

# MAGIC INPAINTER 3.0

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Image inpaint and restoration

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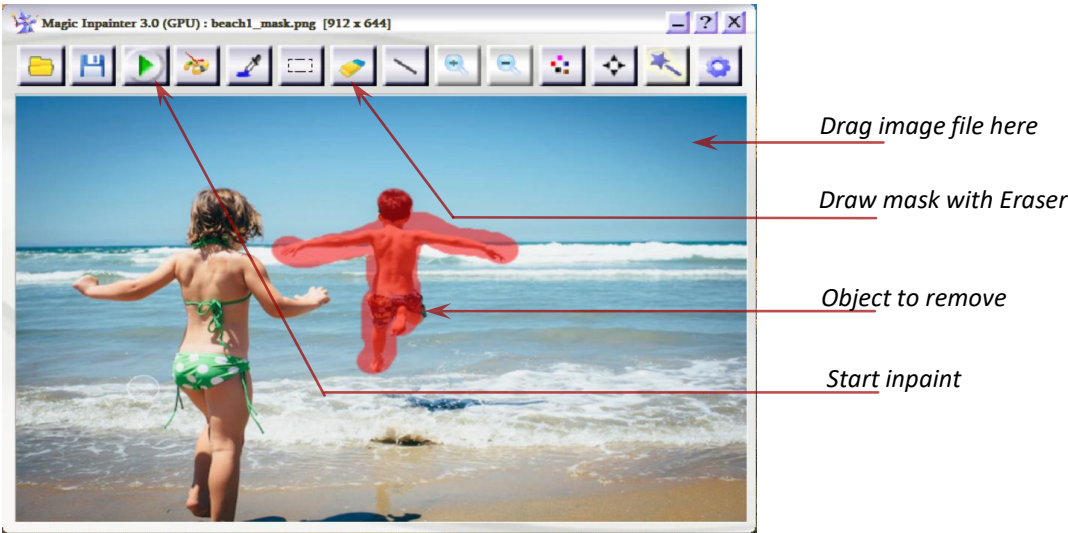
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# Magic Inpainter 3.0

## Description of the interface

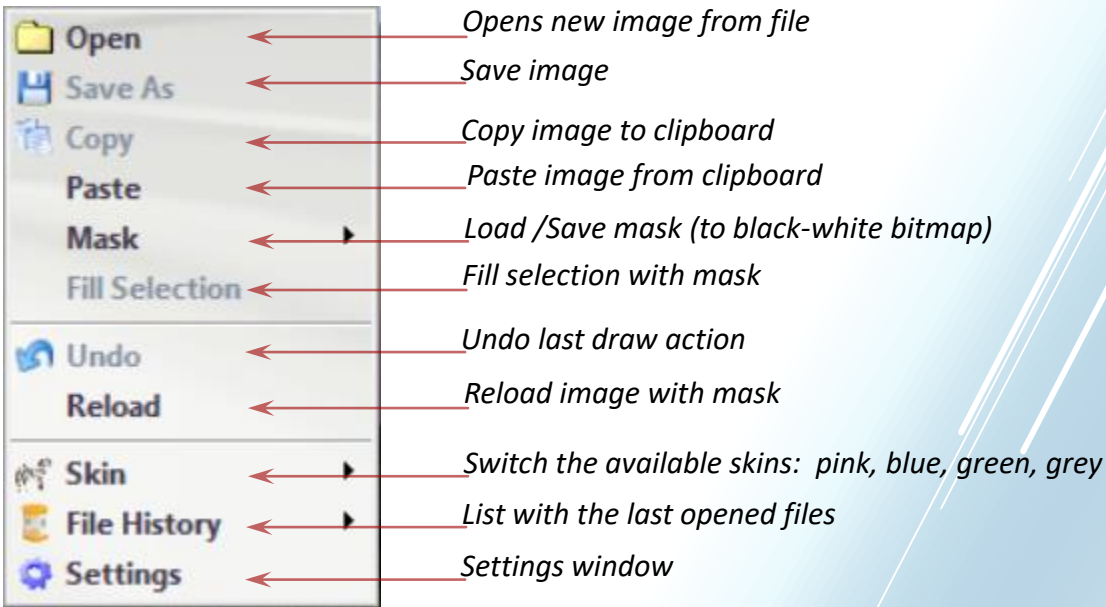
**MagicInpainter 3.0** is image processing tool for inpaint, mask selection and objects removal of small and medium sized objects from photos. Starting with version 3.0 GPU optimized image inpaint algorithms are used.

**Inpaint** (or image reconstruction) is a process of filling in missing parts of images in a natural way, preserving textures and background patterns so that a person is not able to spot the difference and inpainted picture looks natural.



**Open an image.** It can be done from button or menu 'Open' , with dragging the image file from the Windows Explorer or pasting from another application like Paint. Supported formats are bmp, jpg and png.

### Pop-up menu



**Note:** The Save/Load mask is useful when you have many similar images with similar regions to remove, as is the case with photos containing date. You can make a mask for only one of them and then load it to all other pictures. This saves time in outlining the noise area. However, the mask can be loaded only to picture with the same width and height.

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## Description of the interface

### Toolbar buttons



*Load Image From File* (Supported formats JPG,PNG,BMP)



*Save Image To File*



Starts the inpaint of the image with inpainting all pixels marked with the current mask color from outside to inside. If the valid image pixels are too many there is a warning that inpaint can become too slow. Inpaint can be stopped with the **Cancel** button from the Inpaint Progress window. Then if you need to start from the beginning first use **Undo** from the context menu to restore masked region.



*Select Mask Color* use it to select mask color



*Color picker* – obtain the color at the selected point



*Selects rectangle* - it can be used to fill rectangular mask or **Zoom In**



*Eraser* – allows drawing mask over the image, size of the brush can be set from Settings



*Draws line* – draws with the mask color, line width can be set from Settings



*Zoom In* - the selected rectangle becomes the main image



*Zoom Out* – return back the original image, and places back the current image to the previously selected rectangle



When pressed opens popup menu with two replace options – **RGB** and **HSV Histogram**. *Replace Tools* are described in Replace Tools section. You can use Replace Pixels button together with Expand button to quickly mark the region for inpaint



When pressed performs expand (dilate) operation on the mask using the current mask color. It is useful to fill small gaps and single edge pixels.



*Object Selection* select objects based on colors at the given point, can be used together with the Expand button



*Open Settings window*, it contains the basic settings of inpaint and drawing operations.

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## Description of the interface

### Keyboard shortcuts

Magic Inpainter Express supports the following keyboard shortcuts:

*Ctrl+C* - Copy Image to clipboard

*Ctrl+V* - Paste Image from clipboard

*Ctrl+O* - Open File Dialog

*Ctrl+S* - Save File Dialog (need opened image)

*Ctrl+Q* - Open Mask File Dialog (need opened image)

*Ctrl+W* - Save Mask File Dialog (need opened image)

*Ctrl+P* – Open Replace RGB Tool

*Ctrl+R* – Reload last opened image

*Ctrl+H* – Open Replace HSV Histogram Tool

*Ctrl+G* – Toggle Color Select Tool

*Ctrl+E* – Perform Expand Filter (same as button Expand)

*Ctrl+F* – Toggle ‘Fit to screen’ image display option

*Ctrl+A* – Open current image in MS Paint (**version 2.4**)

*Ctrl+Z* – Undo the last drawing action (**version 2.4**)

*Ctrl+Y* – Redo the last drawing action (**version 2.4**)

*Left Arrow* – Move Selection 1 pixel left (need opened image)

*Right Arrow* – Move Selection 1 pixel right (need opened image)

*Up Arrow* – Move Selection 1 pixel up (need opened image)

*Down Arrow* – Move Selection 1 pixel down (need opened image)

*Shift+Left Arrow* – Resize Selection 1 pixel left (need opened image)

*Shift+Right Arrow* – Resize Selection 1 pixel right (need opened image)

*Shift+Up Arrow* – Resize Selection 1 pixel up (need opened image)

*Shift+Down Arrow* – Resize Selection 1 pixel down (need opened image)

*Page Down* – Zoom In (need selection)

*Page Up* – Zoom Out (need selection)

*ESC* – Undo the last drawing action (**version 2.4**)

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## Description of the interface

### Settings Tool

Settings window is opened from  **Settings** button. The following window appears:

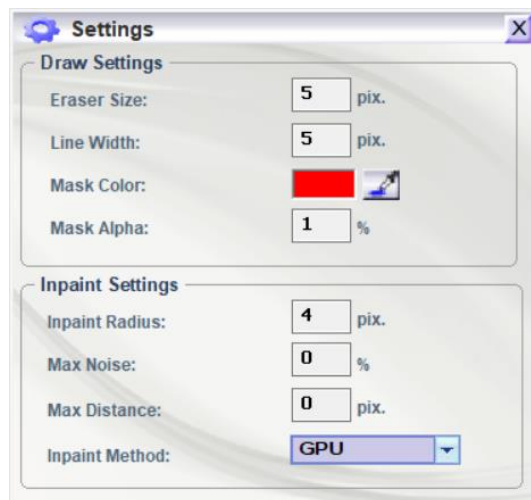
#### Draw Settings

**Eraser Size** – this is the size of the eraser rectangle in pixels

**Line Width** – this is the width of the drawn lines in pixels

**Mask Color** – this is the current inpaint mask color, it is used to mark the region of the image to be removed. The mask color can be changed to make the semitransparent mask better visible, if for example the image is red then the mask should be another color so that can be seen. To change mask color just press the color picker button or click on the colored rectangle to open the Color Select dialog.

**Mask Alpha** – the percentage of transparency of Mask Color, used for better visibility



#### Inpaint Settings

**Inpaint Radius** – set the radius of the inpaint filter kernel, from this radius depends inpaint quality, increase it for each image until the optimal radius is found, this radius is limited between **1** and **64** because beyond that the algorithm performs too slow

**Max Noise** – set the maximal noise allowed during inpaint in the image low noise regions, in precents, noise can decrease the inpaint quality so if masked for inpaint area is not too big it should be set to 0, which is the default. Is some rare cases when masked area is too big or noise pixels are distributed equally around the image this parameter would have to be adjusted. It is not recommended to exceed 40-50%

**Max Distance** – sets maximal allowed distance for each noise pixel replacement, it is given in pixels, the default value is 0 which means that would not be used


**Inpaint Method** – it can be GPU or CPU, for **MagicInpainter 3.0** it is strongly recommended to use the GPU version, it works better and faster, if you have NVIDIA video card with **CUDA** support, if CPU is selected application does not use the GPU even if available, since there is difference in inpaint results when performed with CPU or GPU this option can be used to compare results, in CPU version this option it is disabled



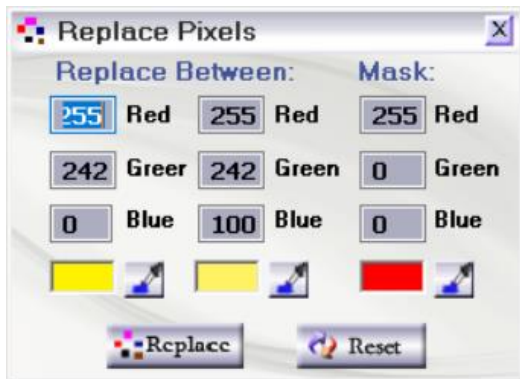
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## Description of the interface

### Replace Tools

Replace Tools are started from the pop-up menu which opens with the  *Replace Pixels* button.

The first replace tool is *RGB Replace*:

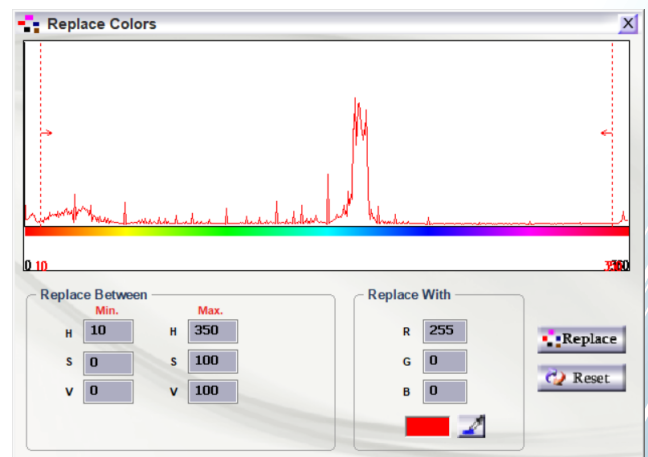
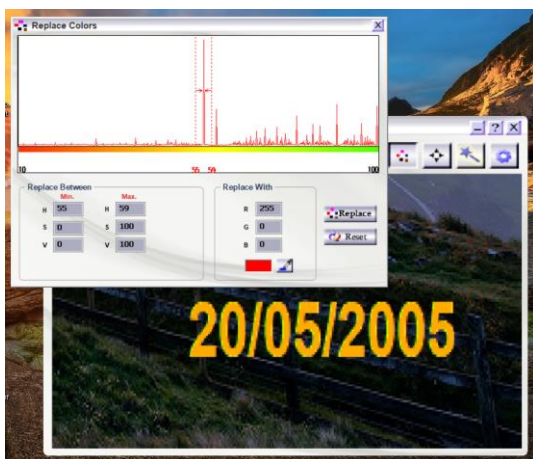


This is a simple window with 3 groups of color values – min and max RGB colors and the replace color RGB values (the 3-rd column). All three colors can be set either by typing the values in the text boxes, by choosing the colors from the standard color dialog (it opens with click over the color boxes below) or by using the color picker buttons . To use the color-picker buttons you need to press one of the buttons and then to press the left mouse button while it moves over the image. Since the first two colors are limits of color range it is important that all 3 values in the max color are bigger or equal to the min color values.

After the 3 colors are correctly set press the Replace button. All pixels the given RGB color range in the image will be added to the current mask. RGB Replace tool is useful when the region to be removed has colors with close RGB values. With selecting large enough color interval most noise pixels will be marked. If some small holes remains or some individual pixels remain unmarked, one or two Expand operations are enough to fix that.

Usually the pixels that have to be removed are not from one monochrome region and are scattered all over the image. In this case the *HSV Color Histogram* can be used:

It contains a color histogram, which shows the distribution of colors over the image. For example, the histogram above corresponds to the image:



The yellow color pick in the histogram corresponds to the yellow date stamp. If we wish to remove the date stamp the yellow pick had to be marked with min and max delimiters (just as it is shown on the first picture). After selecting the pick and then pressing **Replace** the result is:


After replace the date stamp is colored in one color – red mask.

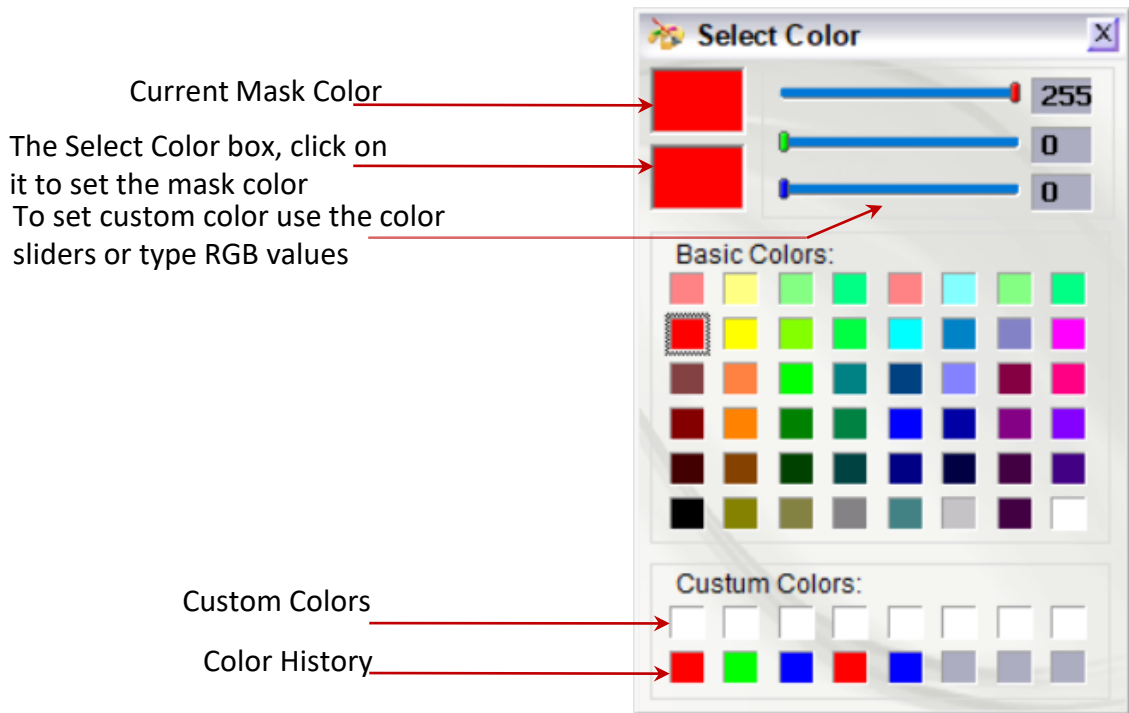
How to use *HSV Color Histogram* in Magic inpainter see [hear.\(link\)](#)

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## Description of the interface

### Color Picker Toolbox

When  *Select Color* button is pressed the following color-picker toolbox pops up:



### Note:

To change the current mask color (this is the color of marking the area for inpainting) you had to click on the Select Color Box, this is the second box from above (colored in orange on above picture).

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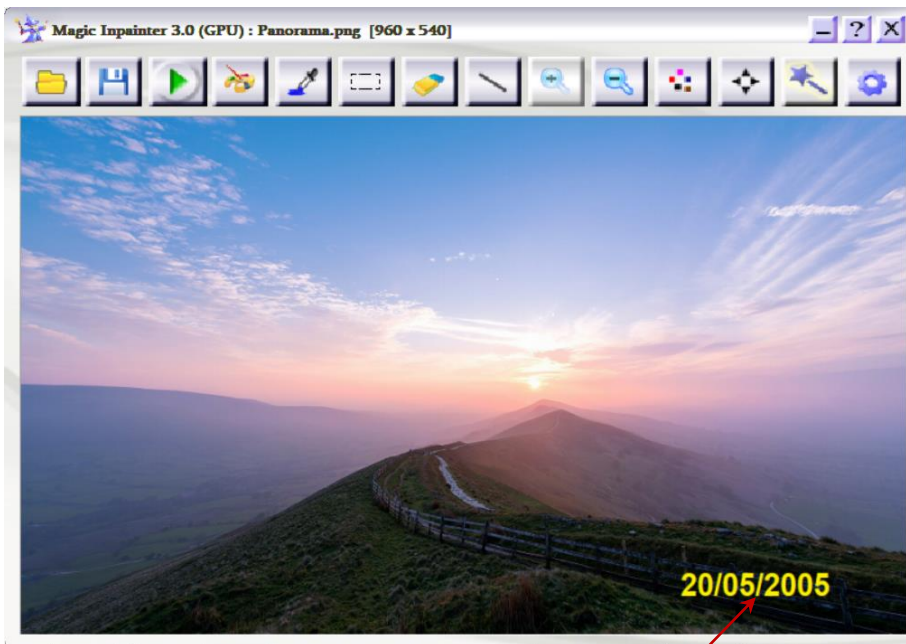
## Description of the interface

### Inpaint

#### Marking Inpaint Area

Before to start inpainting process you had to mark the area of the image you want to inpaint. This area should be marked as precisely as possible because this influences the inpaint quality. The program needs to set the mask over this area. To do this you can use the **Erase**, **Draw Line**, **Expand** and **Replace Colors** buttons. If the provided drawing tools are not enough you can use external drawing programs like *MS Paint* and Adobe Photoshop to create the mask and then to load it with **Load Mask** from the menu. The black-white bitmap image with the mask should be with the same size as the selected image, the mask area should be white and the *remaining part - black* (try **Save Mask** to see how the mask looks like).

Below is given example how you can color a text on a photo. The picture below contains a date text that has to be removed:



text to be removed

This text seems monochrome – a uniform yellow color. However if you look closely at the text, it is a bunch of different yellow colors:






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## Description of the interface



### Inpaint

#### 1. Using *Fill Region (Only in version 2.4)*


After pressing this button the application will go in fill region mode. You need just to click over a text and it will become selected for inpainting. If you click outside the text a wrong area can become selected. To go back press the **ESC** button or **CTRL-Z**. Select the remaining text items. Before inpaint it is sometimes better to select the remaining edge pixels with pressing once the *Expand* button .

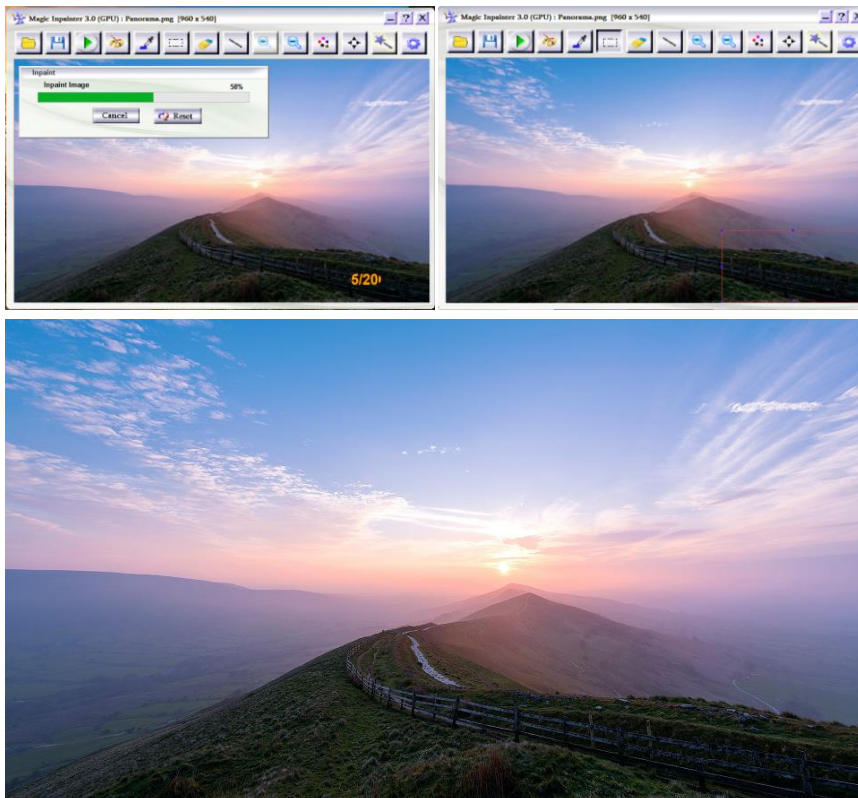
#### 2. Using *Replace Tools*

How to use tools see in carter *Replace Tools. Erase and Line width can be adjusted from Settings*

3. Using *Erase*  and *Draw Line*  drawing tools. Erase and Line width can be adjusted from Settings

### Starting Inpaint

Now when the picture is ready for inpainting press *Start Inpaint*  button to start the inpainting procedure. Keep in mind that if image is too big the inpaint process can take awhile, so it is sometimes better to split the image in sub regions with zoom. During inpainting the results of the inpainting are shown:



Inpainting can be stopped at any time with the Cancel button. Then it can be stated again and inpaint will continue from the moment it was stopped. Reset is undoing the cahnges and is returning the image at the moment before start before the inpainting was started.