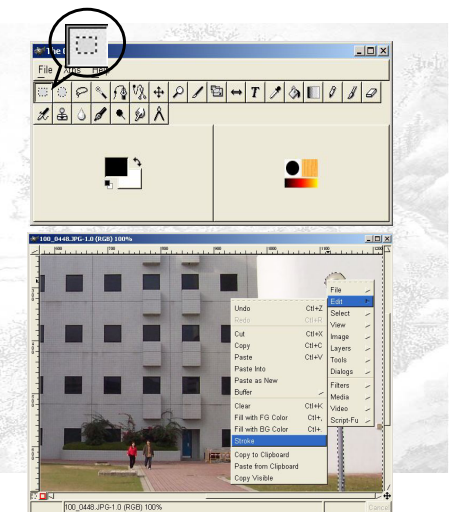


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Alternative method 2 (cont'd)

- To mark the region, you need to switch back to "Select rectangular regions" mode first.
- *Right Click* the object -> Select "Edit" -> Select "Stroke" to bound the object with black color.

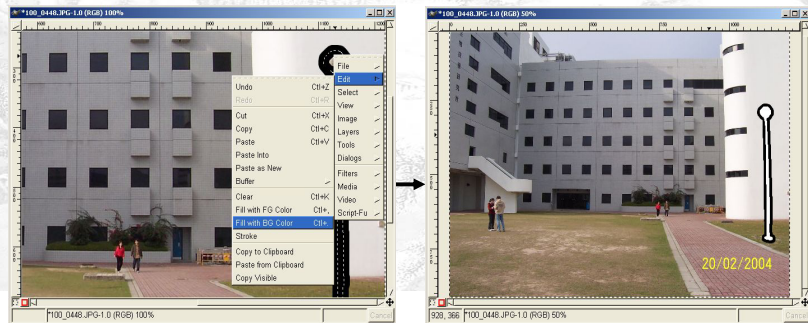


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Alternative method 2 (cont'd)

- Finally, you can color the object in white by ...
- *Right Click* -> Select "Edit" -> Select "Fill with BG color".
- Then, you can use the "intelligent scissor" again to process the next foreground object.



Trouble Shooting for alternative method 2

- Unfortunately, you cannot undo a step (using Ctrl -Z) if you have made mistakes in marking the object.
- You need to switch back to "Select rectangular regions" mode and select the "intelligent scissor" again to start over.



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Outline

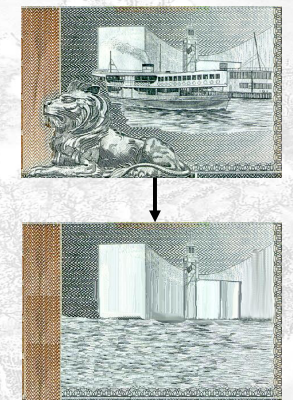
- Introduction
- Techniques for making foreground images
- Techniques for making background image
 - Principle
 - Example: recover the background with regular patterns
 - Example: recover the background with irregular patterns
 - Another example (combined skills)
 - Retouch the background and extra effects.

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Creating the background image

- Principle:
 - "Recover" the color of the background regions which were blocked by the foreground objects (we call it "holes").
 - Replace the color of the "holes" with the nearby colors / textures.
 - The processed background should give a "natural" perception.



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Creating the background image of a real scene



- You can fix the camera position / angle with a tripod.
- Take the first photo as the background image.
- Place the moveable objects inside the scene.
- Take another photo as the original image for glTIP's input.
- The work for making the background image is minimized as you only need to create the foreground mask using GIMP.
- Otherwise, it is a tedious task to produce a background image of a real scene, although it is feasible.

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Creating the background image



- This process is time-consuming but it significantly affects the quality of the output animation.
- However, the process could be fun as you further manipulate the background image so that special effects can be added into the animation.



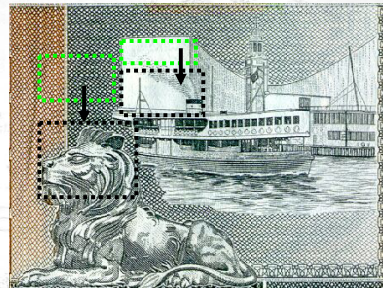
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Example: Recover the background with regular patterns



- Suppose parts of the background were blocked by the foreground objects (see red boxes).
- Recover the missed part using the visible part (see green boxes).
- Select "Select rectangular regions" so that a rectangular area can be selected.



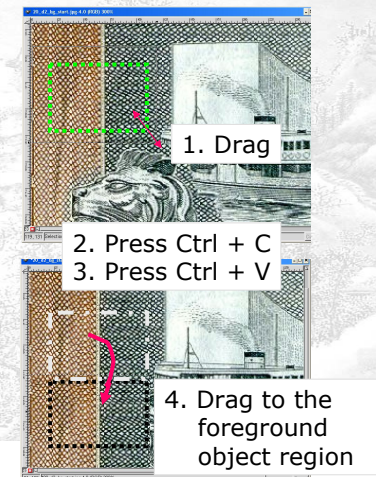
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Examples



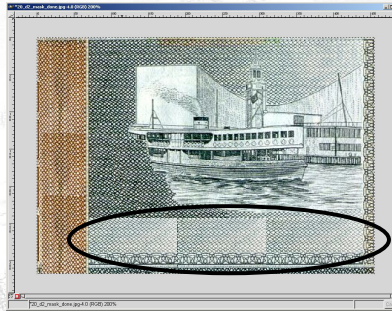
- Drag a rectangle (see green box)
- Press "Ctrl" & "C" buttons to copy the region
- Press "Ctrl" & "V" buttons to paste the region into the image
- Hold the mouse's left button and drag the pasted region to the red area.
- Left click on other part of the image can confirm the operation.
- You can repeat this process so that larger area can be processed.



Remarks



- This method works well to recover the background's architectures or the background with regular pattern (e.g. straight lines).
- However, if the "holes" contains irregular (or random) patterns, this method usually cannot give natural results.
- Counter example is shown at the right.



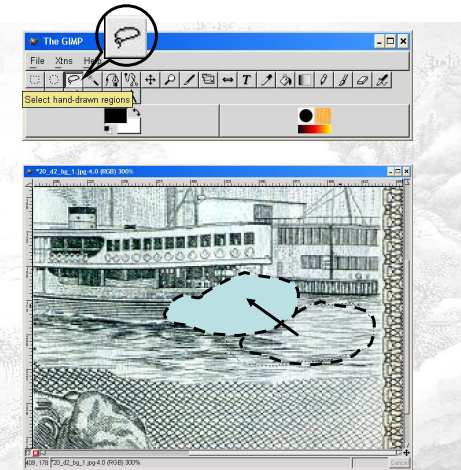
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Example: Recover the background with irregular patterns



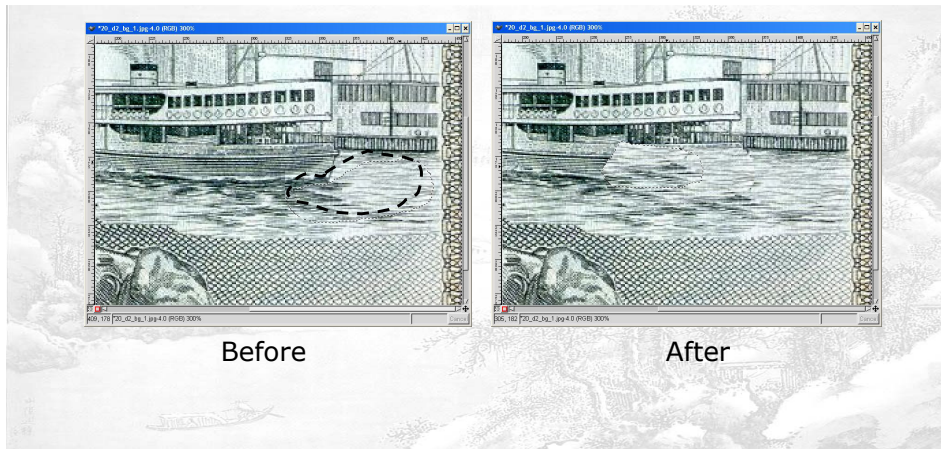
- Use the "Select hand drawn regions" to select a nearby texture with random shape.
- Copy the region and paste it to the hole.
- Repeat this process until the holes are filled.



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Examples



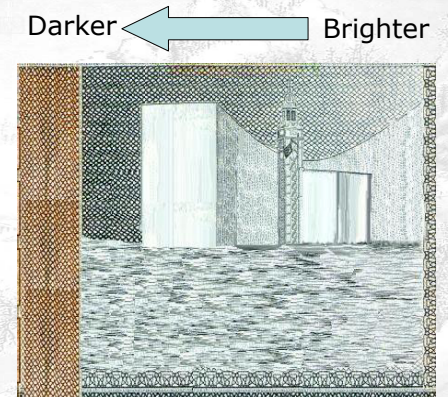
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Tips



- Again, you can undo one step by pressing "Ctrl" with "Z" button when the result is not satisfactory.
- Note: Be aware of the changes in the light intensity of the scene.
- Choose the texture carefully so that the transition from a brighter area to a darker area is handled smoothly.



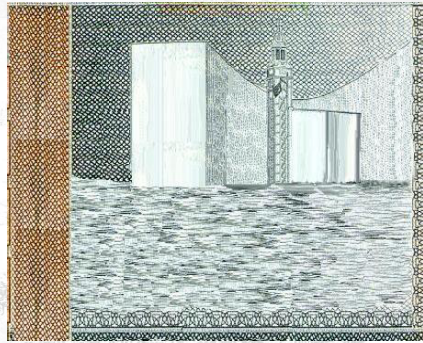
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Save point



- To save the Background image
 - Right Click the mouse button
 - Select "File" -> "Save as ..."
 - Choose the proper directory and enter the file name (for example: 20_d2_bg.jpg)
- Now, the foreground mask and background image can be inputted to generate 3D animation using gTIP.



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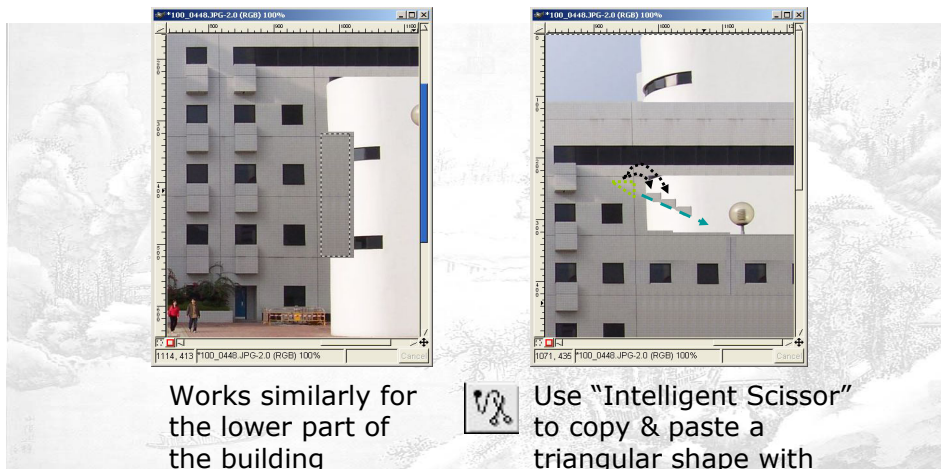
Another Example



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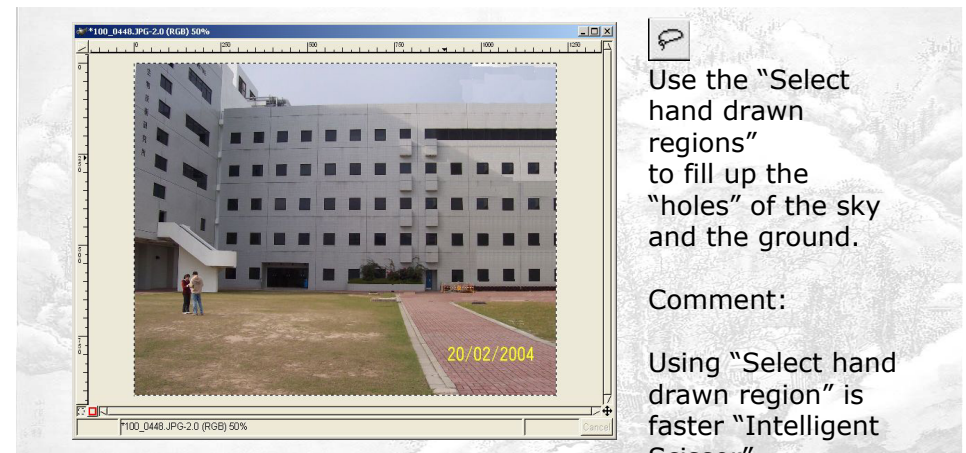
Another Example (cont'd)



Works similarly for the lower part of the building

Use "Intelligent Scissor" to copy & paste a triangular shape with similar brightness

Another Example (cont'd)



Use the "Select hand drawn regions" to fill up the "holes" of the sky and the ground.

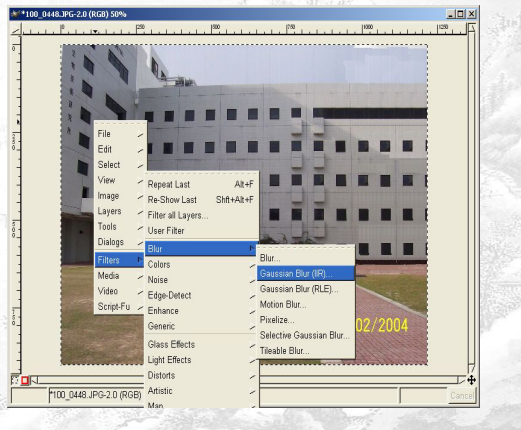
Comment:

Using "Select hand drawn region" is faster "Intelligent Scissor"

Retouching the background image



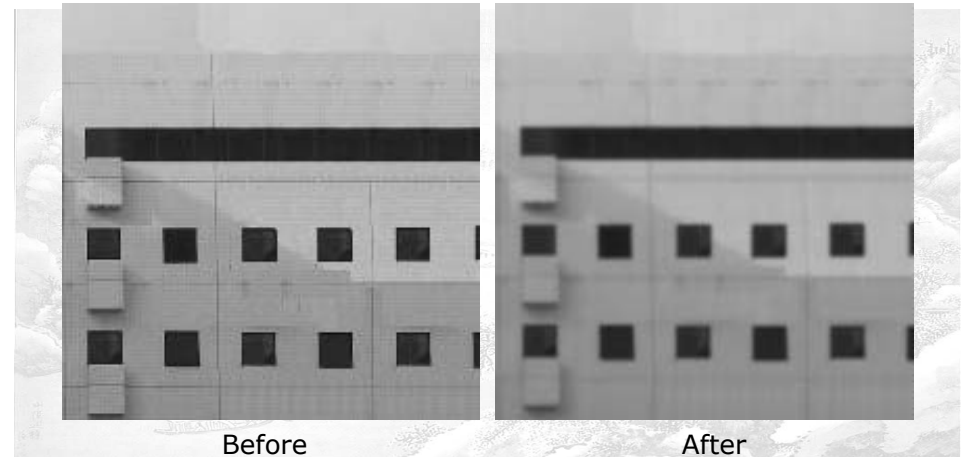
- You can consider to soften (blur) the background image so that the processed result looks smoother.
- To do so, right click the image -> select "Filters" -> Blur -> "Gaussian Blur"



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Processed Result



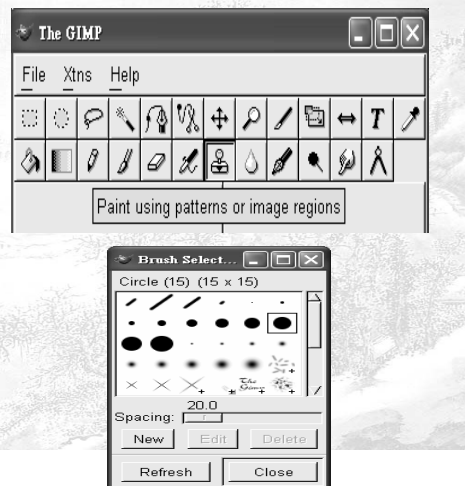
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Extra tools – Clone brush



- This tools can copy the texture from one position to another position in a more flexible way.
- Click on the "Paint using patterns or image regions" button at the main window.
- Choose a larger brush so that the tool can process a larger area



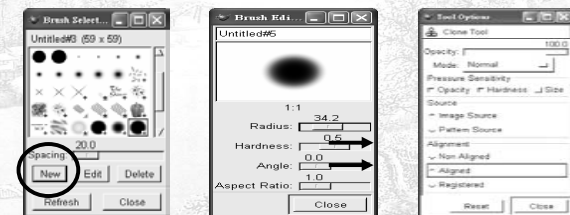
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More settings



- You may even create a larger brush by pressing the "New" button.
- A "Brush Editor" window will appear. Increase the brush's size (~30) by moving the "Radius" slider to the right.
- Increase the Hardness (~0.8) as well.
- To prepare for the clone operations, adjust the parameters of the tool by choosing "Image Source" and "Aligned" as the source option in the "Tool Options" window.



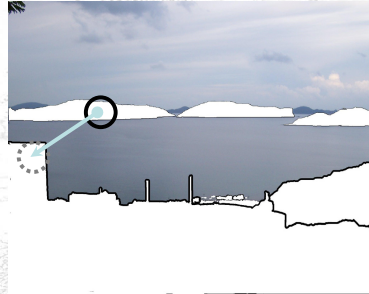
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Clone operations



- Now, let try to recover the lower part of the background image using clone brush
- Hold the "Ctrl" button and *left click* on the image to select the source (red solid ring).
- Release the "Ctrl" button.
- *Left click* on another area of the image as the destination (orange dashed ring), the content within the dashed ring will be replaced by the source.



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Example



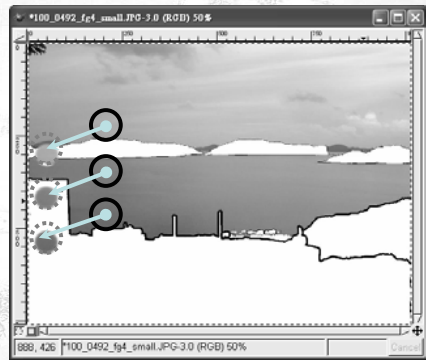
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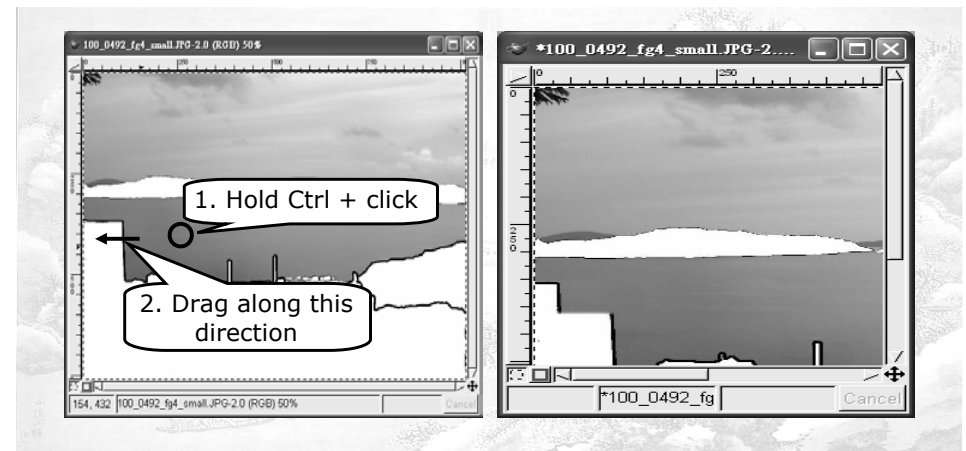
Remarks



- Once the start point is selected, the clone's source will be chosen according to the direction between the first source point and first destination point.
- To change the clone direction, select a new source point again with "Ctrl" + *left click* operation.



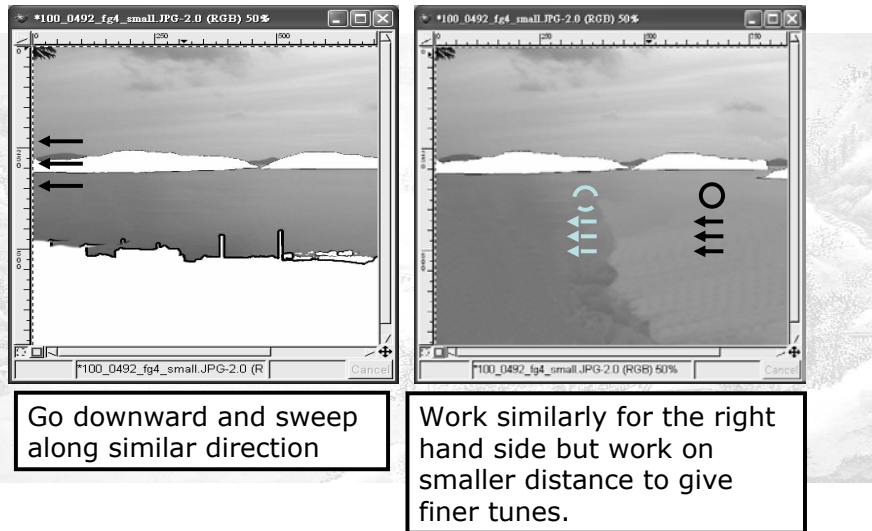
Effects of Clone Brush



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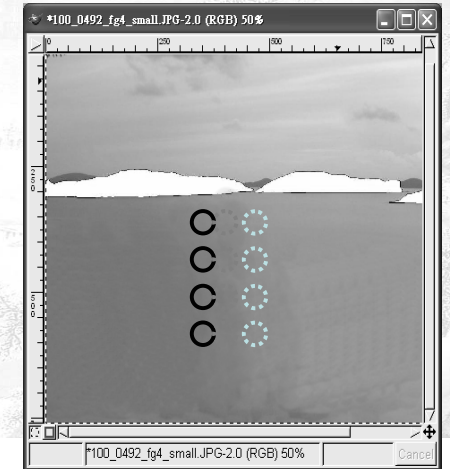
Effects of Clone Brush



Smoothing the transitional area



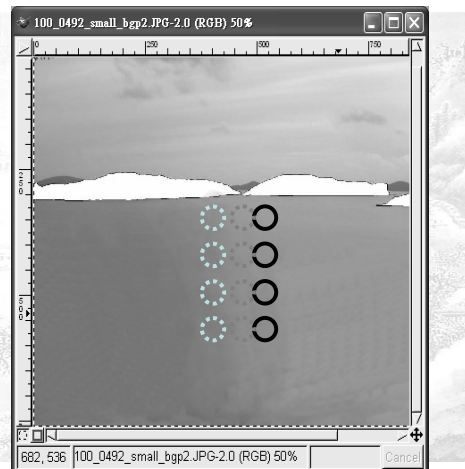
- Reduce the opacity of the clone brush (~35)
- Select a point near the boundary between the bright and dark region as the source
- Dark region is used as starting point in this example
- Do the clone operation from the dark region to bright region



Smoothing the transitional area (Cont'd)



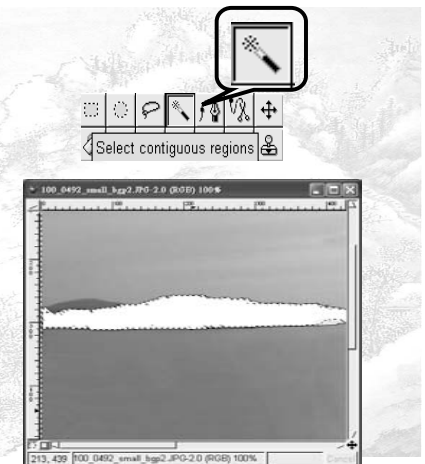
- Do the clone operation in reverse direction if necessary until a satisfactory outcome is achieved.
- Again, you can press "Ctrl" with "Z" to undo one step if needed.
- Note: Save different intermediate results into different file so that you don't need to redo everything if big problems occur.



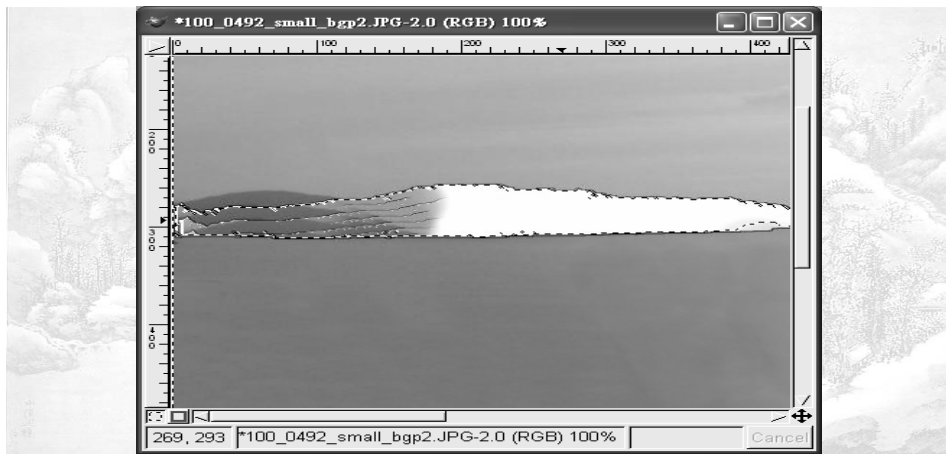
Protect the original background



- Even more, you can use the "Select contiguous regions" to pick the foreground mask area.
- Then, the clone effect will apply on the selected areas only; the background will not be modified.
- This is important if the clone operation is performed at the area containing image detail. (e.g. the mountain)



Clone effect on the foreground mask regions only



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Enhance the image



- If a photo is too dark to locate the foreground objects, (especially when it is taken during nighttime), you may also adjust the brightness and contrast.
- It is easier to produce the foreground mask and the background image if the photo has better contrast.



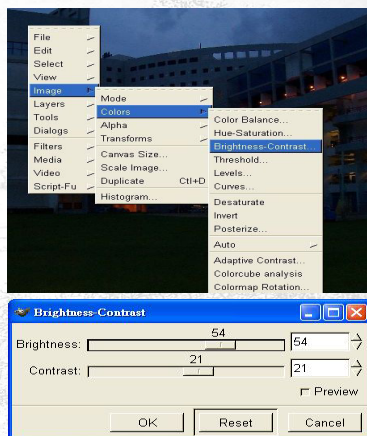
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Brightness / Contrast adjustment



- Right click the image -> Select "Image" -> "Colors" -> "Brightness-Contrast ..."
- Increase the *Brightness* (of the entire image) and *Contrast* (between the bright regions and dark regions) using the sliders.
- Press "OK" to confirm the changes.



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Extra Effects ?

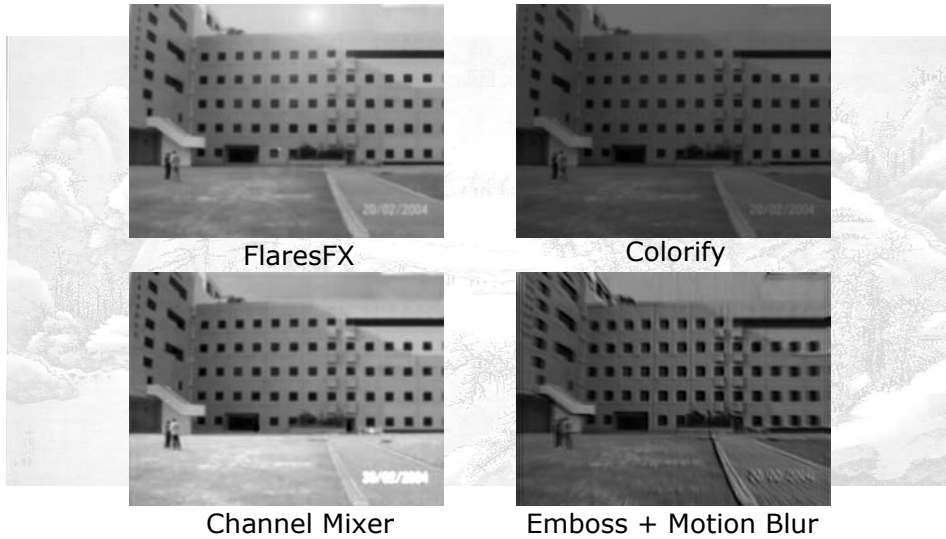


- There are various filter functions (right click -> select "Filters") that could make your image more interesting.
- Try to play around with them and see if they are useful.

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Examples



Q & A Session

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