

3D-EASY SPACE 5

**NEW ART
ILLUSION**



Content

1 The 3D-Easy Complete Kit 5	4
1.0 Overview	4
1.1 The software 3D-Easy SPACE 5	6
1.1.0 Survey of the versions of the program	6
1.1.1 News in version 5	7
ColorCode 3-D™	7
1.1.2 The software 3D-Easy SPACE 5 - Home	10
1.1.3 The software 3D-Easy SPACE 5 - Standard	13
1.1.4 The software 3D-Easy SPACE 5 - Professional	15
1.2 Examples of images of the CD-ROM	16
1.3 ColorCodeViewer™ and anaglyph glasses	17
1.3.1 The ColorCodeViewer™	17
1.3.2 The red/cyan anaglyph glasses	17
1.4 The lenticular cards	18
1.4.1 Portrait and landscape	18
1.4.2 Distinction of the formats 30, 40, 50, 60 and 75 lpi.....	18
1.4.3 Rough determination of unknown lenticular material.....	20
1.4.4 Physical characteristics	21
1.5 The stereo viewer Lorgnette.....	21
2 The basic functions of the program 3D-Easy SPACE 5	23
2.1 Installation, start and finishing the program.....	23
2.2 The user interface of the program, help-functions	24
2.3 Loading images	26
2.4 Saving an image	28
2.5 Working with the clipboard.....	29
2.6 Loading and saving a project	29
2.7 Radio Group "Preview/Calculating"	32
2.7.0 General information	32
2.7.1 Option "none"	32
2.7.2 Option "Image Left (L)"	33
2.7.3 Option "Image Right (R)"	33
2.7.4 Option "Anaglyph (L / R)"	33
2.7.5 Option "Stereo (L / R)"	34
2.7.6 Option "Lenticular"	36
2.7.7 Option: "Stripes with 2 images"	38
2.8 Selection of the images L and R.....	39
2.9 Zoom functions	40
2.10 Background colors.....	41
2.11 Alignment of images, use of alignment lines / boxes	44
2.11.1 General, alignment lines and alignment boxes.....	44
2.11.2 Shift / rotation / scale	45
2.11.3 3D-Easy - Serial Alignment.....	46
2.11.4 3D-Easy - 1-Click-Auto-Alignment	46
2.11.5 Reference image / reference points	49
2.11.6 Determination and serial export of an image part.....	52
2.12 Brightness, contrast, saturation and gamma.....	53
2.13 Animated preview	55
2.14 Printing	56
2.15 Red-cyan alignment stripes	57
2.16 Calibration (pitch test).....	59
2.16.1 Purpose of the calibration.....	59

2.16.2 "Calibration - print direct" (pitch test)	60
2.16.3 "Calibration - image saving" / reference file (pitch test)	63
3 Examples of projects - Step by Step Instructions	66
3.0 General information about the topic "3D"	66
3.1 Anaglyph image	67
3.1.1 Short introduction.....	67
3.1.2 Step by step to the anaglyph image	69
3.2 Flips with 2 images, using the 30-lpi lenticular card	72
3.2.1 Short introduction.....	72
3.2.2 Step by step to the lenticular flip.....	72
3.3 Animation, using the 30-lpi lenticular card.....	75
3.3.1 Short introduction.....	75
3.3.2 Step by step to the lenticular animation	75
3.4 3D-image, using of the 40-lpi lenticular card	78
3.4.1 Short introduction.....	78
3.4.2 Step by step to the 3D-lenticular image	78
3.5 Stereo images	81
3.5.1 Short introduction.....	81
3.5.2 Step by step to the stereo image	82
3.6 3D-Barrier image (only available in <i>Professional Edition</i>)	84
3.6.1 Short introduction.....	84
3.6.2 Step by step to 3D barrier images	85
4 Fixing a printed image on a lenticular card	88
4.0 General Information	88
4.1 Mechanical procedures.....	89
4.2 Glue methods.....	90
4.2.0 General	90
4.2.1 Self-adhesive lenticular material	92
4.2.2 Attatching the double sided adhesive material.....	94
4.2.3 Spray glue.....	97
4.3 Adhesive methods	98
4.4 Other methods	98
5 Production of 3D-images or animations	99
5.1 Production of 3D-images of big natural objects.....	99
5.1.1 Use of a normal camera (1 lens).....	99
5.1.2 Use of a special camera (several lenses / NIMSLO).....	103
5.2 Production of 3D-images of small natural objects	106
5.3 Production of artificial 3D-worlds (not part of the software)	111
5.4 The 2D - 3D conversion (not part of the software)	112
5.5 Production of anaglyph images and stereo images	113
5.6 Production of lenticular animations	114
5.7 Production of lenticular flips.....	115
6 Questions and answers	116
6.1 Questions and answers to anaglyphs	116
6.2 Questions and answers to the lenticular technique.....	118
6.3 Questions and answers to the software <i>3D-Easy SPACE</i>	121
6.4 Questions and answers to the <i>3D-Easy - 1-Click-Auto-Alignment</i>	125
6.5 Questions and answers to the <i>3D-EASY - WebShop</i>	127
7 Ordering possibilities.....	129
8 Copyright.....	130

1 The *3D-Easy Complete Kit 5*

1.0 Overview

For the first time, the graphic amateur (those who are not experienced in graphics) has the possibility with the *3D-Easy Complete Kit* to produce his or her own 3D images and 3D-flips with the help of the lenticular technology.

Due to the development of the PC-hardware and printing technology, it permits the home user to calculate and to print their own lenticular images.

The *3D-Easy Complete Kit 5* is offered in 2 versions:

- *3D-Easy Complete Kit 5 - Home*
- *3D-Easy Complete Kit 5 - Standard*.



3D-Easy Complete Kit 5 - Home



3D-Easy Complete Kit 5 - Standard

The following table shows a survey of the different versions of the Complete Kits:

Content	<i>3D-Easy Complete Kit 5 - Home</i>	<i>3D-Easy Complete Kit 5 - Standard</i>
CD-ROM with <ul style="list-style-type: none">• Software <i>3D-Easy SPACE 5</i>• Example of images and projects• Manual (PDF file)	yes, <i>3D-Easy SPACE 5 - Home</i>	Yes <i>3D-Easy SPACE 5 - Standard</i>
ColorCodeViewertm (ColorCode 3-D glasses)	-	yes
3D-red/cyan glasses (Anaglyph glasses)	yes	yes
Viewer for Stereo Images (Lorgnette)	yes	yes
Lenticular cards (each 15x10 cm, non adhesive) <ul style="list-style-type: none">• 30 lpi (3D portrait)• 40 lpi (3D landscape)• 60 lpi (3D landscape)• 75 lpi (3D portrait)	yes yes - -	yes yes yes yes
<i>3D-Easy - Lenticular Rough Determination</i>	-	yes
Short Instruction Manual	yes	yes

The program *3D-Easy SPACE* makes it not only possible to produce 3D-images and flip images but also to produce anaglyph images and stereo-images. All materials which have been known from the professional field only and which are necessary to produce one's own 3D, flip and anaglyph images are contained in the *3D-Easy Complete Kits*. There is detailed information in the manual regarding how to produce these images.

Only a personal computer and a color printer are required. The system requirements are described in the following chapters. The production of own real 3D-images requires a camera.

The items of the *3D-Easy Complete Kits*, the software and the appropriate lenticular cards, are matched perfectly. Furthermore, with the software *3D-Easy SPACE 5*, 3D images and flip images can be calculated and printed for different lenticular material in high quality.

The most important feature of the lenticular card, the amount of lenses per inch, is indicated in lpi (lpi means lens per inch and 1 inch corresponds with 2.54 centimetres).

The *3D-Easy Complete Kits 5* and the corresponding software *3D-Easy SPACE 5* do not require any special knowledge or hardware. The product is intended mainly for the interested home user. Due to its efficiency, the software *3D-Easy SPACE* can also be used to create advertisements, graphic, arts, design, arts, architecture, science, education etc.

The further development of the software of version 5 fulfils even more the term „*3D-Easy*“: There is the „*3D-Easy - 1-Click-Auto-Alignment*“ in the Standard and Professional versions which adjusts image series to produce 3D lenticular images automatically with only one click.

The manifold possibilities of application of the software *3D-Easy SPACE 5* in connection with the technology of lenticulars are explained in chapter 5.

1.1 The software *3D-Easy SPACE 5*

1.1.0 Survey of the versions of the program

The following table shows a survey of the different versions of the program:

Functions / Features	<i>3D-Easy SPACE 5 - Home</i>	<i>3D-Easy SPACE 5 - Standard</i>	<i>3D-Easy SPACE 5 - Professional</i>
	contained in <i>3D-Easy Complete Kit 5 - Home</i>	contained in <i>3D-Easy Complete Kit 5 - Standard</i>	
Languages available	German or English	German or English	German or English
General information			
number of images	max. 10	max. 20	max. 99
image size in pixel of each image	unrestricted ¹	unrestricted ¹	unrestricted ¹
supported file formats: • Import: JPG, BMP, TGA, TIFF • Export: BMP, TGA, TIFF (BMP, TGA and TIFF: 24 Bit, all uncompressed)	yes yes	yes yes	yes yes
projects load / save	yes	yes	yes
clipboard (copy)	yes	yes	yes
animation preview of all loaded images	yes	yes	yes
Alignment / colors			
alignment of images: shifting / rotation / scaling	yes	yes	yes
NEW: bicubic interpolation with all adjustments	yes	yes	yes
alignment lines to adjust images	yes	yes	yes
NEW: 3D-Easy - 1-Click-Auto-Alignment	-	yes	yes
define reference points, half automatic adjustment	-	yes	yes
NEW: only horizontal shifts (optional)	-	yes	yes
NEW: 3D-Easy - Serial Alignment	yes	yes	yes
fixing and export of an image area	-	yes	yes
NEW: 3D-Easy - Optimized Image Area	-	yes	yes
corrections: brightness, contrast, saturation, gamma	yes	yes	yes
free background colors	yes	yes	yes
Print			
max. print size	16 x 16 cm	30 x 30 cm	unrestricted ¹
print: normal / reversed (film)	yes	yes	yes
additional print info / units: cm / inch	yes / yes	yes / yes	yes / yes
Anaglyph			
Color combination • ColorCode 3-D™ / yellow-blue • red-cyan, red-blue, red-green, magenta-green, green-blue color saturation: • grey / color / manual (define red, green & blue separated)	- / yes yes yes	yes / - yes yes	yes / - yes yes
Stereo images			
number of fixed formats	10	10	10
free stereo format / max. print size	-	yes / 30 x 30 cm	yes / unrestricted ¹
Lenticular			
lenticular types (lpi)	free value between 10 - 50 lpi	free value between 10 - 76 lpi	free value between 10 - 999 lpi
Supported Lenticular Images: • 3D, flip / animation / morph / zoom	all	all	all
reference stripes • left/top, right/down, crosswise • optional visible / invisible	yes yes	yes yes	yes yes
calibration function (pitch test) • direct printing (black/white): free lpi value • calculation and saving universal calibration pattern • supported lpi-values • number of test stripes per lens • max. size of calibration pattern	yes, 10 - 50 lpi - - - -	yes, 10 - 76 lpi yes 10 - 76 lpi 2 (black / white) 30 x 30 cm	yes, 10 - 999 lpi yes 10 - 999 lpi 99 unrestricted ¹
define compression levels	-	-	yes
automated / manual image optimization (consideration physical printer characteristics)	-	yes / yes	yes / yes
stripes of 2 images (special menu)	yes	yes	yes
parallax barrier method	-	-	yes
Documentation / example images			
• manual (PDF-file), incl. • step by step - info, practicable hints • example images / example projects	yes yes yes	yes yes yes	yes yes yes

¹ *3D-Easy SPACE 5* read and save uncompressed 24 Bit RGB files (BMP, TGA and TIFF) up to 4 GB file size.
This means a maximal image size of about 36000 x 36000 pixel.

1.1.1 News in version 5

Compared to version 4, the program *3D-Easy SPACE 5* contains the following essential new features:

ColorCode 3-D™

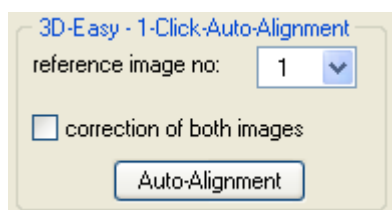
- Implementation of the new ColorCode CS Plus™ Dual encoding.
 - Improved color rendering
 - Faster calculation
- The improved ColorCode-3D technology is implemented in both Standard and Professional Edition

Adjustment: Bicubic Interpolation

- The new function „bicubic interpolation“ is used as a substitute of the method „next neighbour“ (pixel position is rounded) which was used until now. It is applied with all adjustments (shift, rotation, scaling). With this method, 16 vicinal pixel are evaluated for the calculation of one single pixel. Bicubic interpolated images or pixels lead to much better results especially with rotations and scaling as well as „non-integer“ pixel values (e.g. after *3D-Easy - 1-Click-Auto-Alignment*). Horizontal or vertical edges appear to be straight with any rotations (without „jumps“).
- Sharpness and contrast of the basic image are mostly preserved. This is the main feature of the bicubic interpolation. (There are different versions with different parameters.)
- The new function bicubic interpolation is contained in all editions (Home, Standard and Professional).

Full automatic adjustment: 3D-Easy - 1-Click-Auto-Alignment

- Version 5 contains a professional *3D-Easy - 1-Click-Auto-Alignment* (complete automatic alignment) in addition to the existing possibilities of the manual or half automatic adjustment (direct adjustment or use of reference points).



- It is the aim of *3D-Easy - 1-Click-Auto-Alignment* to get only a minimum of vertical deviations by complete shifting, rotation, and scaling.
- The Software *3D-Easy SPACE 5* is the first and only lenticular software worldwide with such a 1 Click-Auto-Alignment, which contains a complete automatic adjustment of all unadjusted source images.
- It is as simple as the name *3D-Easy - 1-Click-Auto-Alignment* says: e.g. no reference points have to be placed manually, no information regarding camera parameters necessary, no evaluation of maximum deviations necessary. The images which have to be

adjusted are loaded and with only one click, a complete automatic calculation is carried out.

- The new function *3D-Easy - 1-Click-Auto-Alignment* is contained in the editions Standard and Professional.
- You can find more advice regarding *3D-Easy - 1-Click-Auto-Alignment* in section „New example projects“ as well as in chapters 1.2. and 6.4. (FAQ).

3D-Easy - Serial Alignment

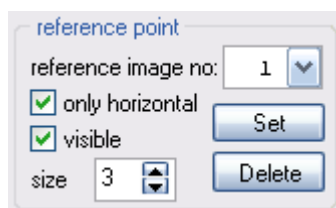
- Shiftings can be applied to all images at the same time with the new function *3D-Easy - Serial Alignment*.



- This function is useful with 3D lenticular images with 3 or more basic images which have to be shifted horizontally after the auto correction to fix the room depths. The reference image is not shifted, the next image is shifted by 1 pixel, the next image but one is shifted by 2 pixels etc. to the left or right. The 3D effect is applied to all loaded images automatically.
- The new function *3D-Easy - Serial Alignment* is contained in all editions (Home, Standard and Professional).

Reference points: only horizontal shiftment

- When placing reference points (one reference point per image), the images are shifted automatically horizontally and vertically the way that all reference points have the same pixel position.



- It is new that only horizontal shifts are carried out. This makes sense if the images are perfectly adjusted by the *3D-Easy - 1-Click-Auto-Alignment* and only the 3D-impression has to be adjusted to personal taste by horizontal shifting.
- The new function „only horizontal shift “ is contained in editions Standard and Professional.

Improved image cropping function: 3D-Easy - Optimized Image Area

- The new function *3D-Easy - Optimized Image Area* calculates automatically the maximal rectangular optimized image area of all images which does not contain missing image contents in edge areas, e.g. caused by rotation.



- The function *3D-Easy - Optimized Image Area* is applied after a manual adjustment or after a *3D-Easy - 1-Click-Auto-Alignment* in order to carry out a *3D-Easy - Serial Export*.
- The new function *3D-Easy - Optimized Image Area* is contained in editions Standard and Professional.

Export / Image cropping

- If an image area is exported, not only the corresponding image parts of all single images are saved but also the corresponding anaglyph image, if „anaglyph (L / R)“ was selected in the preview.
- This new function (additional saving of an anaglyph image part with serial export) is contained in editions Standard and Professional.

Complement of the manual

- The manual (PDF file) has been updated. The above mentioned functions are explained in detail.

New adjusted stereo images and image serials

Many 3D example images (3D stereo image pairs and 3D lenticular projects) which had to be taken by a camera (digital camera, stereo camera, NIMSLO) and which had to be adjusted manually, were completely new calculated and saved with the above mentioned new functions

- *3D-Easy - 1-Click-Auto-Alignment*
 - *3D-Easy - Optimized Image Area*
- in a very short time.

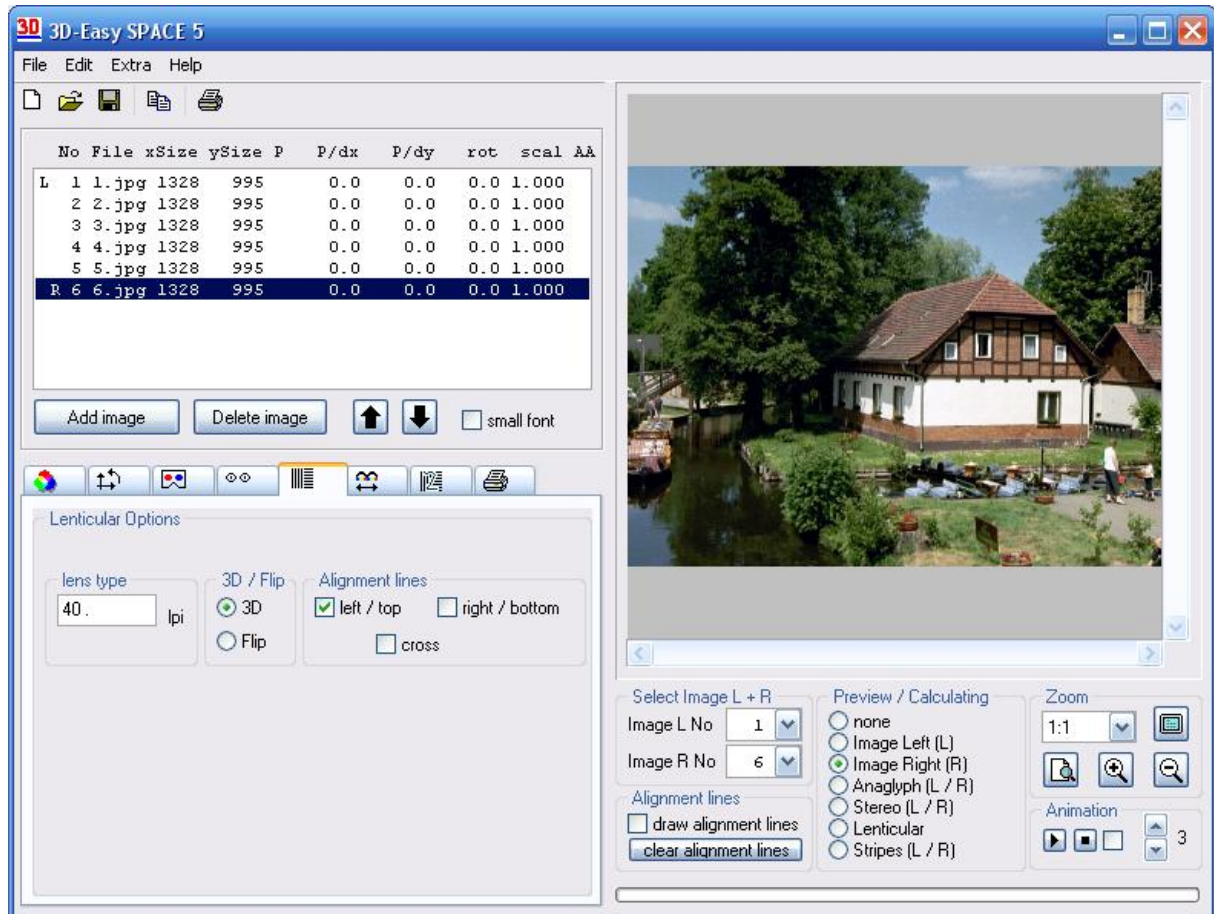
The new adjusted images, which were developed, are contained in the folder of the stereo images and image serials and have the file name „Newxx.bmp.“ The *3D-Easy - 1-Click-Auto-Alignment* increased the quality of the adjustment in all cases.

Only the 3D-impression has to be adjusted referring to personal taste by horizontal shifting with the new function *3D-Easy - Serial Alignment*.

1.1.2 The software *3D-Easy SPACE 5 - Home*

The software *3D-Easy SPACE 5 - Home* belongs to *3D-Easy Complete Kit 5 - Home*.
The user interface of the software *3D-Easy SPACE 5 - Home* is clearly structured.

The large preview image gives a good impression of the current program situation. The single program functions are summarized in tab controls and groups.



User interface of the *3D-Easy SPACE 5 - Home* Software
(We hold the right to change the software without notice.)

The software *3D-Easy SPACE 5 - Home* has the following capabilities:

- production of 3D-and flip images with the help of the enclosed lenticulars
- continuous calculation of lenticular images from 10 lpi up to 50 lpi
- production of gray and colorful anaglyph images (3D Images with yellow/blue, red/cyan, red/green, red/blue, magenta/green and green/blue parts as grey or color images) on the monitor and as a print; this function will be used for the 3D impression of the lenticular image (depth of the room); it can also be used to produce anaglyphs only
- smooth and independent saturation of the color channels red, green and blue make the production of colored anaglyphs possible even with difficult colors
- production of stereo-images (selection out of 10 given formats)
- *3D-Easy SPACE 5 - Home* does not require another graphic program; all necessary functions are contained in the program, including image print
- the software is optimized for home printers with a resolution of 300 dpi and higher; the software is matched perfectly with the lenticulars

- parallel processing up to 10 single images with single images of any size (process and create images (24 Bit BMP, TGA, TIFF, all uncompressed) up to 4 GB file size; this means a maximal image size of about 36000 x 36000 pixel)
- efficient alignment functions (freely definable alignment lines and alignment boxes in the preview) in order to correct horizontal and vertical movements of the images for each single image as well as canting/distorting and enlarging/decreasing; moreover, the alignment function can be used to receive certain 3D-effects (room depth)
- bicubic interpolation with all adjustments (shifts, rotations, scalings)
- *3D-Easy - Serial Alignment* (manual shifts of several images with one click)
- universal calibration function (direct print) to correct small deviations of length of prints and/or lenticular material (10 - 50 lpi)
- an animated preview of all loaded single images supports a perfect adjustment of all single images and gives a 3D and flip image effect in advance
- adjustment of any colors of different backgrounds
- image file types for import and export in BMP, TGA, TIFF (24 Bit RGB, uncompressed) and JPG format (import only)
- every produced image can be copied in a different graphic program via the clipboard
- special options for encasement of 2 images (e.g. images for 3D shutter glasses, 3D monitors)
- adjustable print function (print borders and sizes of the images can be adjusted freely up to 16x16 cm)
- large preview of the image with zoom to pixel level
- regulations of brightness, contrast, saturation and gamma (preview image and print)
- normal and inverted depiction (for print on paper or transparent material)
- optional print of different red-cyan reference stripes of an image in order to put the lenticulars in the right position
- savings of all adjustments in project files
- compatibility of project files with older versions (older project files can be loaded)
- automatic saving and restoration of important program adjustments
- user interface easy to use and extensive manual on CD (PDF-file) for beginners, including a detailed instruction to produce 3D-, flip and anaglyph images

The Software *3D-Easy SPACE 5 - Home* requires following parameters:

- PC Pentium 166 MHz, 64 MB RAM
- 30 MB drive space for program and manual, the processing of large single
- images can require several 100 MB temporary drive space
- CD- or DVD-ROM drive
- VGA graphic card from 800x600 pixel and from 256 colors as well as corresponding color
- monitor
- Operating System of Microsoft® Windows 98, ME, NT 4, 2000, XP, Vista
- Printer from 300 dpi (a color printer is recommended from 1200 dpi)
- Mouse or other pointing device.

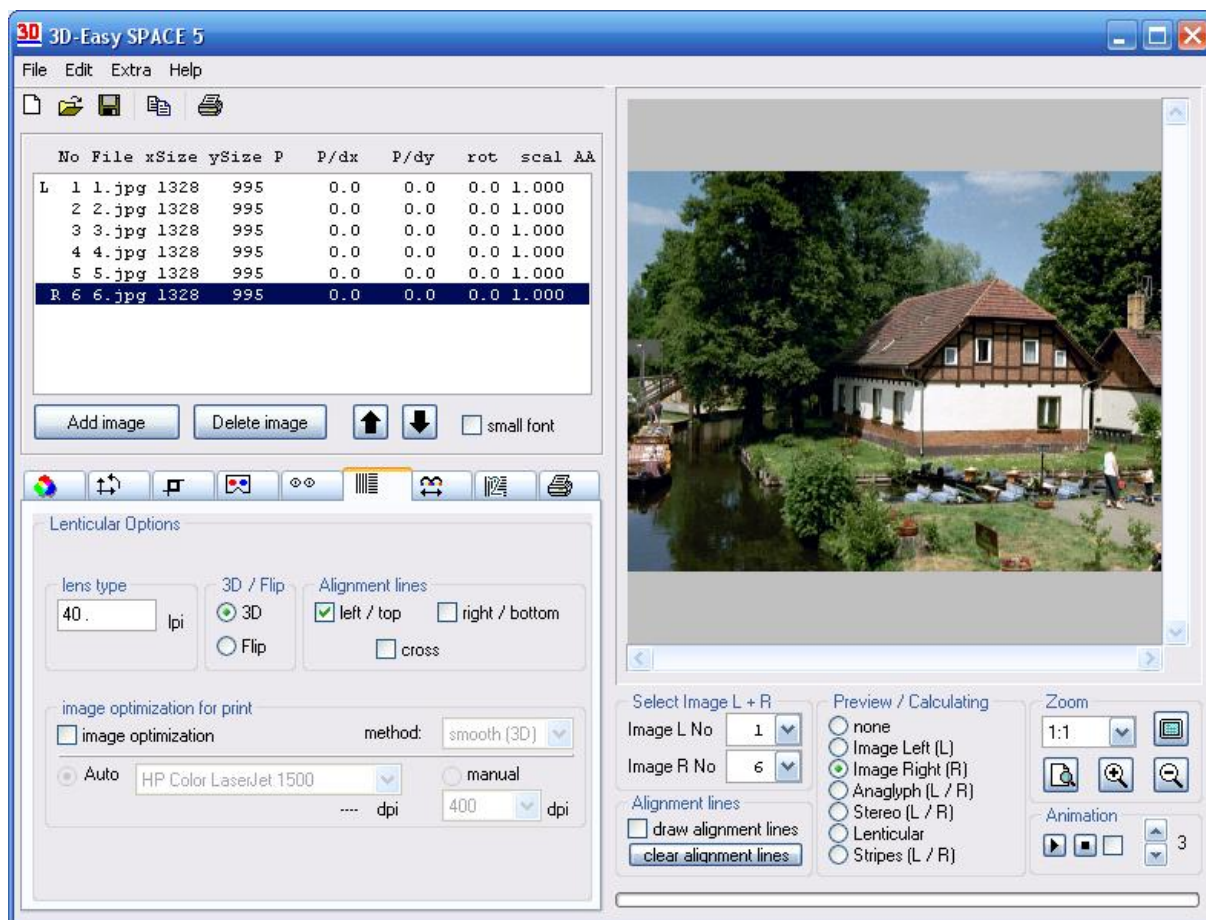
For fast working on a computer, the following or even better equipment is recommended:
Pentium II / 400 MHz, 128 MB RAM, graphic card with a color depth of 16 Million colors
(True Color).

Prints of high quality require a color printer from 1200 dpi and printing paper of high quality.
The production of own real 3D-images or flips requires a camera.

The abbreviation dpi (= dot per inch) signifies the printing resolution and indicates how many single spots within one inch (= 2.54cm) can be printed. Dpi-values, which are often used, are 600, 720 or 1200.

1.1.3 The software *3D-Easy SPACE 5 - Standard*

The software *3D-Easy SPACE 5 - Standard* belongs to *3D-Easy Complete Kit 5 - Standard*.



User interface of the *3D-Easy SPACE 5 - Standard* Software
(We hold the right to change the software without notice.)

The software for *3D-Easy SPACE 5 - Standard* has the following capabilities:

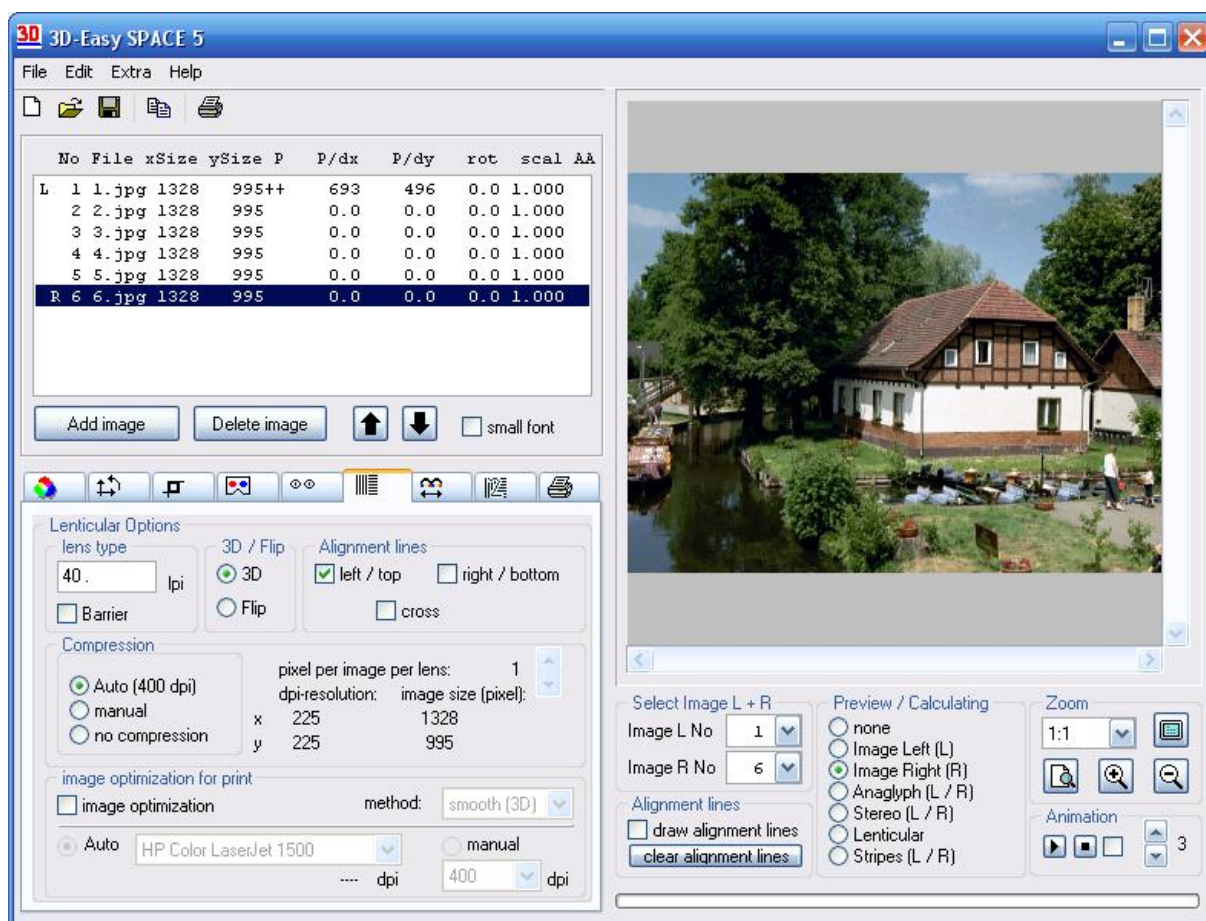
- the Software *3D-Easy SPACE 5 - Standard* has the same capabilities as the Software *3D-Easy SPACE 5 - Home* and additional
- support of the patented **ColorCode CS Plus™ Dual encoding** technology (instead of the anaglyph color combination yellow / blue in the *Home Edition*)
- *3D-Easy - 1-Click-Auto-Alignment* (completely automatic adjustment of all loaded images referred to an reference image or the possibility of symmetrical correction if 2 images are loaded)
- parallel processing up to 20 single images with single images of any size
- individual reference points (1 reference point per 1 single image) to a half automatical fast horizontal/vertical adjustment of all single images, a possible further rotation and scaling use reference point as image centre. There is the possibility to allow only horizontal shifts
- *3D-Easy - Optimized Image Area* calculates the rectangular image part of all loaded images which does not contain empty image contents (e.g. caused by rotation)
- define and **cut a rectangle window** from all adjust single images **in one step** (per mouse or entering pixel-values) with following export of all adjusted single images)
- continuous calculation of lenticular images from 10 lpi **up to 76 lpi**

- **automatic / manual image optimization** (consideration of physical print characteristics) in the calculation of lenticular images leads to better qualitative results, especially with formats A4 and larger
- calculation and print of **30 x 30 cm** images
- **calibration function / pitch test** (direct print) to correct small deviations of length of prints and/or lenticular material from 10 lpi **up to 76 lpi**
- universal generation and saving of **calibration image files (pitch test) for the range of 10- 76 lpi (to use external print services); black/white stripes**
- **free definable stereo-images.**

The Software *3D-Easy SPACE 5 - Standard* requires a PC with 128 MB RAM.

1.1.4 The software *3D-Easy SPACE 5 - Professional*

The software *3D-Easy SPACE 5 - Professional* is not sold within a Complete Kit but as an independent software version.



User interface of the *3D-Easy SPACE 5 –Professional* Software
(We hold the right to change the software without notice.)

The software for *3D-Easy SPACE 5 - Professional* has the following capabilities:

- **The Software *3D-Easy SPACE 5 - Professional* has the same capabilities as the Software *3D-Easy SPACE 5 - Standard* and additional**
- parallel **processing up to 99 single images** with single images of any size
- defines the **compression level** by calculation of lenticular images
- continuous calculation of lenticular images from 10 lpi **up to 999 lpi**
- calculation and print **without any limitations of size** (e.g. 50 x 70 cm)
- **calibration function / pitch test** (direct print) to correct small deviations of length of prints and/or lenticular material from 10 lpi **up to 999 lpi**
- universal generation and saving of calibration-image files (pitch test) for highest demands in the field 10- 999 lpi (to use external print services) with **up to 99 images / colors** per lens
- support of the **Parallax Barrier-Method**

The Software *3D-Easy SPACE 5 - Professional* requires a PC at least 128 MB RAM.

1.2 Examples of images of the CD-ROM

Different example images are contained in the folder \IMAGES on the CD-ROM.

The images to produce ColorCode 3-D, Anaglyph and Stereo images are in the folder: \IMAGES\STEREO.

The single images to produce lenticular images are contained in the folder:

\IMAGES\LENSES\3D (for 3D images).

\IMAGES\LENSES\FLIP (for flip images).

\IMAGES\LENSES\ANIMATIO (for animations).

The pairs of images or the series of images that consists of up to 10 single images are saved in separate folders. The respective project files with the file extension “.3DE” are also saved in the single folders. There is additional information about the image subjects and the used technique (INFO.TXT) in all folders.

Lots of stereo image pairs and image serials of 3D images were adjusted with the new functions *3D-Easy - 1-Click-Auto-Alignment* and *3D-Easy - Optimized Image Area* and saved as new images. The new images are in the same folders and have the names NewXX.BMP. The anaglyph image „New.00.BMP“ is saved in addition with stereo image pairs. All new anaglyph images have a red/cyan color combination.

The example images are the basis for the step-by step instructions in chapter 3.

1.3 ColorCodeViewer™ and anaglyph glasses

1.3.1 The ColorCodeViewer™

The *3D-Easy Complete Kit 5 - Standard* contains a patented ColorCodeViewer™. The ColorCodeViewer™ which can be purchased in the *3D-Easy - WebShop* can be used to view ColorCode 3-D™ images (ColorCodeStereogram™).

For more information on anaglyph techniques see chapters 3.1, 5.5 and 6.1.



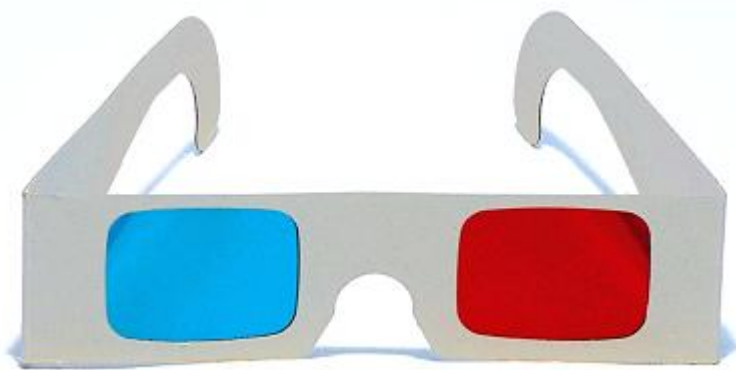
The patented ColorCodeViewer™ (We hold the right to change the product without notice)

The special feature of the ColorCodeViewer™ is the use of patented amber and blue color filters. Moreover, the glasses are made of light materials.

1.3.2 The red/cyan anaglyph glasses

The *3D-Easy Complete Kits 5 - Home and Standard* contains a pair of red/cyan anaglyph glasses. These glasses can also be purchased in the *3D-Easy - WebShop*. The pair of red/cyan anaglyph glasses can be used to view anaglyphic images.

A pair of anaglyph glasses consists of paper / cardboard, the color filters are made of standardized plastic color filter. Anaglyph glasses are made of light material which can be folded and therefore, any size can be obtained. Anaglyph glasses can be worn in front of prescription glasses. Since the software *3D-Easy SPACE 5* supports the color combination red-green and red-blue, anaglyph glasses with this color combination can be used as well. They can also be purchased in the *3D-Easy - WebShop*.



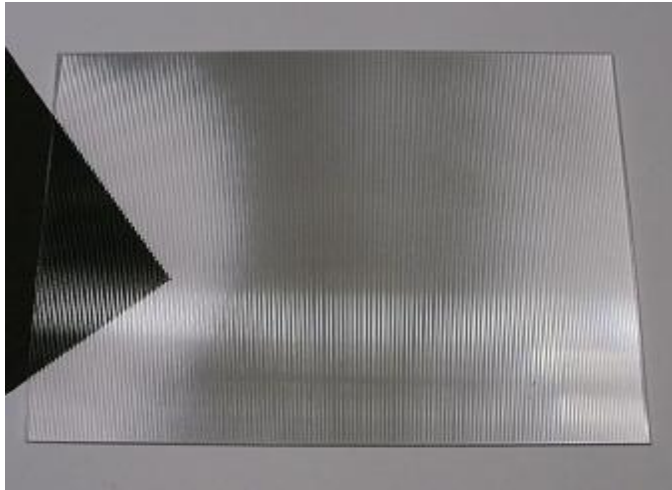
red/cyan anaglyph glasses (We hold the right to change the product without notice)

For more information on anaglyph techniques see chapters 3.1, 5.5 and 6.1.

1.4 The lenticular cards

1.4.1 Portrait and landscape

The *3D-Easy Complete Kit 5* contains 2 (*Home*) or 4 (*Standard*) lenticular cards altogether, each in the measures 15 x 10 cm.



lenticular card in 3D-landscape



lenticular card in 3D-potrait

The illustration **on the left** shows a lenticular card in **3D-landscape**, which has been photographed from an angle from above. It is also possible to use this lenticular card for flip as well as for animations. The card only has to be turned around at an angle of 90 degrees. Then you obtain a lenticular card in **flip-potrait**.


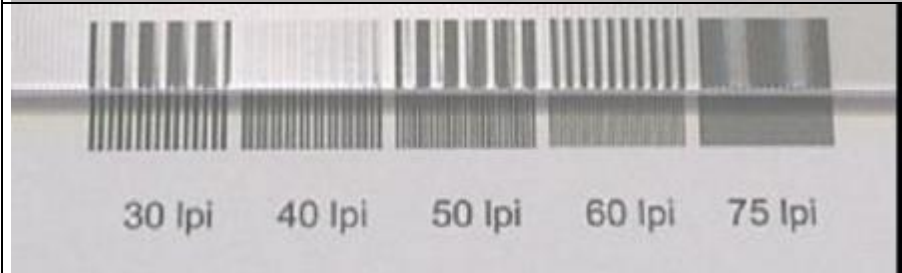
The illustration **on the right** shows a lenticular card in **3D-potrait**, which has been photographed from above. After turning the card around at an angle of 90 degrees, the card can be used as **flip-landscape**.

1.4.2 Distinction of the formats 30, 40, 50, 60 and 75 lpi

The most important feature of the lenticular card, the amount of lenses per inch (1 inch corresponds with 2.54 cm), is indicated in lpi (lens per inch).

The *3D-Easy Complete Kit 5 - Home* contains a 30 and 40 lpi lenticular card. In addition, there is a 60 lpi and a 75 lpi lenticular card in the *3D-Easy Complete Kit 5 - Standard*.

These lenticular cards can be differentiated by the **reference pattern**, which can be seen in the short instruction manual.

	<p>The reference pattern to determine the lenticular material</p>
	<p>A 40-lpi-lenticular card is on the reference pattern, it is recognizable at the user interface, which is filled with white (or black) color.</p>

For this, any lenticular card has to be put on the pattern stripe. The lenticular cards (with the structured user interface) have to be showed above (to the viewer). The lenticular card has to be turned the way that the lines of the card run parallel to the printed stripe. There is congruence between lenticular card and printed lenticular if there is a filled user interface (either black or white) that appears instead of black/ white stripes.

Regardless of this method of differentiation, the two different densities of the lenticulars (lpi) can be seen when looking at them with the naked eye and by comparing them. The densities of the lens correspond exactly with the printed lenticulars on the "Short instruction manual". In general it means: the larger the lpi-value, the denser the lenses are.

The reference stripe in the "Short instruction manual" serves only to differentiate the 2 or 4 lenticular cards, which are in the Kit, it does not substitute with the calibration functions of the software *3D-Easy SPACE 5*.

The rough determination of the lpi-value for unknown lenticular material is carried out very easily with the "*3D-Easy - Lenticular Rough Determination*" (chapter 1.4.3).

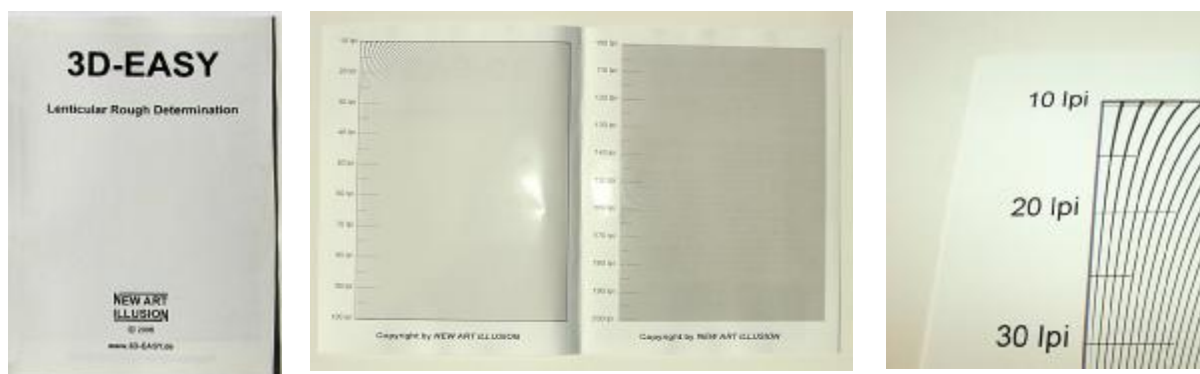
There are non-self adhesive as well as self-adhesive lenticular cards in our offer. With a very thin glue layer on the back of the self-adhesive lenticular cards, a permanent no reversible fixation is guaranteed.

1.4.3 Rough determination of unknown lenticular material

Purpose of use

The "*3D-Easy - Lenticular Rough Determination*" serves the simple and fast rough determination of lenticular cards with unknown lpi-value in the field from 10 to 200 lpi. It does not replace the calibration functions which is contained in the software *3Deasy SPACE 5*. The lpi-value, which is determined by the "*3D-Easy - Lenticular Rough Determination*", should therefore be starting point of a following lenticular calibration (pitch test).

The "*3D-Easy - Lenticular Rough Determination*" is contained in the *3D-Easy Complete Kit 5 - Standard*, but can be purchased separately in the *3D-Easy – WebShop* too.



Special print "*3D-Easy – Lenticular Rough Determination*" (10 - 200 lpi)

Application

The operation is carried out as described in 1.4.2 and 2.16.2:

1. Place Lenticular sheet

Any lenticular sheet is placed on "*3D-Easy - Lenticular Rough Determination*". The lenticular sheet with the structured user interface has to be placed to the viewer.

2. Align lenticular sheet parallel

The lenticular sheet has to be rotated the way that the lenses run parallel to the printed parallel lines. There is a correspondence of lenticular sheet and printed lenticular if the red/cyan alignment stripe does not show any "stair effects".

3. Destination the lpi-value

An even black or white stripe sideways to the red-cyan alignment stripe indicates the correspondence of the lpi value of the paper and the lenticular. The lpi-value can be read or estimated on the left, doubling and quad duplication etc. of the lpi value. So the lowest lpi value is correct.

Due to physical reasons, suitable samples recur with 2x, 3x, 4x etc. of the lpi-value. That lpi value which owns the lowest value is right.

1.4.4 Physical characteristics

The following table shows a survey of the different lenticular materials:

	30 lpi	40 lpi	60 lpi	75 lpi
Technical information				
amount of lenses per inch	30,0	40,0	60,0	75,4-75,6
optical angle in °	49	25	26	49
thickness in mm	1,39	2,08	1,20	0,46
weight (15x10 cm) in g	24	39	22	7
viewing distance in m	0,3-5	0,3-5	0,3-3	0,3-1
Use				
3D	yes	yes, really strong	yes, really strong	yes
flip / animation / morph / zoom	yes	yes, fast animation	yes, fast animation	yes
Availability				
non-self adhesive lenticular material available	yes	yes	yes	yes
self adhesive lenticular material available	yes	yes	yes	no
Content of the 3D-Easy Complete Kit 5				
<i>3D-Easy Complete Kit 5 - Home</i> (each 15x10 cm)	3D-Portrait	3D-Landscape	-	-
<i>3D-Easy Complete Kit 5 - Standard</i> (each 15x10 cm)	3D-Portrait	3D-Landscape	3D-Landscape	3D-Portrait

(We hold the right to change the product without notice)

If the lpi-value rises, the depiction of the detail of the single images increases. At the same time, the demand for the printing resolution increases.

All lenticular cards are available in size 15x10 cm and 24x18 cm and in 3D-portrait- as well as 3D -landscape. Special productions up to 50x70 cm are possible.

There are only non-self adhesive lenticular cards in the *3D-Easy Complete Kits 5*.

The thickness of the lenticular (lpi) varies a bit due to its production. With the help of the calibration, which *3D-Easy SPACE 5* contains, these fluctuations can be equalized completely.

1.5 The stereo viewer Lorgnette

The *3D-Easy Complete Kit 5* contains a stereo viewer Lorgnette. Stereo images of a size up to 12 x 12 cm per image can be viewed with this 3D-stereo viewer.

For more information regarding stereo-images see chapters 3.5 and 5.5.



stereo viewer Lorgnette (We hold the right to change the product without notice)

Lorgnette is one of the most used stereo viewers worldwide.



Stereo image produced with *3D-Easy SPACE*

How to use the stereo viewer

The distance between eye and stereo image is nearly the same distance when reading (about 40 cm). First, the stereo viewer has to be held closely above the stereo image. Now the stereo viewer has to be put the way that a part of an image (e.g. head of a person) is clearly visible under both lenses of the stereo viewer. Afterwards you lift the stereo viewer slowly nearer to your eyes. The selected image part (head of the person) still has to be visible under both lenses. The selected image parts of the left and right image (head of the person) appear to move towards each other with the larger distance of printed stereo image and diminishing distance of the stereo viewer. Without moving the viewer, bring your eyes closer to it (keep minimal gap of the movable piece) until you can see the entire image. Both images which were separated before merge into one entire image (head of the person). In this moment, the depth of the entire image is clearly visible.

Persons wearing glasses can also use the stereo viewer.

How to clean the stereo viewer

You can clean the lenses, as you would do with your own glasses by washing with water or by breathing on the lenses and wiping them with a cloth. Do not use paper napkins because there can be scratches; also do not use acetone or similar liquids because it could destroy the plastic.

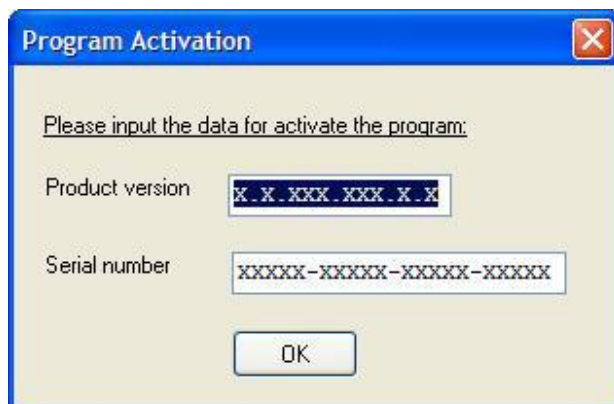
2 The basic functions of the program *3D-Easy SPACE 5*

2.1 Installation, start and finishing the program

After putting the *3D-Easy - CD-ROM* into the CD-/DVD-ROM drive of the computer, the program *3D-Easy SPACE* can be started directly from the CD-ROM. After the start of the Windows-Explorer or another file manager, it is only necessary to make a double click on the file 3D-EASY.EXE in the folder \PROG of the CD ROM. Due to speed reasons, it is recommended to copy the complete folder \PROG from CD-ROM on hard disk in any (new) folder (e.g.: C:\PROGRAM\3D-EASY\PROG). Afterwards the program can be started out from the hard disk, for instance by using the Windows -Explorer. It is recommended to make a new (own) symbol in start menu or on the desktop.

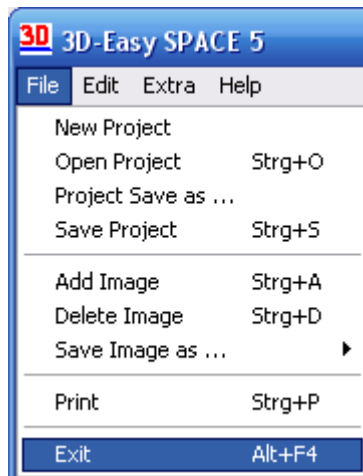
Information on how to copy files or complete folders and information how to install program symbols can be read in the manual of the operating system.

With the first start of the program, product version (key) and serial number (only Standard and Professional version) have to be entered. There is neither a registration nor a computer related activation.



You can find the product version (key) and serial number on the Short instruction manual.

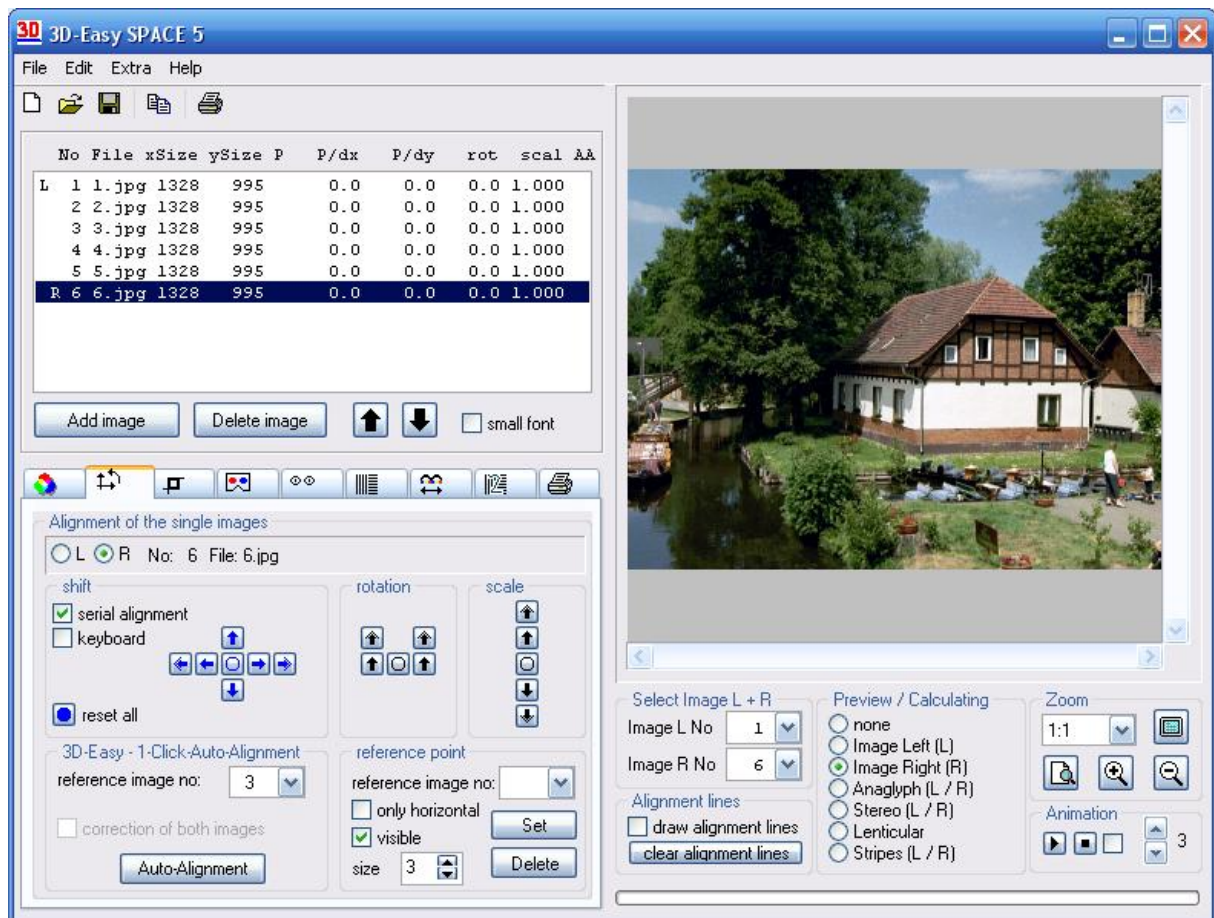
After the start of the program *3D-Easy SPACE* by making a double click on the symbol of the program or by starting the Windows-Explorer, the single functions of the program can be started.



In order to finish the program *3D-Easy SPACE*, the menu sequence "File" > "Exit" has to be selected.

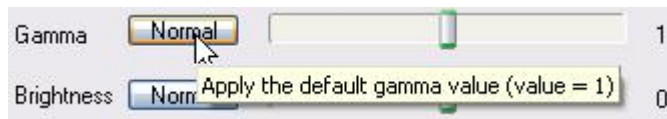
2.2 The user interface of the program, help-functions

The following image shows the user interface of the program *3D-Easy SPACE 5 - Standard*.

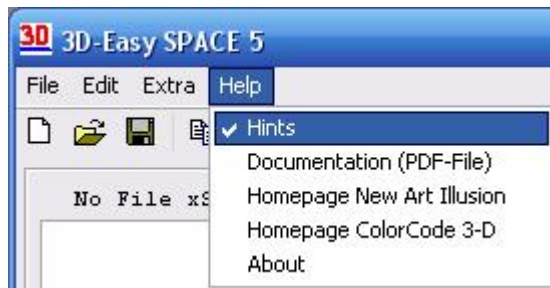


Connected functions are summarized in tab controls or groups and panels. There is a large image-preview on the right hand side, which always gives a good impression of current status of the image processing.

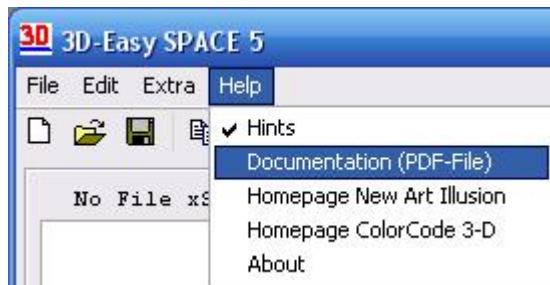
The program *3D-Easy SPACE 5* is mostly operated by mouse. If the mouse stays on the buttons or input elements, there will be a help hint to the related operating element after a short time (approximately 1 second). The following image illustrates so-called quick information:



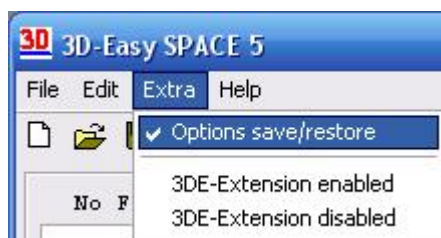
These quick information can be enabled or disabled in the menu "Help" > "Hints".



The manual in PDF-format is shown with the software Adobe Reader. You can download a free version of Adobe Reader on the Internet.



The most important options of the program such as size and position of the window, background colors for the preview, statements to the animated preview image sequence, last selected folder are saved automatically and are considered with the next start of the program.

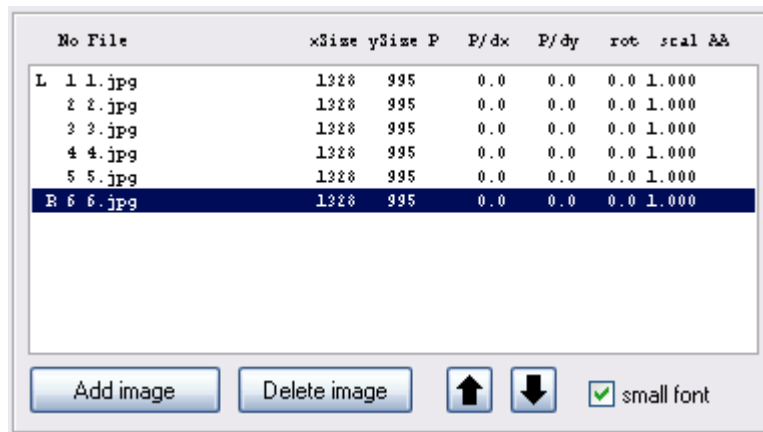


These options do not have any influence on the result of the image calculations.

The automatic saving and restoring of the options of the program can be activated/deactivated with the menu "Extra" > "Options save/restore".

2.3 Loading images

The single images, which have to be processed, have to be loaded in the program after its start.



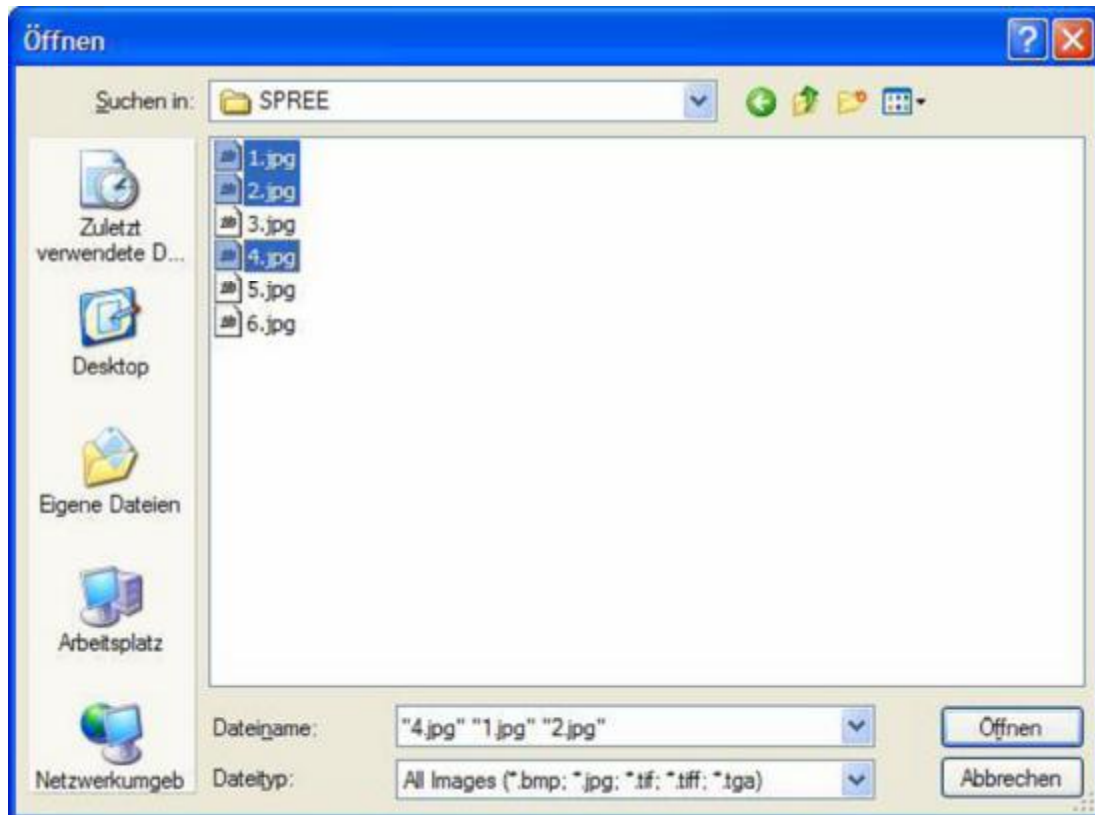
In this table, the following information of all loaded images are shown:

- without heading: sign, whether an image is selected as image "L" or "R"
- No: ordinal number (is given by the program *3D-Easy SPACE*)
- File: file name
- xSize: width of the image (pixel)
- ySize: height of the image (pixel)
- P: indication if selected image is reference image ("++") or indication if reference point is placed in the current image ("+")
- P/dx and P/dy: shifting alignment values (pixel) or coordinates (pixel) of the reference point
- rot: rotation alignment value (°)
- scal: scale alignment value (scale factor)
- AA: result of the auto-alignment („+“: very good; „?“: „good“; „-“: no correct. possible)

The following buttons are available for loading, deleting and fixing the succession of the single images:

Schalter	Funktion
	The button "Add image" starts the "Open Dialog". One or more files can be selected for the project in this dialog box.
	The button "Delete image" removes the selected file ("blue bar") out of the project. The file itself is not deleted from the drive space.
	The succession of the processing of the files can be changed with these buttons. A file should be selected ("blue bar") and should be shifted.
	Enabling and disabling of a smaller font in the list of files. A smaller font is useful with more than 10 files or longer file names.

The images can have different pixel sizes. All images are first aligned on the left edge on the top. Parts of images, which are missing, are filled with the background color, which is used. Additional shifting, rotation and scaling of all single images can be carried out with alignment functions.



(Open Dialog; language depends on the language of the operating system)

Several images can be selected in "Open Dialog" at the same time. There are 2 methods available:

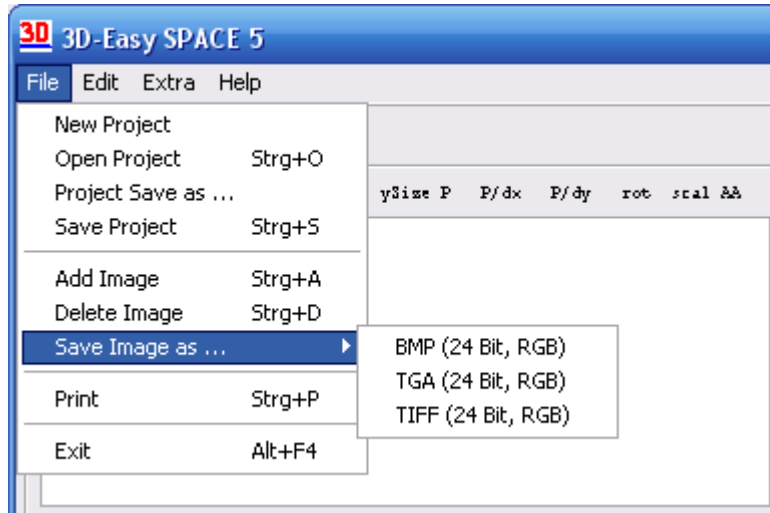
- selection of single files with pressed Control Key.
- selection of the first and last file with pressed Shift Key.

The selected files are loaded into the project with a final click on the button "Open".

The program *3D-Easy SPACE 5* supports the 24 Bit uncompressed image types BMP, TGA, TIFF and the JPG format.

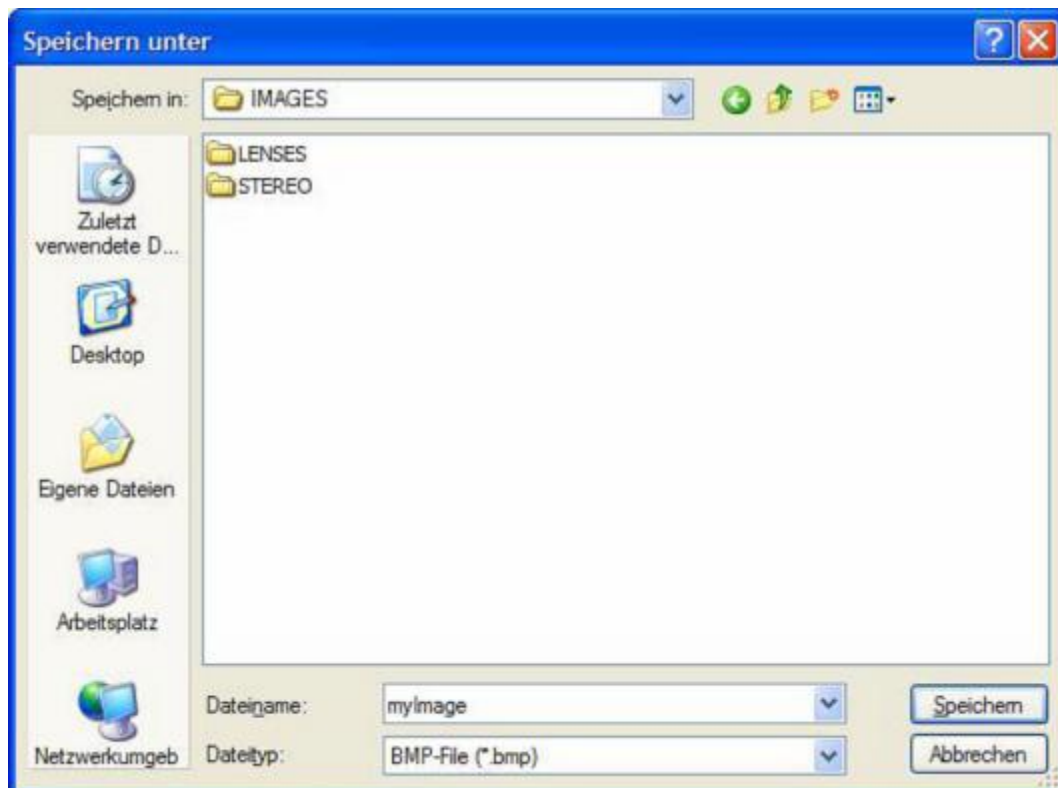
2.4 Saving an image

Every image that is shown in the preview can be saved. The saving of an image is made by the menu sequence "File" > "Save Image as ...".



The program *3D-Easy SPACE 5* supports the uncompressed image types BMP, TGA and TIFF.

The corresponding dialogue "Save Image as ..." resembles the dialogue "Open":



Save Image as Dialog; language depends on the language of the operating system

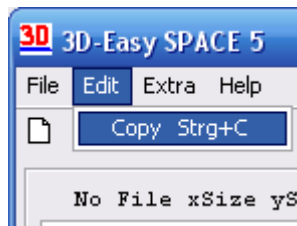
After an own file name has been indicated (e.g. "my Image") and after having clicked the button "Save", the image has to be saved in selected folder. The file extension ".BMP", ".TGA" or ".TIF" is attached automatically to the name of the file.

The following advice has to be taken into consideration in case a lenticular image should be saved and should be printed in another program:

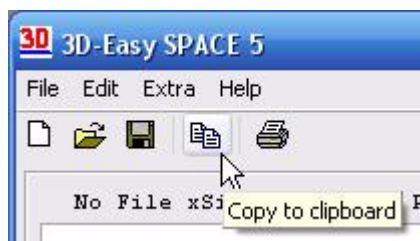
- save image always without loss of information (is always the case in *3D-Easy SPACE 5*), loss of information occurs with lots of graphic programs with image compression
- note down the values in cm or inch which are shown in the program *3D-Easy SPACE 5* after the complete calculation of the image and indicate them in other programs as printing size.

2.5 Working with the clipboard

The program *3D-Easy SPACE 5* is able to copy all images, which are shown in the image preview, in the clipboard of windows. One can copy with the help of the menu sequence "Edit" > "Copy"...



or by a click on the copy-icon:



Due to that, other graphic programs can paste this image out of clipboard. Mainly, the operation works with the menu sequence "Edit" > "Paste".

2.6 Loading and saving a project

With the help of the so-called project files, every single option of a project can be saved in a file.

The following information belong to a project:

- all file names of the loaded images
- information to the reference image and to the reference points
- x, y alignment values (shifting of images) for every single image
- angle alignment value (image rotation) for every single image
- scale factor (enlarging / reducing) for every single image
- brightness value
- contrast value
- saturation value
- gamma value
- background color for missing image contents
- preview/calculation-option

- lenticular options
- type of anaglyph
- information to the pair of stereo-images
- barrier options
- adjustments for the calculation of stripes of 2 images
- printing options (printing borders, size of images etc.)

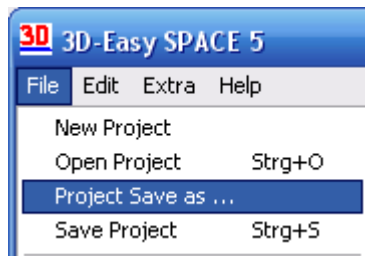
The following information does not belong to a project:

- used printer and its options such as quality/printing resolution
- position of alignment lines/boxes
- size and position of a piece of an image (tab control "Alignment of the single images")
- zoom options in the image preview
- lenticular calibration options
- background colors for the image preview
- other options of the operating system (Windows).

In the project file, only the file names are saved, not the images themselves.

Therefore, the corresponding files (images) should be saved in addition to the project file when saving them.

The saving of a project file is done by the menu sequence "File" > "Project Save As..."; the opening or loading of a project file is done by menu sequence "File" > "Open Project" ...



or by a click on the corresponding icons "Open" or "Save".



As already mentioned, the used file names are saved in a project file.

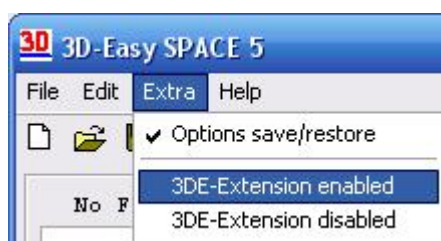
Moreover, the name of the drive (e.g. "C") and the complete name of the file including folder names are saved in the project file. In case the image files will be moved in another folder or if they will be archived on CD/DVD, it is necessary to save the corresponding project file in the same folder where the single images are saved. Otherwise the program cannot find the single image files. The program *3D-Easy SPACE 5* first searches in the original folder. If the images cannot be found there, the search of the images goes on in the folder of the current project file.



Open project Dialog; language depends on the language of the operating system

The *3D-Easy SPACE*- project files have the file extension ".3DE". If a project is saved, this file extension will be added automatically to the relevant file names. This file extension is used as a file filter in the dialogue box "Open Project".

A file linkage between file extension "3DE" and the program *3D-Easy SPACE 5* is established in the registry of the operating system with the menu "Extra" > "3DE-Extension enabled". Afterwards, a *3D-Easy SPACE*-project file (*.3DE) can be started for instance by the windows explorer. The program *3D-Easy SPACE 5* will be started automatically and the project is loaded.

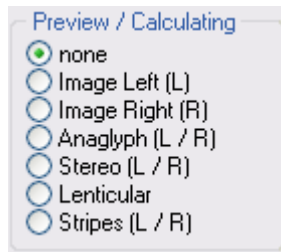


The menu "Extra" > "3DE-Extension disabled" separates an existing file linkage between file extension "3DE" and the program *3D-Easy SPACE 5*.

2.7 Radio Group "Preview/Calculating"

2.7.0 General information

The calculation of the preview /result image will be introduced with the help of the radio group "Preview/Calculating".



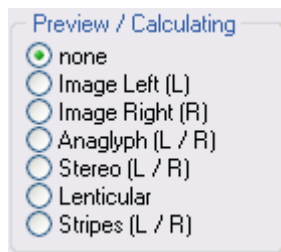
The preview image is always based on a complete calculated result image. That is the reason why following operations such as printing, saving or copying in the clipboard can be realized without any time delay.

The current state of the large-scale calculations of a lenticular image can be seen at the progress bar beneath the preview image.

The following "Preview/Calculating" options are available:

2.7.1 Option "none"

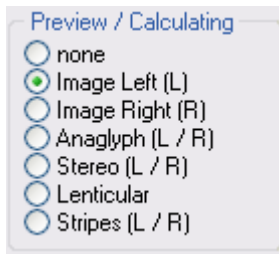
There is no preview with this option; the corresponding preview image is empty.



Due to this reason, images cannot be saved or copied in the clipboard. The option "none" is the default option after the start of the program. The selection of the option "none" makes only sense on slow computers if several changes have to be carried out without starting a new time-consuming calculation of the image each time.

2.7.2 Option "Image Left (L)"

Image Left (L) is shown with the selection of option "Image Left (L)".



In this connection, all aligned values (shifting, rotation, scaling) are always taken into consideration.

The adjusted image serves as a preview and can also be saved as an aligned single image.

The preview of a single image has the advantage that with the help of fixed alignment lines and boxes one can carry out the alignment for every image.

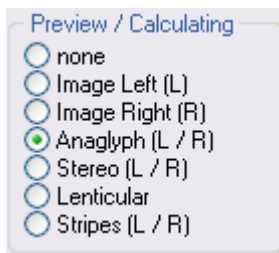
"Image left (L)" and "image right (R)" define the stereoscopic pair of image ("L / R").

2.7.3 Option "Image Right (R)"

The statements of option "Image Left (L)" are also valid for option "Image Right (R)".

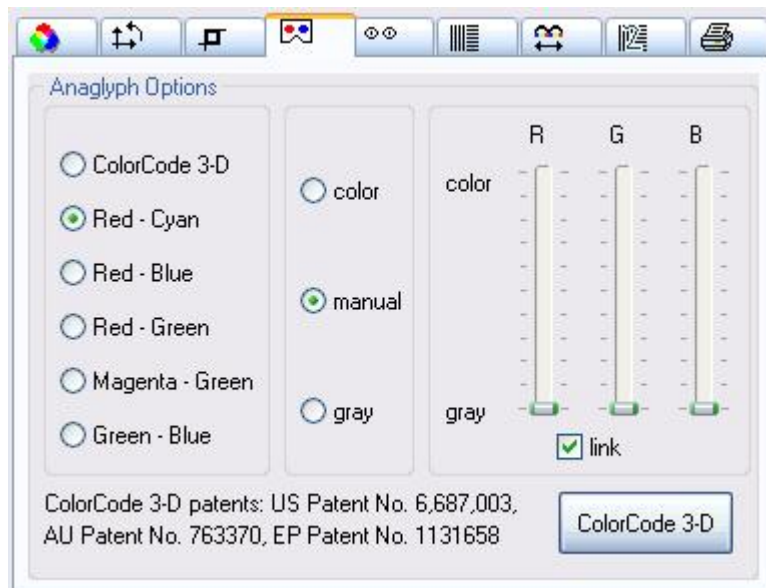
2.7.4 Option "Anaglyph (L / R)"

The option "Anaglyph A / B " has the effect that an anaglyph image is calculated.



Two images are needed for the anaglyph image. The selected options in the radio group "L" and "R" define the two basic images, which are the basis for the production of anaglyphs. You will find details for the selection of the images L and R in chapter 2.8.

There are 6 types of anaglyphs available. The type is selected in the tab control "Anaglyph options".



User interface of the Software *3D-Easy SPACE 5 – Standard* (We hold the right to change the product without notice).

The following options are selected in the middle and right field:

- "color" (generation of colored anaglyphs)
- "manual" (variable color saturation with the help of the color channels red, green, blue)
- "gray" (generation of gray anaglyphs)

When selecting ColorCode 3-D™ there is no access to the three selections mentioned above because the patented ColorCode 3-D encoding automatically delivers an optimal result.

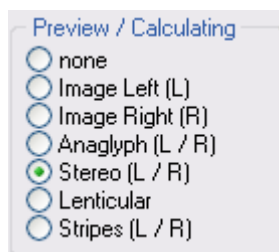
The manual color saturation makes the production of colored Anaglyphs possible even with critical colors of the basic images.

You can find more information regarding ColorCode 3-D™ technique in chapter 6.1.

Each anaglyph can be saved and printed. For further information to anaglyphs see chapter 3.1 and chapter 5.5.

2.7.5 Option "Stereo (L / R)"

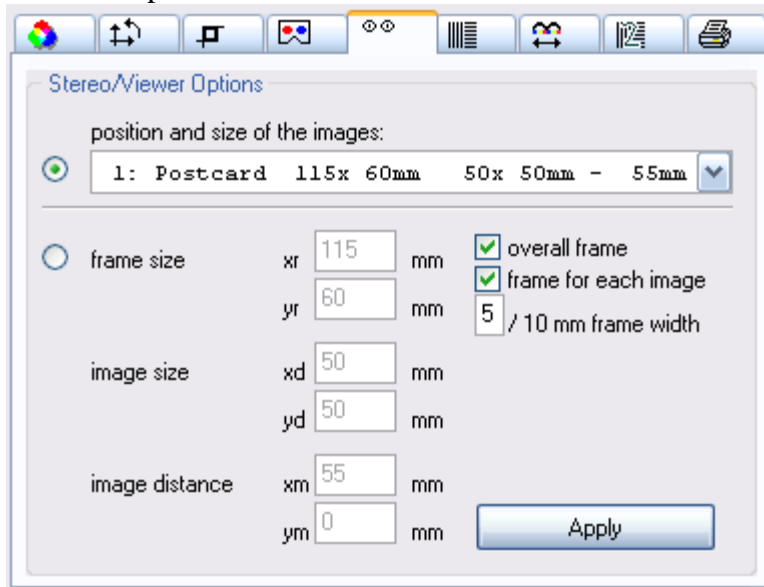
The option "Stereo (L / R)" causes the calculation of one pair of stereo-images.



2 images are needed for one pair of stereo-image. The selected options in the radio group "L" and "R" define the two basic images, which are the basis for the pair of stereo-images.

You will find details for the selection of the images L and R in chapter 2.8.

Different options can be carried out in the tab control "Stereo/Viewer Options":



User interface of the Software *3D-Easy SPACE 5 - Standard*
(We hold the right to change the product without notice).

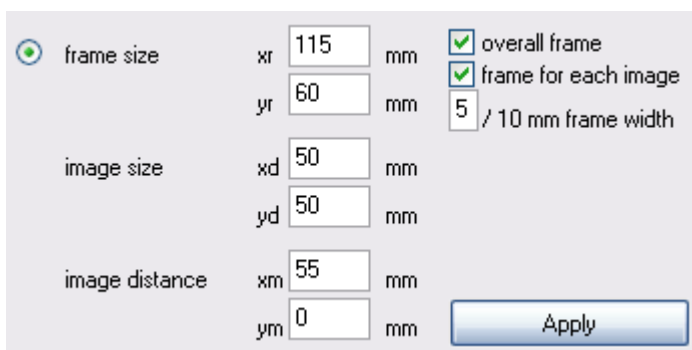
The program *3D-Easy SPACE 5 (all editions)* supports 10 fixed stereo-formats.

1: Postcard	115x 60mm	50x 50mm	- 55mm
2: Lorgn. 1	135x 90mm	60x 80mm	- 65mm
3: Lorgn. 2	175x110mm	80x100mm	- 85mm
4: Dia	101x 41mm	41x 41mm	- 59mm
5: Loreo 1	130x 90mm	65x 90mm	- 65mm
6: Loreo 2	150x100mm	75x100mm	- 75mm
7: KMQ 1	140x200mm	130x 90mm	100mm
8: KMQ 2	160x220mm	150x100mm	110mm
9: KMQ 3	190x280mm	180x130mm	140mm
10: Amazing	144x 37mm	40x 27mm	- 62mm

The following options are available to determine the image parameters:

- "overall frame": marks the outer frame of the pair of images (useful if the pair of image has to be cut later)
- "frame for each image": marks the edge of each of both images
- " .../ 10 mm frame width": description of frame width in one tenth of a millimetre

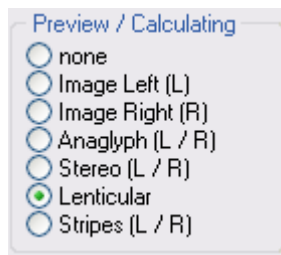
Moreover, the *Standard and Professional Edition* allows defining any stereo-formats (see screenshot).



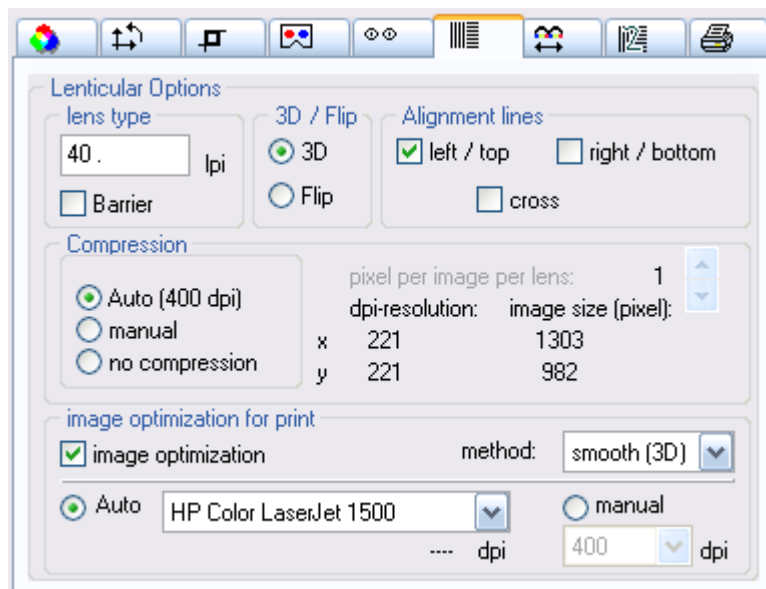
The *3D-Easy Complete Kits 5* contains a 3D stereo viewer Lorgnette (chapter 1.5).

2.7.6 Option "Lenticular"

The selection of the option "Lenticular" has the effect of the calculation of a lenticular image.



Lots of other options are taken into consideration as well, such as the lenticular type (e.g. 40 lpi) or the 3D/Flip option (tab control "Lenticular options").



User interface of the program *3D-Easy SPACE 5 - Professional*
(We hold the right to change the product without notice)

The following options are available in the tab control "Lenticular options":

lens type

Different lenticular cards such as 40 lpi have to be used depending on their purpose and the printing technique. For further details see chapter 1.4

With the help of the radio group "lens type" in the tab control "Lenticular options", the appropriate type of lenticular can be selected. The printed lenticular image only has an effect if the appropriate lenticular card (e.g. 40 lpi) is used.

3D / Flip

The program *3D-Easy SPACE 5* supports the production of 3D images as well as the production of flips/animations.

With **3D** lenticular images, the lenticulars run **vertically**, with **flips** or **animations** / **Morph** / **Zoom** the lenticulars run **horizontally**. This basic difference is determined in the radio group "3D/Flip" in the tab control "Lenticular options". Therefore, with the production of 3D-lenticular cards, the option has to be selected on "3D". With the production of flips /animations, the option has to be selected on "Flip".

Alignment lines

The alignment stripe left (3D) or on the top (Flip/Animation) will be calculated and printed as a standard. There can be more alignment stripes calculated and printed for very demanding alignments or larger formats.

Barrier (only in *Professional Edition* available)

The *3D-Easy SPACE 5 - Professional* makes it possible to calculate and print 3D stripe images according to the Barrier-method. Due to the use of normal glass between stripe image and stripe mask instead of lenticular cards, the lens refraction stops. That is why a slightly modified calculation of the stripe image is carried out. For more information to Barrier technique see chapter 2.14 and 3.6.

Compression (only in *Professional Edition* available)

The compression level with the calculation of the lenticulars can be changed in the *Professional Edition*. The recommended value is "Auto (400 dpi)". In case professional printing technique (lithography) will be used, the compression can be reduced gradually and the resolution can be increased. Therefore, more image details are maintained with the calculation.

At the same time, the demand on the printing resolution (in pixel) rises. The results of the adjusted compression are pursuable because of the changed "dpi-resolution" and "image size (pixel)".

Image optimization for print (only *Standard* and *Professional Edition*)

The physical printer resolution should be taken into consideration if large (A 4 and larger) and very demanding lenticular images are produced. The calculated image is adapted on the physical printer resolution by a very expensive interpolation.

There are the following options available with activation of the check box "Image optimization":

auto / manual:

We recommend the option "Auto" if the lenticular image should be printed from the PC directly and if the corresponding printer driver is installed (default option). In this case, the program *3D-Easy SPACE 5* calculates the necessary print characteristics of the selected printer automatically.

We recommend the option "manual" if the lenticular image should be calculated and be printed on an external printer. In this case, the dpi number of the external printer has to be entered.

In both cases (auto and manual), the basic image is usually increased in its pixel measures.

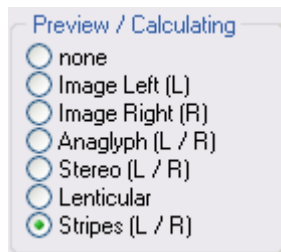
method: hard / soft:

There are 2 methods for the interpolation: We recommend option "smooth (3D)" for the calculation of a 3D-lenticular image, which means the processing of basic images with similar images.

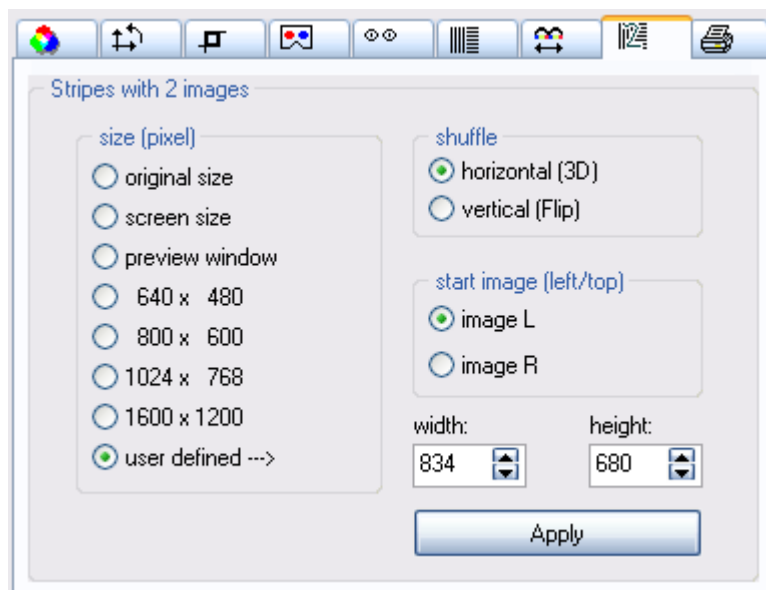
The option "hard (flip)" should be applied, if the image information of the display images to each other show a strong contrast, e.g., with one flip image with day/night-effect.

2.7.7 Option: "Stripes with 2 images"

The selection of the option "Stripe (L / R)" starts the calculation of an image, which is created by line and gap like encasement of the images L and R.



Such stripe images are used with stereoscopic depiction with shutter glasses and 3D-monitors. *3D-Easy SPACE 5* calculates the images but does not control the described devices.



"Stripes with 2 images" of the software *3D-Easy SPACE 5 - Standard* (product changes possible)

The following options for an encasement are available:

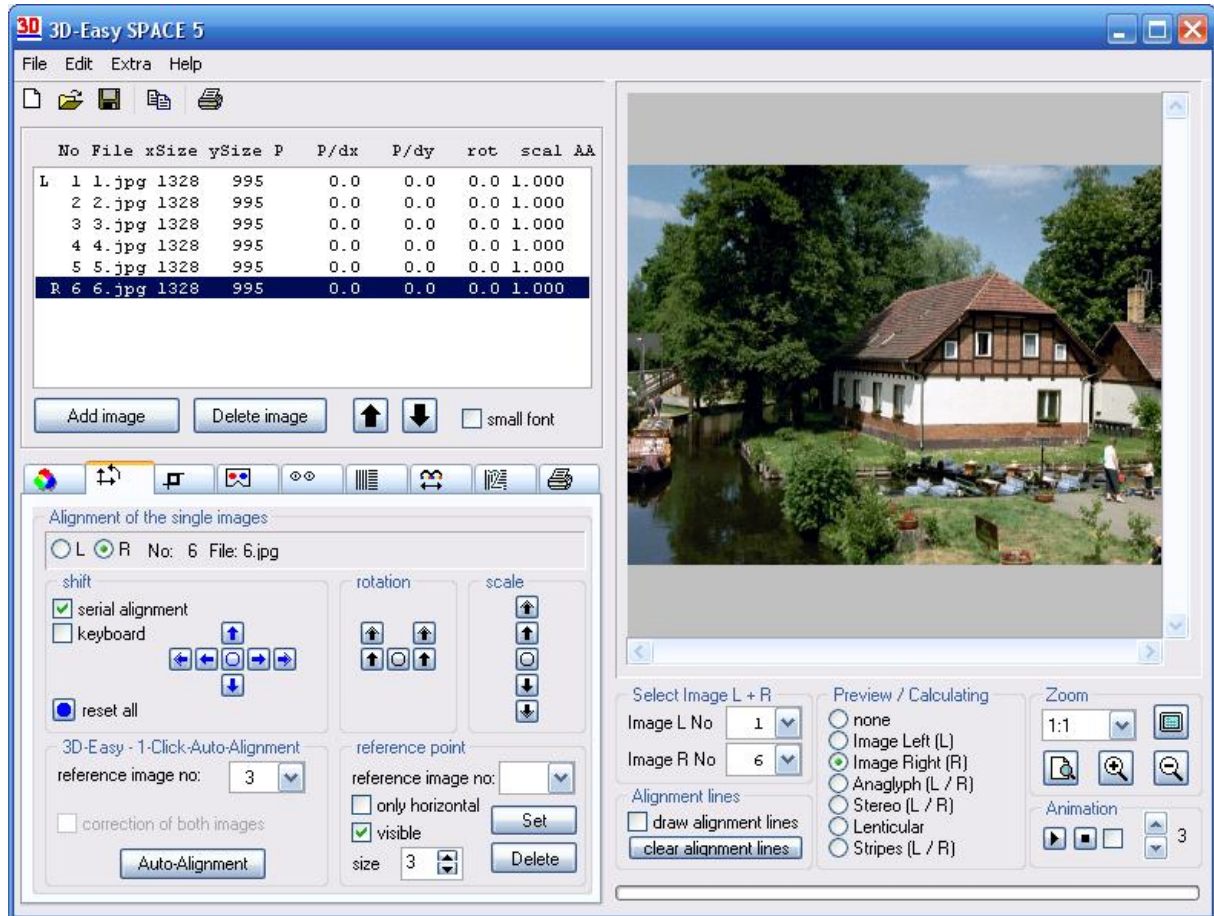
- horizontal and vertical encasement possible
- basic image for encasement free selectable (image L or image R)
- selection of standard image sizes possible but also fixation of individual image sizes

With these options, all applications are covered.

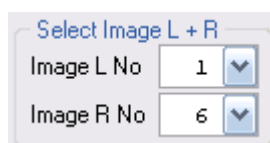
The printer options do not have any influence on the produced stripe image on the contrary to the lenticular images.

2.8 Selection of the images L and R

All loaded basic images are shown tabular on the left side of the program user interface. You will find more details in chapter 2.3.



In group „selection image L+R“, a file is arranged towards image L or image R.



In the above shown depiction, image L is the image with the running number 1 (= 1.JPG) out of the left detail list file list. Image R is the image with the running number 6 (=6.JPG).

A fast change of image L towards image R and vice versa is possible with the group preview/calculation (see 2.7.2. and 2.7.3) and the group „Alignment of the single images“.

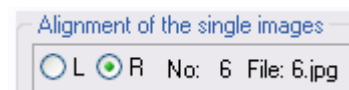
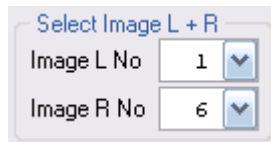


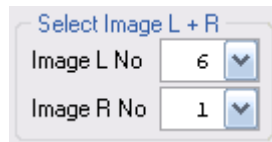
Image R or L is selected automatically by a click on a file list. This depends of the L and R selection in the group „Alignment of the single images“.

Selecting images for L and R can produce any combinations of anaglyphs and stereo-image pairs.

Image L must have a lower number than image R on the example images which are contained on the 3D-Easy - CD-ROM in order to calculate accurate anaglyphs and stereo images. This condition is valid if the images are taken as it is described in chapter 5.



right

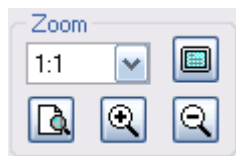


wrong

If this principle is neglected, inverse anaglyph images (pseudoscopic images) will be calculated. With the calculation of the anaglyph image or the pair of stereo-images the current alignment values (shifting, rotation, scaling) are taken into consideration.

2.9 Zoom functions

The complete calculated image is shown in the preview window. This zoom function is called "1:1".

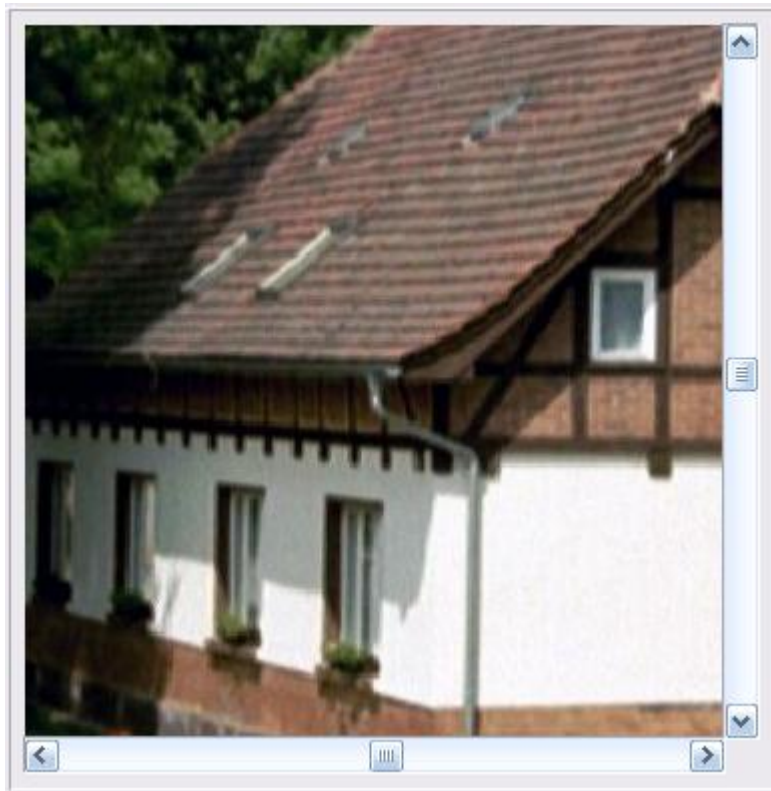


There are the following buttons to enlarge or to reduce the view:

Schaltfläche	Funktion
1:1	an enlargement factor can directly be selected from the list
	image is shown completely in a new window over the whole screen
	zoom "1:1"; image is shown completely in the preview window
	enlargement of the current zoom factor (factor 2)
	reduction of the current zoom factor (factor 2)

The zoom function does not change the calculated image. There are scale buttons in tab control "Alignment of the single images" to enlarge or reduce an image.

The zoom function serves the precise adjustment of the single images.



Any kind of image parts can be shown with the help of the horizontal and vertical scroll bars.

2.10 Background colors

Following three background colors can be selected:

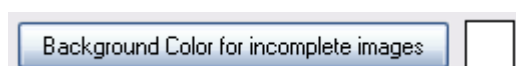
- Background color for incomplete images
- Background color for preview
- Background color for full screen preview



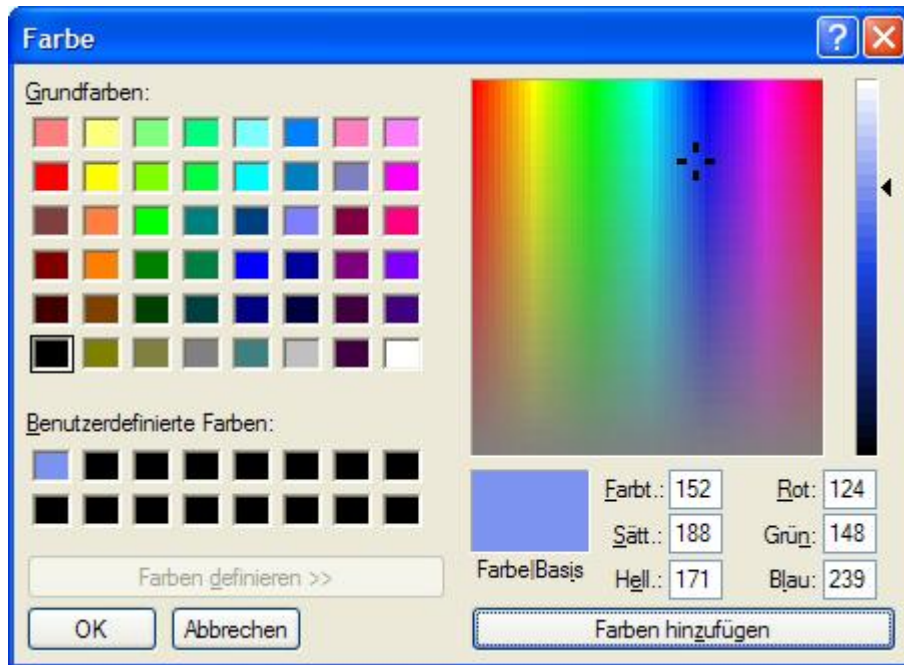
Color choice in the tab control "color settings" of the software *3D-Easy SPACE 5* (reserve product updates)

Background color for incomplete images (missing image contents)

"Empty" image parts develop by means of adjustment and use of single images of different size. These "empty" images are filled with the fixed background color in the tab control "Color options". The basic color for the background is white and can be changed as follows:



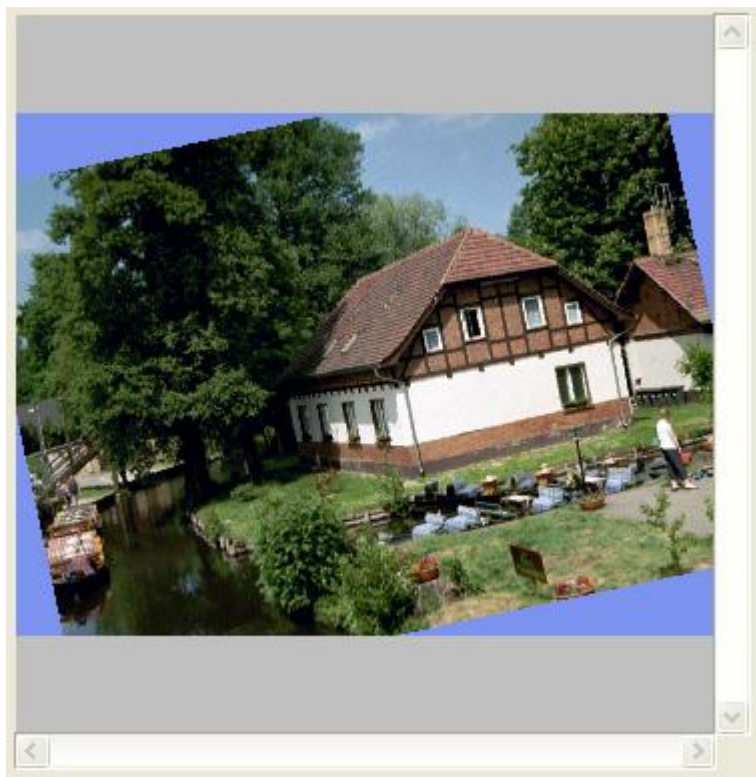
The color dialogue appears when clicking the button "Background Color".



Color Dialog; language depends on the language of the operating system



After the selection of the color and after clicking the button "OK." the relevant color is used as a general background.



Background color for image preview

In the preview-window on the right page, the currently calculated image is displayed. The general background color for this preview range is silver-grey and can be changed individually as described above. This color has no influence on the image, which has to be calculated.

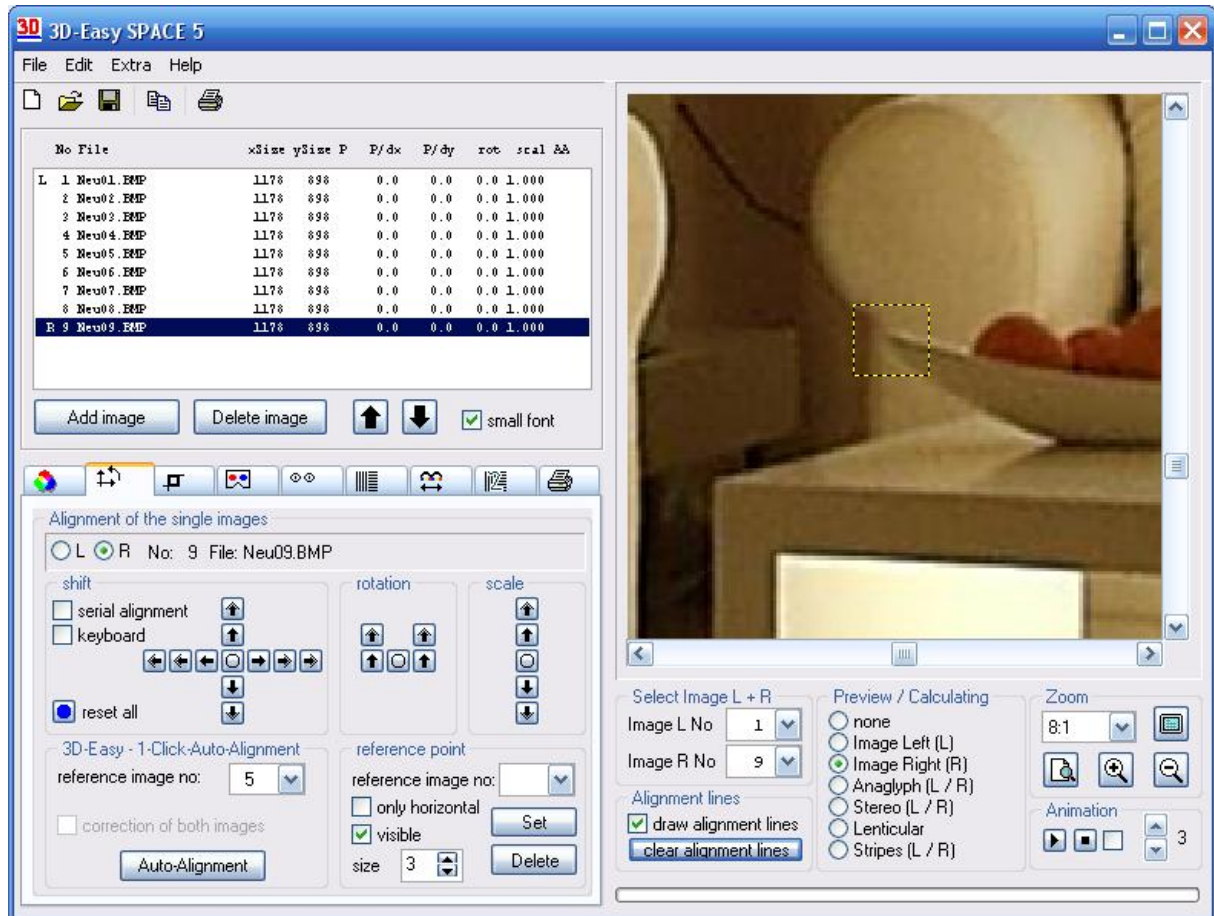
Background color for full screen preview

The general background color with the full image representation in a separate window is black and can be changed individually as described above. This color has no influence on the image, which has to be calculated.

2.11 Alignment of images, use of alignment lines / boxes

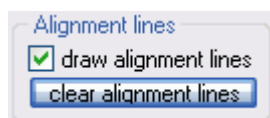
2.11.1 General, alignment lines and alignment boxes

The single images can be isolated with the help of *3D-Easy SPACE* but they can also be aligned easily in connection to other images with the help of the tab control "Alignment of the single images". Only one single image will be processed. A file is selected by a click into the file list. The blue background of the file list emphasizes this image optically.



Surface of the program *3D-Easy SPACE 5 - Standard*
(reserve product updates)

Alignment lines or alignment frames can be drawn in the preview to support the adjustment. The left mouse has to be pressed and the option „draw alignment lines“ has to be activated.



The single images are arranged manually on the edges of the alignment frames. Alignment frames do not belong to the image and can be cleared with the button „clear alignment lines“ at any time.

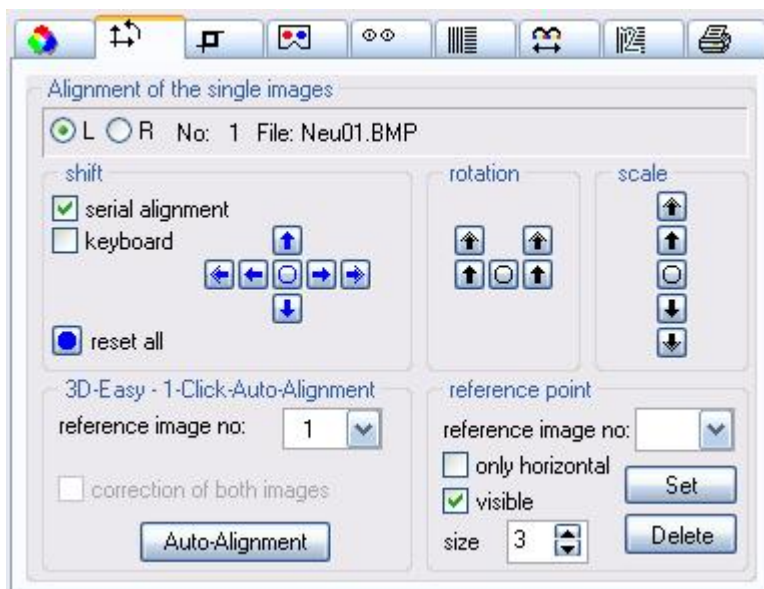
A zoom function is recommended with big single images, thus the adjustment can be carried out more precise.

Any alignment lines and boxes can be drawn although theoretically one frame is sufficient for the alignment. After a frame of alignment has been drawn, it cannot be moved or changed anymore. The clearing of all adjustment lines and boxes is carried out with the help of the button "clear alignment lines".

Alignment lines and boxes are never printed or saved with the image, neither are they saved in the project files.

2.11.2 Shift / rotation / scale

The adjustments of each selected image is carried out with the help of the buttons in the group boxes "shift", "rotation" and "scale". There are additional special buttons for the image shifting which is used very often.



"Alignment of the single images" of the software *3D-Easy SPACE 5 - Standard* (reserve product updates)

The image alignment does not change the original images. The alignment values are saved in the project files and are shown in the file list. The selected image is reset in the original position by the central buttons.

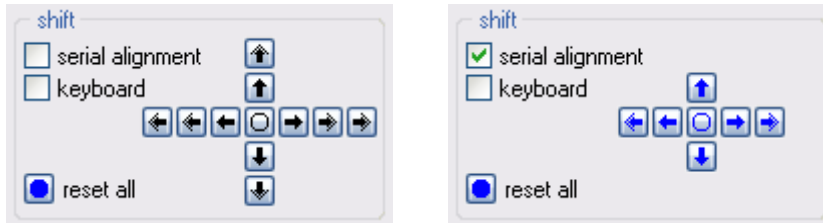
In the following, the alignment of the original images to produce a 3D lenticular image is described:

- any original image (e.g. the image in the middle of a 3D-series) can be selected as a reference image from all loaded single images and it is shown in a preview
- frame the reference point of the object of the selected reference image (e.g. the top of the fruit bowl) with the mouse, the reference point of the object should be in the foreground of the image scene and should be located in the central part of the two dimensional image
- now all other images are shown in the preview; by means of the fixed alignment line/box the same reference point of the object (which means the top of the fruit bowl) is put into the same reference position
- by means of the preview of the anaglyphs, it can be checked if the reference point of the object of all single images coincides with one point: the relevant reference point of the object is on the image level when aligned correctly

For more details to the reference point of the object see chapter 5.1.1 and 5.2 .

2.11.3 3D-Easy - Serial Alignment

Shiftings can be applied in one step to all images with the function *3D-Easy - Serial Alignment*.



This function is useful with 3D lenticular images with 3 or more basic images, in which for instance a horizontal shifting has to be carried out after the self correction in order to fix the depth of the room. The reference image is not shifted, the next image is shifted by 1 pixel, the next image but one is shifted by 2 pixel etc. to the left or right. The 3D effect is applied to all loaded images automatically and evenly.

2.11.4 3D-Easy - 1-Click-Auto-Alignment

The aim of *3D-Easy - 1-Click-Auto-Alignment* is a minimum of vertical deviations by complete automatic shifting, rotation and scaling of all images which have to be adjusted.



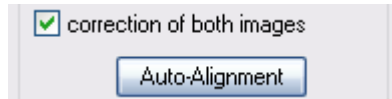
It is as simple as the name *3D-Easy - 1-Click-Auto-Alignment* says: e.g. no reference points have to be placed manually, no information regarding camera parameters necessary, no evaluation of maximum deviations necessary. The images which have to be adjusted are loaded and with only one click, a complete automatic calculation is carried out.

The *3D-Easy - 1-Click-Auto-Alignment* works independently from all the other alignment methods but considers alignments which are already available.



Selection of a reference image, all other images are aligned to this picture

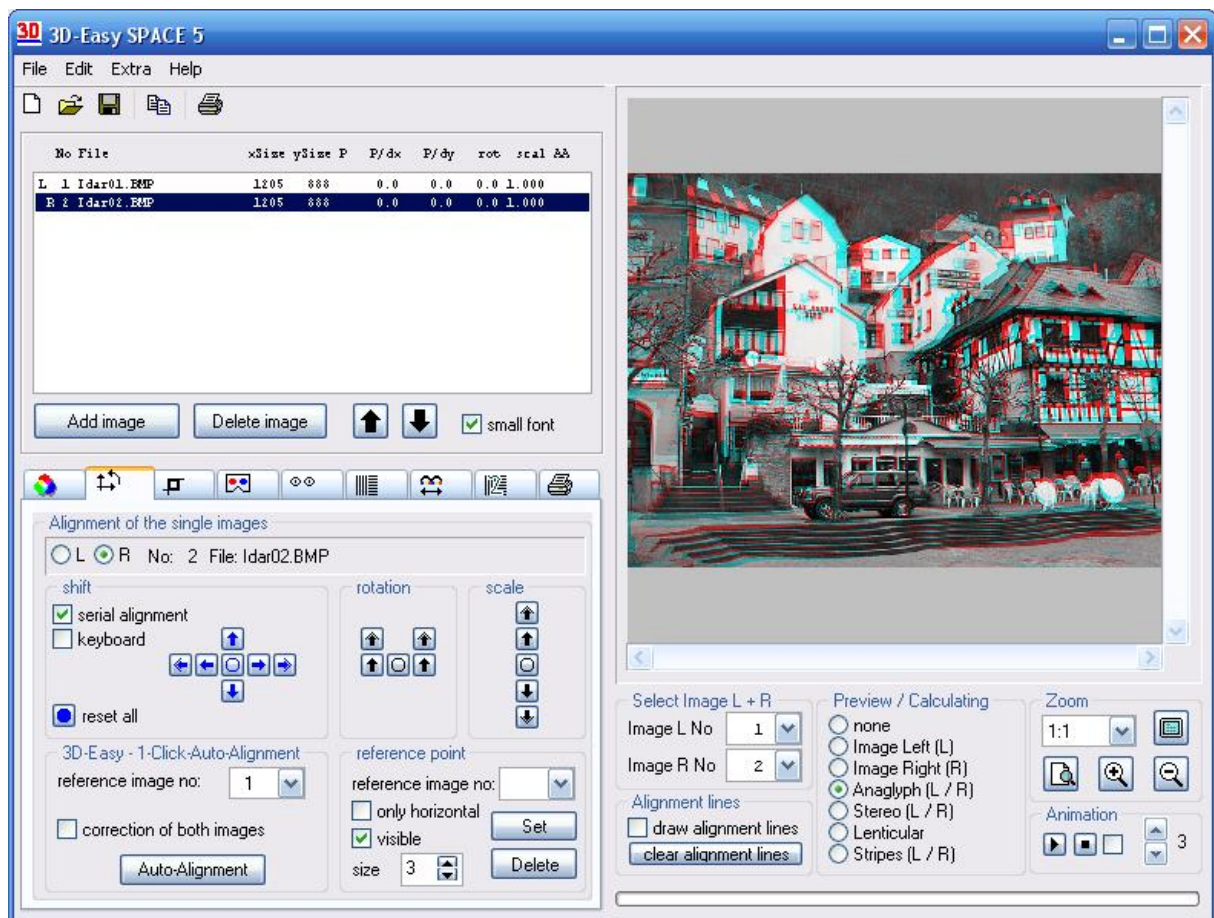
As a standard, the *3D-Easy - 1-Click-Auto-Alignment* suggests the first image as a reference image with 3D stereo image pairs. With 3D lenticular projects, the image in the middle of the file list is suggested as a reference image. At any time, the user has the possibility to determine any image as a reference image. The reference image or the available alignment is not changed while all other images are aligned on this reference image and are normally changed (shifted, rotated, scaled).



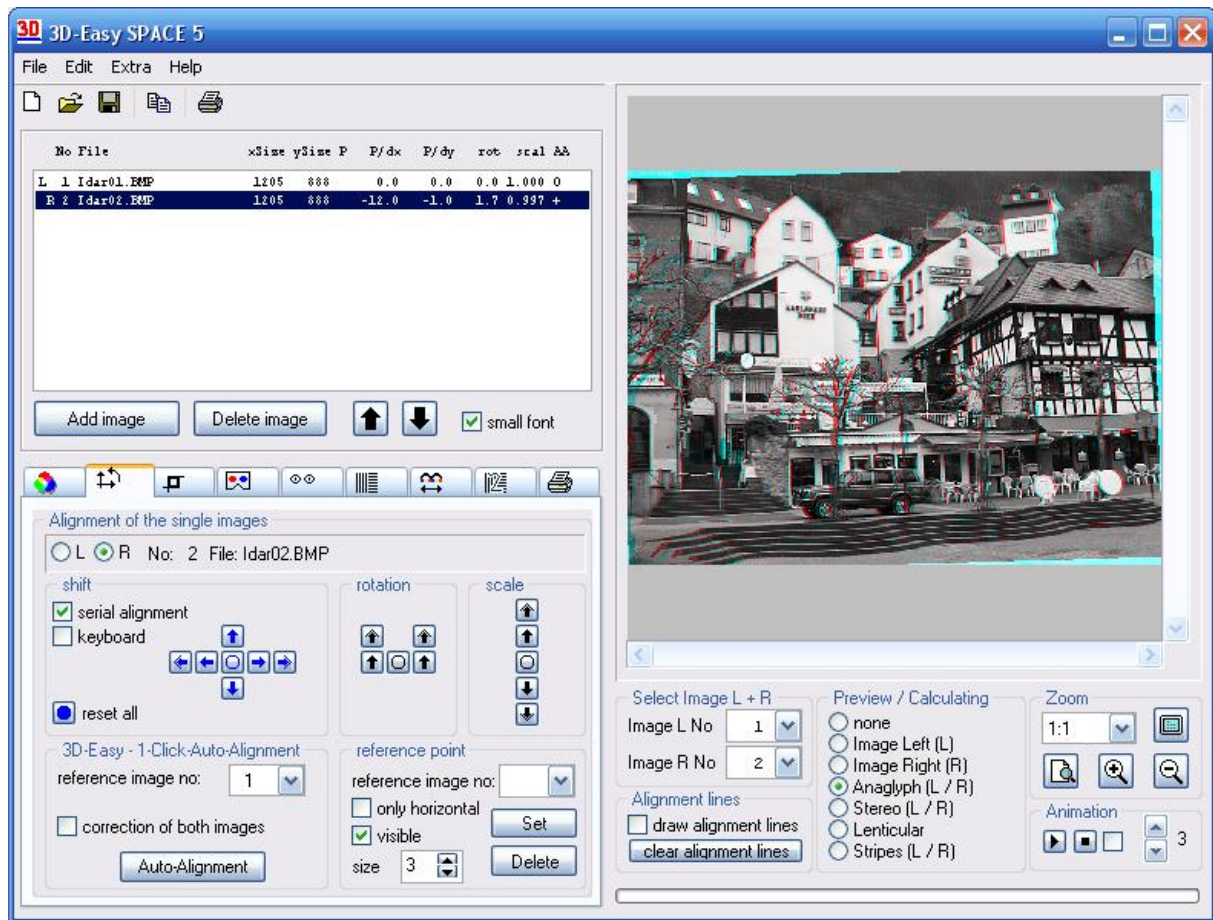
Both images are corrected symmetrically when enabling „correction of both images“.

In case „only“ 2 images are loaded (3D stereo image pair), there is the possibility to apply the corrections symmetrically on both images (option „correction of both images“). With this symmetry-method, there is a reduction of the loss of image parts (missing overlap of both images in edge areas) by manual or automatic corrections.

3D stereo image pairs (not aligned) or 3D lenticular image series (not aligned) are typical basic images for the *3D-Easy - 1-Click-Auto-Alignment*. For instance, 10 images, which are not yet aligned for a 3D lenticular project, can be aligned perfectly without any user activity in only one step in a very short time.



Before *3D-Easy - 1-Click-Auto-Alignment*



After 3D-Easy - 1-Click-Auto-Alignment

The *3D-Easy - 1-Click-Auto-Alignment* fits perfectly to a fast alignment of 3D basic images which were taken by hand one after the other. The alignment values (shift, rotation, scaling) for each single image are applied automatically on the source images.

The *3D-Easy - 1-Click-Auto-Alignment* works fast and reliable even with very big images (e.g. 10 000x10 000 pixel and bigger per image) and delivers almost always really better results compared to an alignment which has to be carried out manually and where much time is lost, even if this was carried out by an experienced user.

The results of *3D-Easy - 1-Click-Auto-Alignment*, the correction values for shift, rotation and scaling for each single image, are shown in the file list and the corresponding images are depicted. The animated preview takes into consideration all corrections as before, and gives an impression of the quality of the automatically calculated corrections after having finished the process. In addition to the correction values, a summarized quality statement for each corrected image is shown.

In case the *3D-Easy - 1-Click-Auto-Alignment* cannot find an optimum (it happens very seldom) this will be shown in the detail list. Such cases occur if the image contents are not suitable for an automatic alignment (e.g. if they don't have none or a few striking points or the image content differ too much from each other).

The *3D-Easy - 1-Click-Auto-Alignment* can be applied on not aligned images or images which were already aligned manually. Normally, the results are identical. A rough pre-alignment can be useful in the following cases:

- If e.g. a reference image was taken unevenly, then this image should be straightend (straight rotation) in advance manually; the images which have to be corrected will follow automatically this correction which means any manual correction of a reference image).
- In a few difficult cases, if it was not possible to calculate an unaligned image, a rough alignment can be useful before using the auto-alignment again.

After the automatic alignment, one can keep on adjusting the images manually.

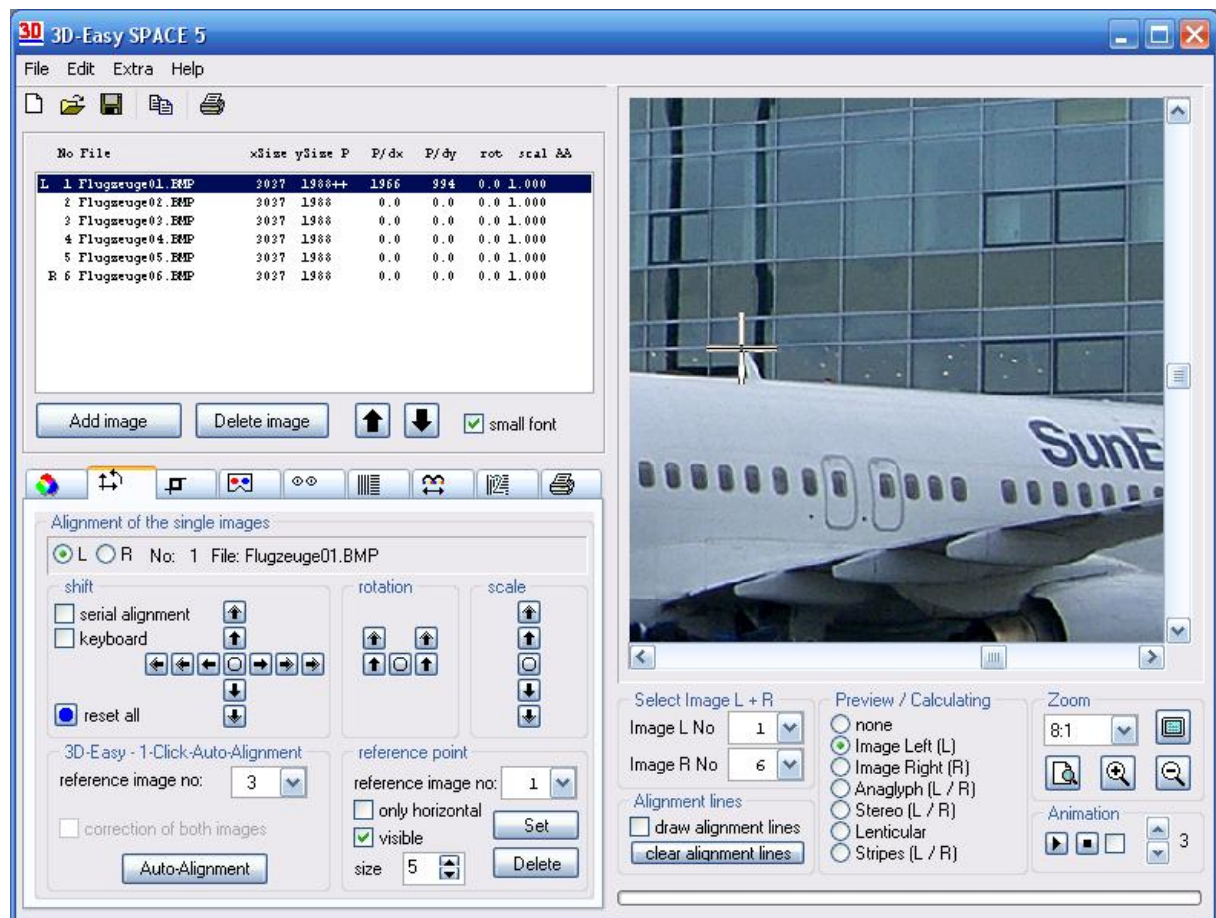
Succeeding images of an animation or a flip image pair contain useful and necessary vertical deviations of corresponding image points. This is the reason why the **3D-Easy - 1-Click-Auto-Alignment should not be applied to the alignment of animations or flips.**

For more details see chapter 1.1.1 (new aspects of version 5) and in chapter 6.4 (FAQ).

2.11.5 Reference image / reference points

We recommend reference points to get a fast half automatic horizontal/vertical adjustment. A corresponding reference point on each single image will be determined as follows:

- selection and show of the image on which the reference point should be fixed
- activating engage of the button (reference point) "Set" (changed Cursor).
- Left Mouse click within the image preview (at any zoom levels) fixes reference points
- A succeeding shifting of the reference point with the help of alignment buttons is possible



Surface of the program of the software *3D-Easy SPACE 5 - Standard*
(reserve product updates)

The selected reference point is displayed as a cross whose size can be changed.
This size setting refers to all reference points.

The reference point (cross) can be shown in the preview or its depiction is not shown with the option „visible“.

If at least another reference point is defined in another image, the current image is shifted automatically, so that all reference points are at the same place.

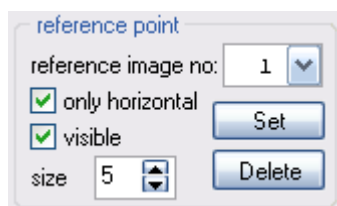
There is exactly one reference image within an image series. This reference image is not moved. All the other images are aligned / shifted to this reference image. A (manual) change of the reference image leads to a new adjustment of all other images automatically.

The reference points are image centre at the same time for possible additional rotations and scalings.

Tips for the image adjustment with reference points

In the following, the adjustment of the source images to produce a 3D lenticular image is described:

- any source images (e.g. the middle images of a 3D series) is selected by all loaded images as a reference image and is brought to the view (preview)
- activation / engage of the button "Set" (reference point) will be changed the cursor
- mark the object reference point (e.g. in the upper image the peak (highest point) of the airplane antenna) from the selected reference image with the mouse (click left mouse button)
- now all the other images are brought to the preview and set a reference point (e.g. each time on the edge of the airplane antenna) is put in each case
- with the help of the anaglyph preview (pair-wise loading of different image pairs) can be checked very well whether the object reference point of all display images collapses in one point: the suitable object reference point lies with right adjustment at the image level



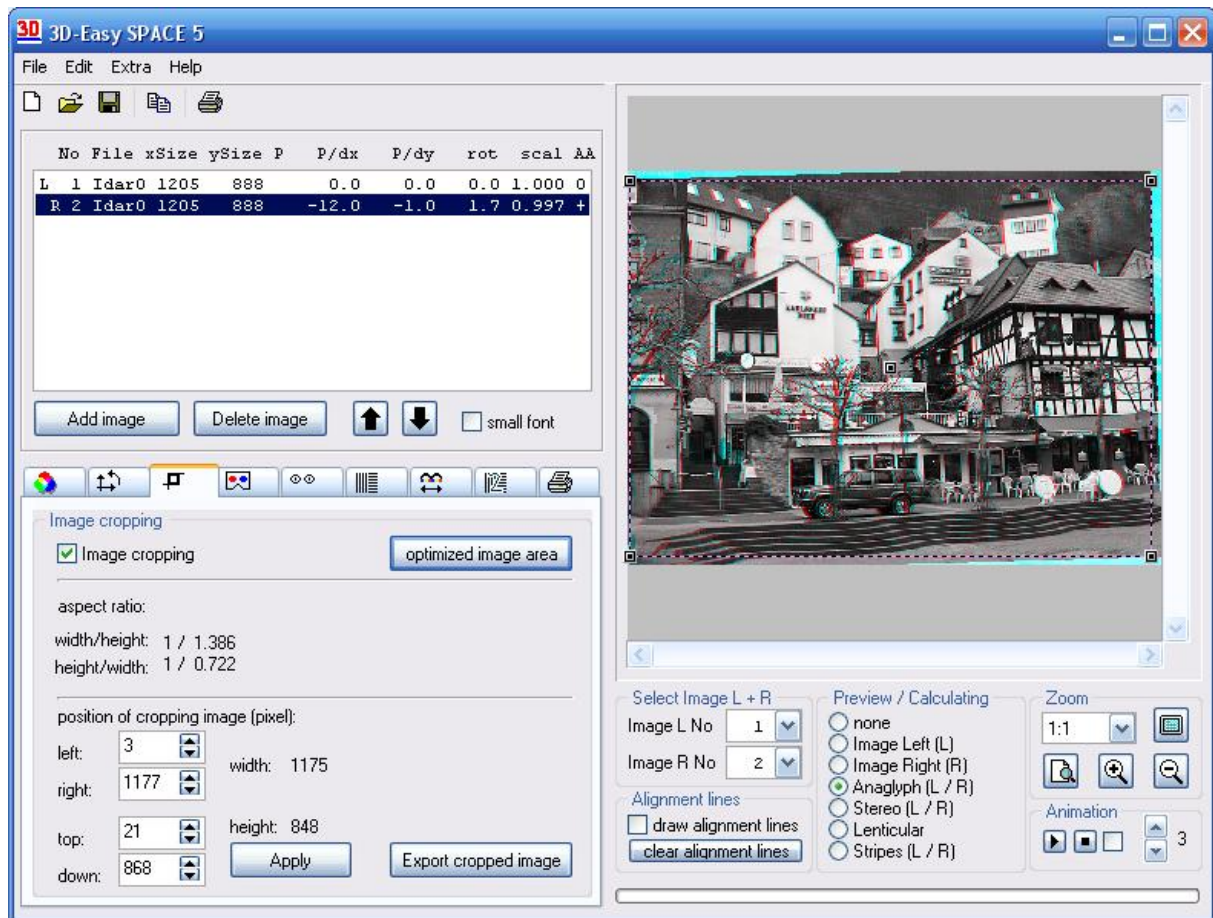
If the option „only horizontal“ is enabled, the above-described corrections are only carried out in horizontal direction when using reference points. The use of this option makes sense if there has been carried out an automatic adjustment of the single images before with the *3D-Easy - 1-Click-Auto-Alignment* and a new object reference point should be fixed with the help of reference points (change of image level).

You will find more details regarding object reference point in chapter 5.1.1 and 5.2.

The reference point functions are only available in Standard and Professional editions.

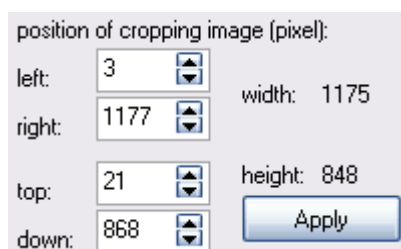
2.11.6 Determination and serial export of an image part

There is the possibility to obtain a rectangular image part with succeeding serial export of all loaded single images with enabling the “Image cropping” in tab “Image cropping”.



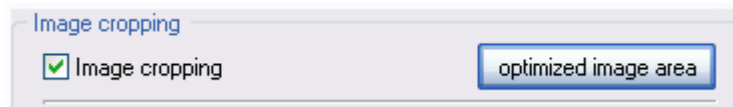
„optimized image area“ calculated automatically

With the help of five control points which can be shifted in any direction, a rectangular image part is defined. In section “position of cropping image”, the aspect-ratio relation is shown.

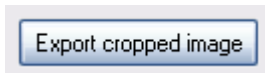


The pixel reference points can be entered directly in order to define an exact image area. Only after pressing the button “Apply” manual change of values is operated.

The function *3D-Easy - Optimized Image Area* calculates automatically the maximum rectangular image part of all images which does not contain missing image contents in edge areas, e.g. caused by rotation.



The function *3D-Easy - Optimized Image Area* is applied after a manual alignment or after the *3D-Easy - 1-Click-Auto-Alignment* to carry out a *3D-Easy - Serial-Export* afterwards.



The button „Export cropped image“ has the effect that the defined image part out of all aligned single images is calculated and saved.

The user fixes in the dialogue „Save as“ a general file- name such as “MyPicture“. The single images get automatically the file names „MyPicture01.BMP“, „MyPicture02.BMP“ etc. Single Images are always saved in the graphic type BMP.

Afterwards, all saved single images are loaded in a new project so that interesting image parts can be fixed, image relations can be defined or empties boundary image areas caused by adjustment can be eliminated.

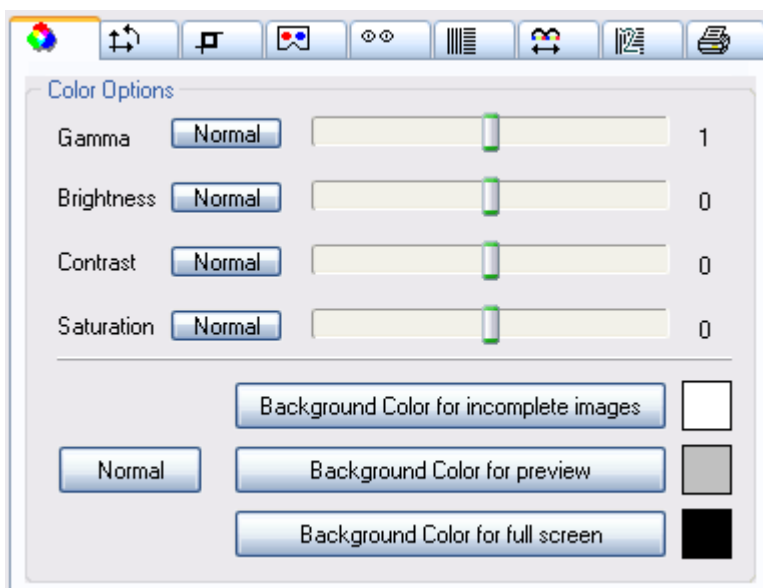
The function „Image cropping“ is only available in the zoom function „1:1“ and is only included in the Standard and Professional editions.

2.12 Brightness, contrast, saturation and gamma

With the help of the device for brightness, contrast and saturation in the field „color saturation“, the final image is changed. There is a gamma value starting from 0 or 1 (no modification of the calculated image).

A value smaller than 0 (or 1 with gamma value) leads to darkness (brightness), to a loss of contrast (contrast) or gamma value or color reduction.

A value bigger than 0 (or 1 with gamma value) leads to brightness, raise of contrast or gamma value or color strength (saturation).



Clicking the small button of the controls carries out changes to the brightness, contrast, saturation and gamma. The current value is on the right hand side just besides the control bar.

If the button "Normal", which is on the left hand side besides the control bar, is clicked, the original value will be re-established.

All control bars can be used as often as you wish. The calculation of the brightness, contrast, saturation and gamma always refers to the original image. The original image (original file) itself will not be changed in this operation.






The shown value of brightness, contrast, saturation and gamma is saved in the project file.

2.13 Animated preview

An animated preview of all loaded single images supports a perfect adjustment of all single images and gives 3D and flip image effect in advance.

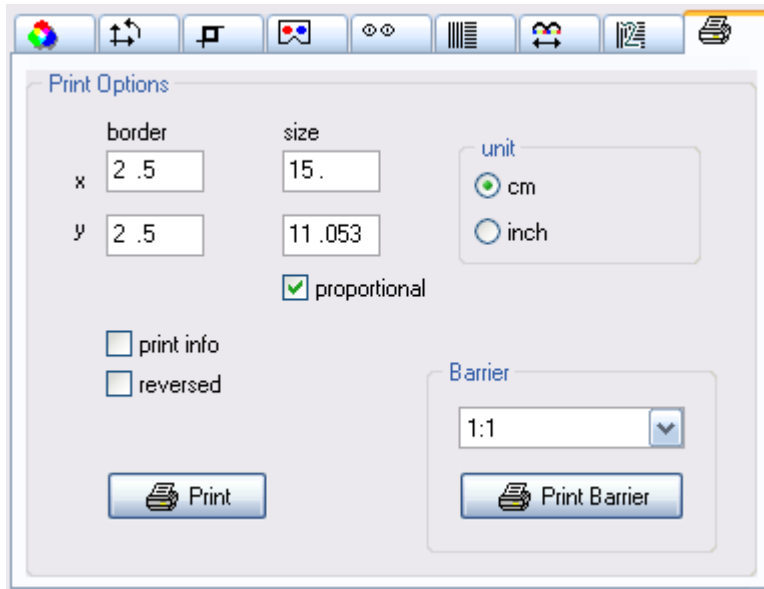


The animated image preview is navigated with the following buttons:

Schaltfläche	Funktion
	start of animation
	end of animation
 or 	change between cyclic animation and ahead/backwardsanimation (ping-pong-effect)
 3	fixing and depiction of the animation speed (selectable between 1 and 5)

2.14 Printing

With the help of the print-options, the necessary parameters, which are relevant for the print, are determined here.



tab control "Print options" of the software *3D-Easy SPACE - Standard Edition 3* (reserve product changes)

The single parameters and options have following meaning:

Printing border, size of the image, unit

The printing border (x= distance between left paper edge and left image edge, y=distance between upper paper edge and upper image edge) and the size of the printed image (x= width of a image; y= height of a image) can be fixed. The measurement cm or inch can be selected in the group "unit".

Due to the change of the y-border value 2 different result images can be printed beneath each other on one page on printing paper of high quality. All input values are finished by clicking the enter-key or tabulator key or by a mouse click in any other field.

Proportional

The fulfilment of the width/height (aspect ratio) can be disabled or enabled. If the checkbox is enabled (which is recognizable at the small hook let), a change of width of the image is automatically followed by the change of the image height. The change of the height of an image leads to a change of the width of the image.

If the checkbox is disabled (without hook lets), the size of the images x and y can be changed independently of each other. This leads generally towards stretching of the calculated image.

Print Info

If the checkbox "Print Info" is enabled, additional information beneath the printed image are given. The following functions belong to the "printing information" among other things: the selected lenticular type (e.g. 40 lpi), all file names of the used images including the x, y and angle-alignment values as well as the printing resolution.

Reversed

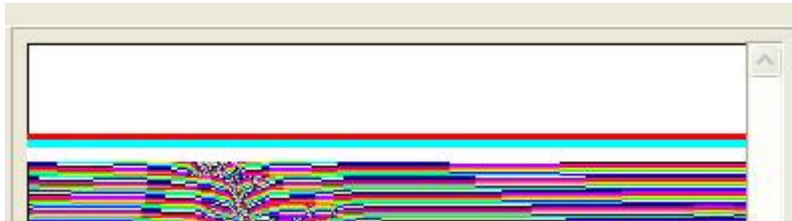
With this option it is reached that the result image is calculated and printed reversed (y- axle is the mirror axle). You have to select this option if the print is on transparent material (e.g. selffixing adhesion film) and if this material is to be attached at the lenticular card. For more information on adhesive methods see chapter 4.3 .

Barrier (only available in *Professional Edition*)

The group Barrier serves for printing the barrier stripe mask. The proportion "transparent part" (transparent stripe) can be fixed to "covered part" (black stripe) in the corresponding group. The measurements of the stripe mask (e.g. 15x15cm) and the distance of the stripes (like the lpi-value) are the result from the values of the tab controls "Print" and "Lenses". For more information to Barrier-Method see chapter 3.6.

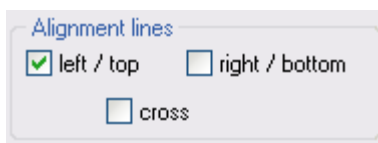
2.15 Red-cyan alignment stripes

The red-cyan alignment stripe appears standard-like with 3D-lenticular images on the left hand side, with reversed prints on the right hand side. The red/cyan alignment stripe appears standard like on the upper image edge with flips/animations. The alignment stripe is exactly as wide as the width of a lenticular and it has to run parallel to the lenticular. The alignment stripe is not necessary with anaglyph and stereo images.

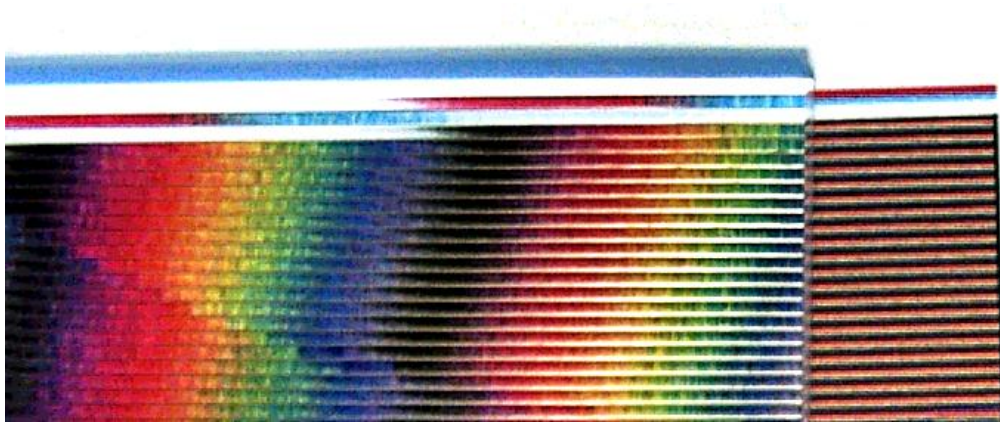


The red/cyan alignment stripe is recognizable with this example of a lenticular animation on the upper image.

The tab control "Lenticular options" determines which red/cyan alignment stripes should be shown.



You can attain a perfect alignment of lenticular and printed image as follows: The lenticular card must be put on the printed image and has to be aligned roughly. The lenticulars with the structured surface have to be shown upright (to the viewer). The printed image and the lenticular card are both turned the way that the alignment stripe appears above (turning is only necessary with 3D images). Normally you notice a stair effect in the colors cyan and red of the reference stripe.



"Stair effect": lenticular card and printed image have not been aligned yet

The lenticular card is now turned until the stair effect vanishes and only one color of the reference stripes is visible on the full length of the lenticular.



Perfect alignment: lenticular card and printed image run parallel.

The alignment is even more precise if both colors red and cyan are visible at the same time and if this color division is visible on a full length of a lenticular card. Eyes have to be focused above the reference stripe. The parallelism between lenticular and printed image is ready and there is the congruence of the lenticular above the corresponding reference stripe. Then, the lenticular card and the printed image must be turned into the basic position. The fixation is maintained. This is only necessary with 3D-images. A slight correction can be carried out by moving the lenticular card above the lenticular image and by maintaining the parallelism. The final positioning can be carried out.

2.16 Calibration (pitch test)

2.16.1 Purpose of the calibration

There will be deviations between the real lpi-amount of the lenticular material and the amount the manufacturer states as well as print deviations (printer inaccuracies). Due to these deviations, which are caused in the production, there may be deterioration in quality especially with flips.

A calibration is absolutely necessary with large prints (larger than 16 x16 cm) and /or the use of lenticular material with a high lpi-value (higher than 40 lpi) as well as with high quality demands.

The calibration which is contained in the software *3D Easy SPACE 5* determines the exact lpi-value of the lenticular material. The determined lpi-value is put directly in tab control "Lenticular options" in field "lens type".

The software *3D-Easy SPACE 5* contains two different calibration methods:

- Calibration "print direct" (mainly for home use)
- Calibration "reference file" (mainly for professional use)

With the same source conditions, both methods deliver identical results.

Regardless of both methods, 2 steps are necessary in the production of a calibrated lenticular image in this order:

- a) Calibration of printer and lenticular material
- b) result image calculation and image print with the same printer as in a).

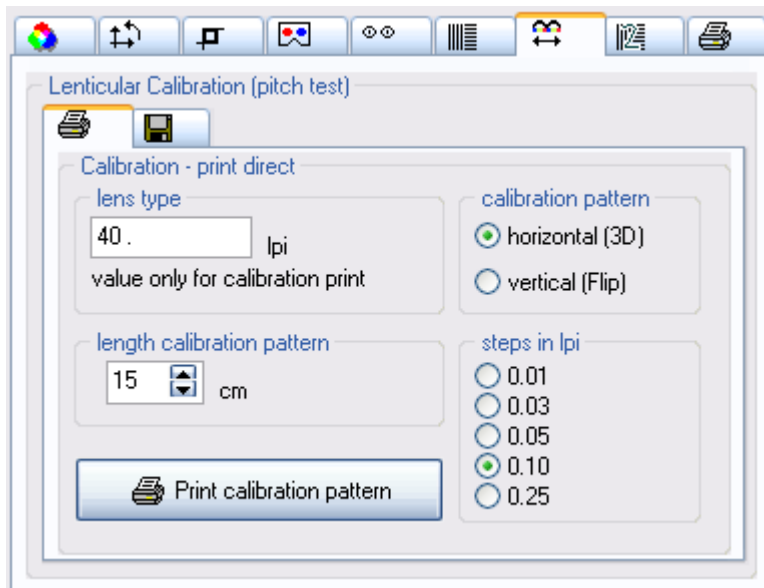
2.16.2 "Calibration - print direct" (pitch test)

The "calibration - print direct" is completely sufficient for most applications in the "home use". It is applied especially if the print of the lenticular images by the software *3D-Easy SPACE 5* is carried out at the local printer.

The calibration works in 4 steps:

1. Input of the basic calibration parameter

The parameters "lens type", "length calibration pattern", "calibration pattern" and "steps in lpi" are input in the tab control "Lenticular Calibration (pitch test)".



calibration options of the software *3D-Easy SPACE 5*
(reserve product changes)

2. Printing the calibration pattern

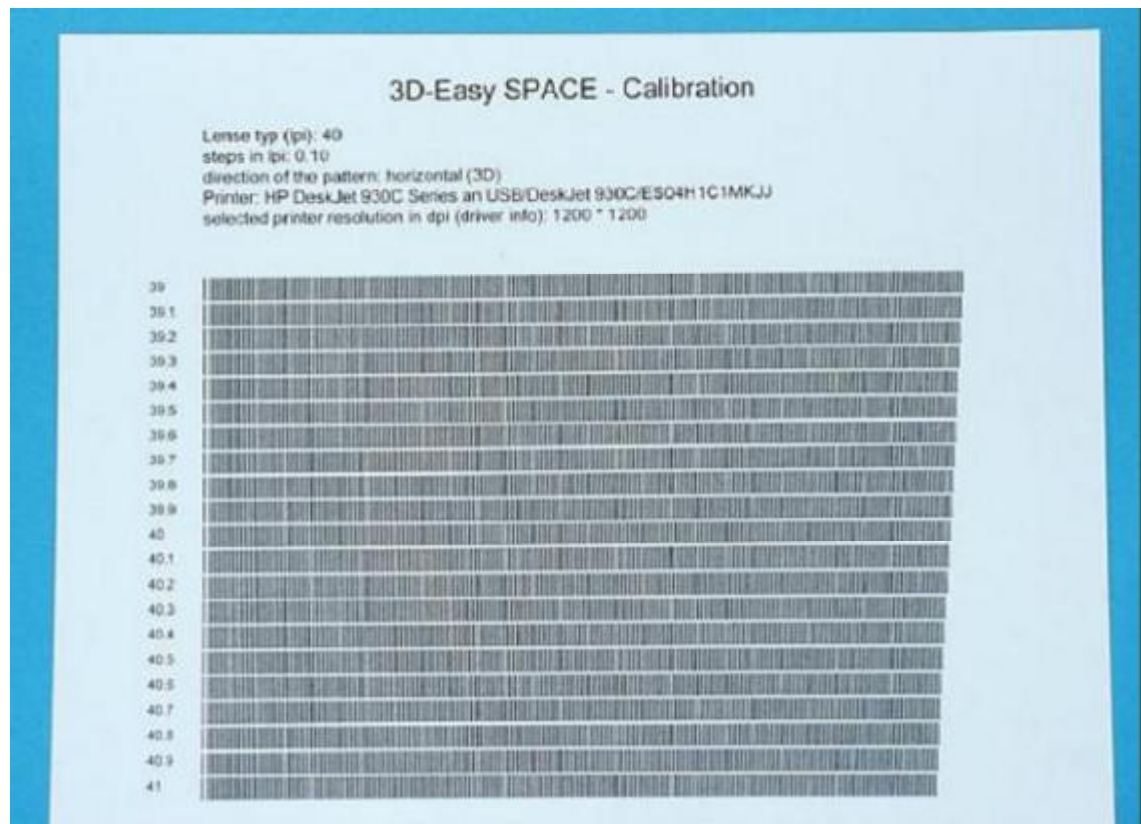
Clicking the button “Print calibration pattern” carries out the printing of the calibration pattern.

When printing the calibration pattern (reference stripe pattern), it has to be used

- the same printer
- the same print options (orientation, resolution etc.)
- the same print material (paper type, film etc.)

in order to print 3D images or flips.

The calibration print contains altogether 21 reference stripes with different lpi-values.

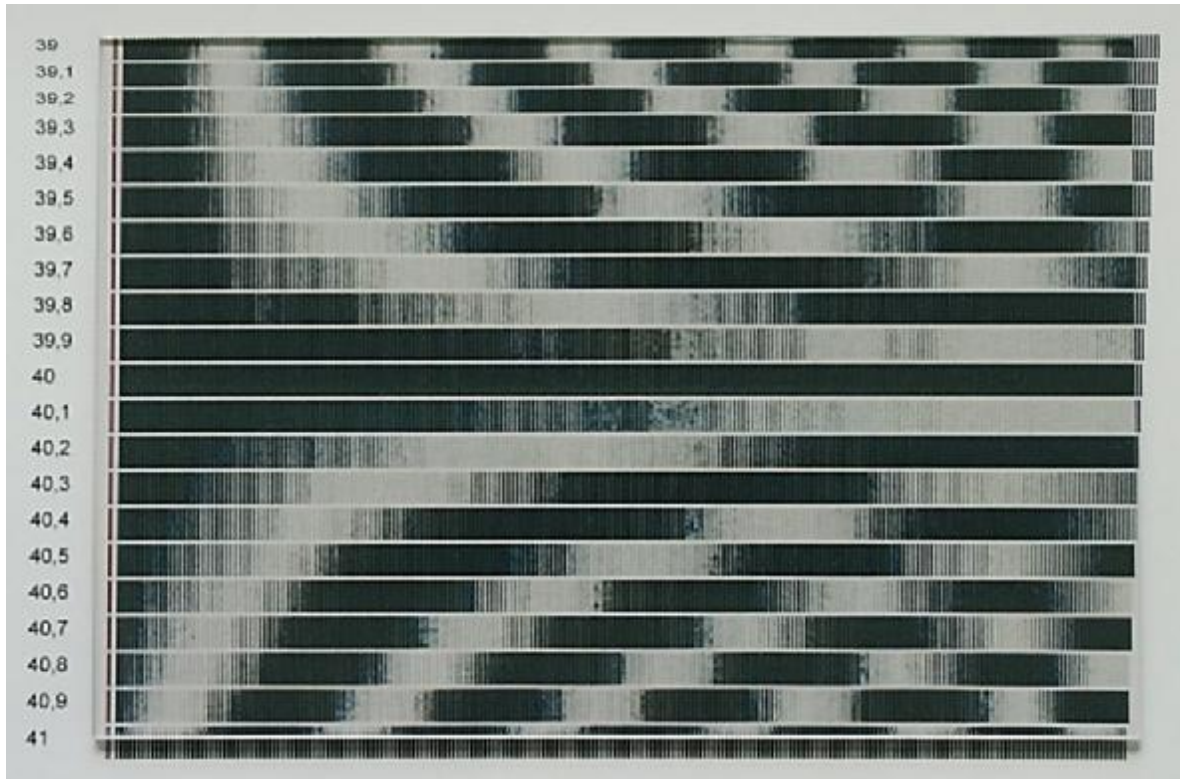


Calibration print produced with the software *3D-Easy SPACE 5*
(lens type 40 lpi; step 0.1 lpi; horizontal (3D))

3. Determination of the exact lpi-Value

After the print of the corresponding calibration pattern (print has to be dry!), the lenticular material (with the structured surface) has to be showed above (to the viewer). The lenticular material has to be aligned along the red and cyan reference stripes (see also chapter 2.15).

The following image is produced:



lenticular material is on the calibration print
(the continues black stripe at 40 lpi is clearly recognizable)

A continues black or white reference stripe (depends on view angel) is the right reference stripe. We recommend carrying out the alignment with only one open eye if you have such a horizontal pattern like the example above. The reason is the different view angel of both eyes on the reference stripe pattern. Alternatively, the stripe pattern and the lenticular card can be turned by 90 degrees. **The corresponding lpi-value can be read off directly on the stripe edge.** This lpi-value considers the deviations due to lenticular production or printing as well as the distance between eye and lenticular material. This would be lpi-value 40.0 in our example.

The distance between eye and reference stripe has only small influence on the exact lpi-value.

In general, the following is valid: the larger the distance between viewer and reference stripe (lenticular image), the higher is the exact lpi-value. With a 40-lpi value lenticular card, the lpi-reference value in a smaller distance (e.g. 10 cm / 4") can be 39.7 lpi and in a larger distance (e.g. 5 m) the value can be about 40.1 lpi. **That is why the distance between viewer and lenticular image has to be taken into consideration with the calibration.**

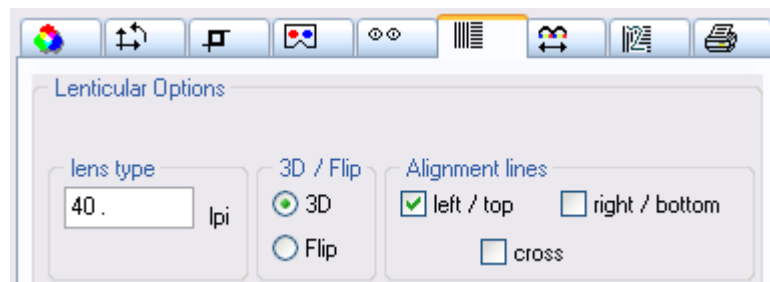
4. Appliance of the determined lpi-value

The determined lpi-value has to be entered in the field "lens type" in the tab control "Lenticular Options" (see also chapter 2.7.6).

When printing 3D or flips,

- the same printer
- the same print options (orientation, resolution etc.)
- the same print material (paper type, film etc.)

has to be used like the calibration.



tab control "Lenticular options" of the program of *3D-Easy SPACE 5*
(reserve product changes)

2.16.3 "Calibration - image saving" / reference file (pitch test)

The calibration "Image saving" (reference file) is planned rather for the professional use. External printers can print the calibration-image files and lenticular images. The use of external printing services is also possible.

Two steps are always necessary with the production of a calibrated lenticular image in this order:

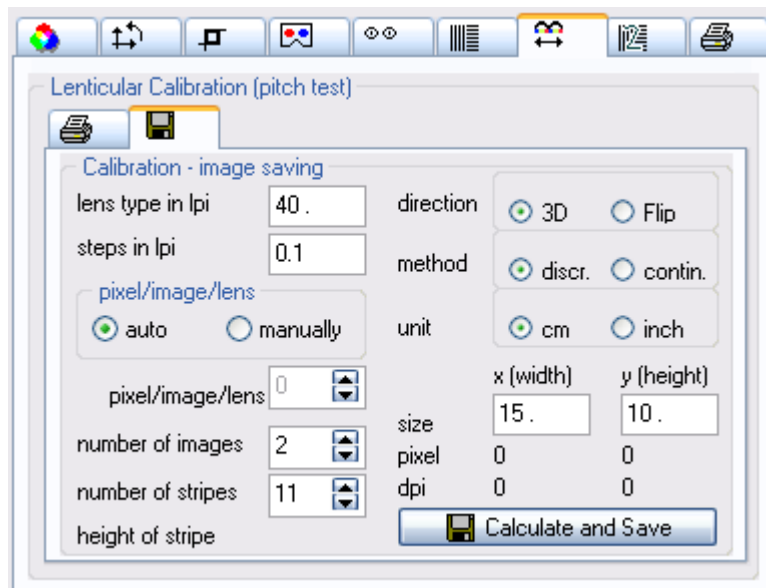
- a) Calibration of printer and lenticular material
- b) result image calculation and image print with the same printer as in a).

For the use of an external printer or an external printing service it is not sufficient to calculate a lenticular image (step b) and to provide it as an image file. Only by use of a project-related calibration-image file, an external calibration (step a) can be carried out.

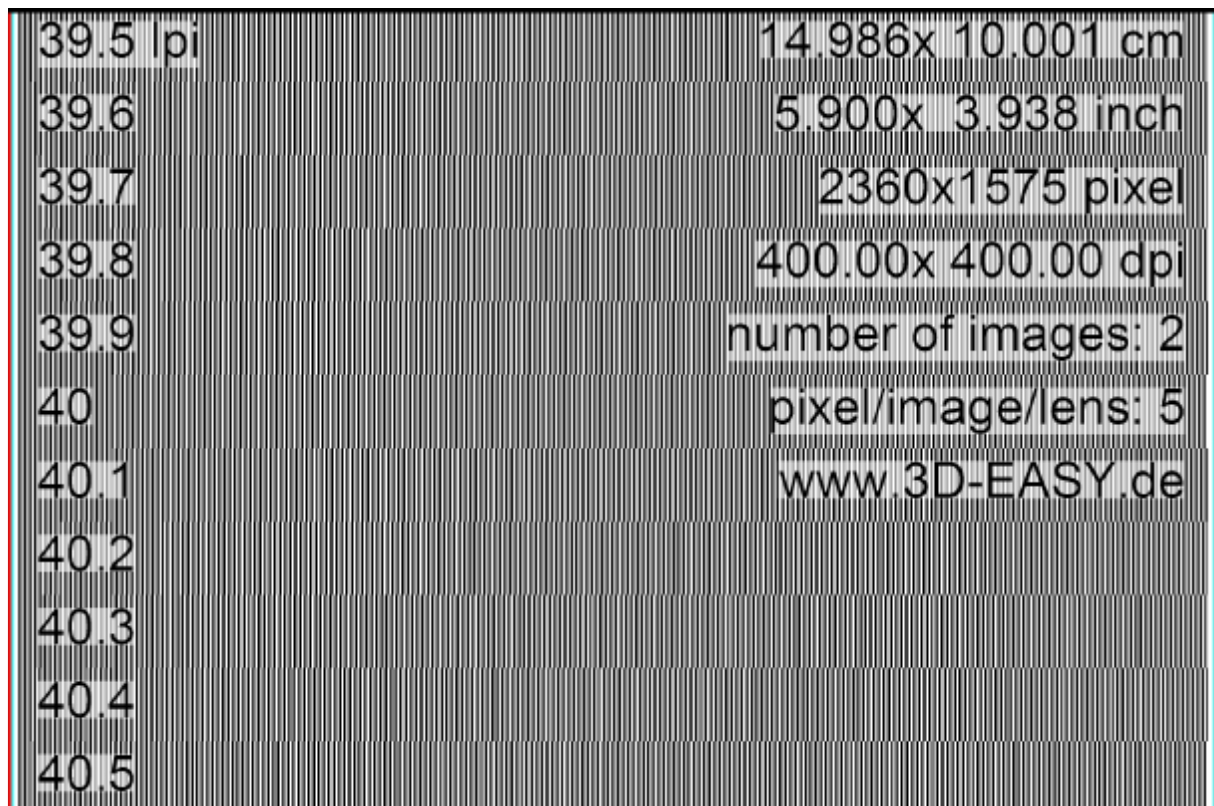
3D-Easy SPACE 5 calculates and saves universal calibration-image files for this application case. The huge number of options also covers all requirements for the professional use.

The use of the storable calibration-image files is carried out analogously to the 4 steps with the calibration- print direct (see **chapter 2.16.2**):

1. Step: - Enter all calibration parameters
- storage of the calculated calibration image file
2. Step: - Print of the calibration image file (with external printing service provider)
3. Step: - Determination of the exact lpi value
4. Step: - Enter the determined lpi value
- Calculation and storage of the lenticular image
- print of the calculated lenticular image (with external printing service provider)



3D-Easy SPACE 5 – Professional and Standard: tab control "Lenticular Calibration (pitch test)" > "Calibration - image saving"
(reserve product changes)



From 3D-Easy SPACE 5 – Professional and Standard generated, universal calibration image file, based on the default Values

The advantages of the calibration-image file generated by 3D-Easy SPACE 5 are:

- Calibration occurs not only in black/white (enough for most applications), but **up to 99 images (stripes) per lens** (with suitable colored representation) **for highest demands** (only Professional Edition), the "color sequence" black/white always marks the beginning of a new lens
- **there is an extensive inscription** on the calibration bit map (lpi values, printing sizes etc.) which are **in the internal part of the bit map** and are a component of the bit map;

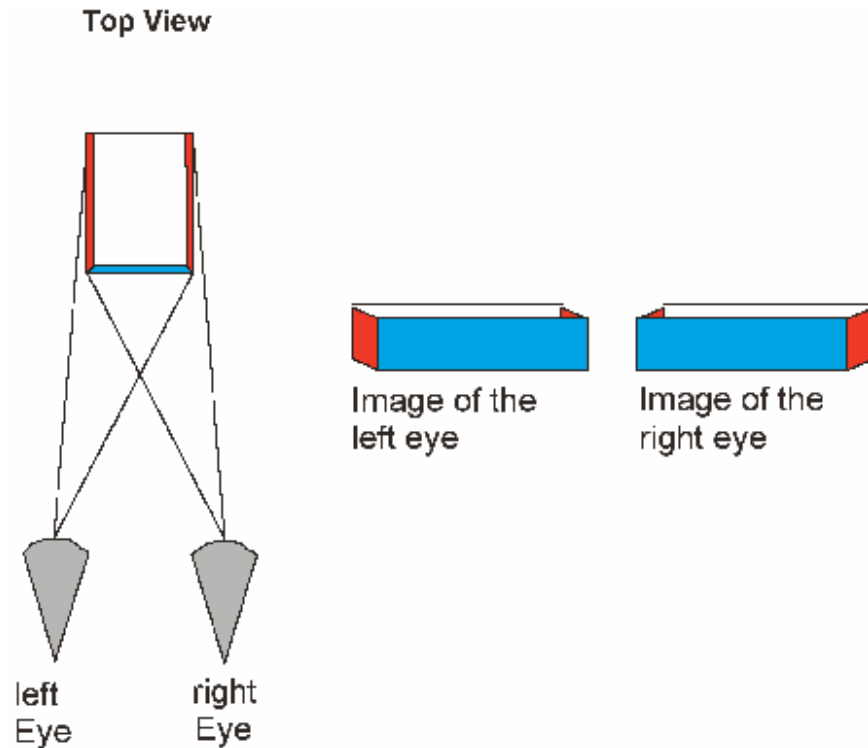
therefore, additional info on paper or additional files are widely unessential, mistakes with the print not possible

- **a huge number of test stripes** on the smallest space saves **paper and other materials** in the printing process
- the edges, which run parallel to the lens margin, have **the red-cyan alignment stripes, which are typical for 3D-Easy SPACE 5** in order to obtain parallel alignment of print and lenticular material.

3 Examples of projects - Step by Step Instructions

3.0 General information about the topic "3D"

All stereoscopic 3D-techniques are based on the fact that each eye sees a little different, specific image. The brain creates the rest, meaning both images are merged into a "room image" (image with depth).



Basically, you need to take only two images (from two different camera positions), each image corresponding with the position of the left and the right eye. The image, which has been taken from the left camera position, has to be seen by the left eye. The image, which has been taken from the right camera position, has to be seen by the right eye.

There are different methods in order to view the two images. Procedures that are often used are anaglyph procedures, polarization techniques, shutter glasses or lenticular techniques. The lenticular technique is a special technique because normally more than 2 images are used with this technique in order to produce different view angles on the lenticular material.

The scientist Sir Charles Wheatstone, Professor of experimental natural science at King's College London, is said to have discovered and described principles of stereoscopy. He first published this topic in 1832 and developed the mirror stereoscope in 1838. But it was Henry Fox Talbot who took the first stereoscopic photograph in 1840.

3.1 Anaglyph image

3.1.1 Short introduction

The word anaglyph is of Greek origin and means relief. The anaglyph technique is a simple stereoscopic technique to view images with depth. The anaglyph technique is invented by Wilhelm Rollmann in 1853 and reinvented in 1858 by J. Ch. d'Almeida, who did not know that it was already invented by Rollmann five years earlier.

Exactly 2 images are used (one for the left, one for the right eye). Both images are dyed with colors that are complementary to each other. When viewed through two matching complimentary color filters, the left eye can only recognize the left image and the right eye can only recognize the right image. The color Red for one image and Cyan (blue/green) for the other one is used very often as complementary colors. The brain merges both images into a 3-dimensional image, a so-called image with depth.

Images in gray levels are usually represented very well. However, the use of different color filters for each eye leads to problems with the depiction of colored motives. Due to the patented ColorCode3-D™ technique, the original colors can be seen much better compared to the conventional anaglyph procedure. This technique uses special color filter and it applies plenty of color corrections of the basic images. The special features of the color code procedure are the processing and depiction of pictures with high amount of red- and/or green parts.

A loss of brightness caused by the color filters must be accepted.

Stereo cameras (with 2 objectives) are used in the professional field when producing the two basic images. The two lenses of the camera have an eye distance (approximately 65 mm) and run parallel to each other. Both cameras work synchronous, distance setting, diaphragm and exposure time are firmly connected with each other.

Stereoscopic images are also possible with a conventional camera: 2 images of the same objects have to be taken. The images have to be taken with a shifted eye distance. The disadvantage of this method is that only unmovable images can be taken due to the time difference of the two takes.



Image of the left eye



Image of the right eye

The software *3D-Easy SPACE* produces a 3D-anaglyph image from both images (for the left and the right eye).

The software *3D-Easy SPACE 5* supports 6 different color combinations, the combinations red-cyan, red-green and red-blue occur very often. The versions Standard and Professional of

the program *3D-Easy SPACE 5* calculate even ColorCode 3-D™-images. Gray and colored anaglyphs can be produced within a selected color combination (e.g. red-cyan). There is also the possibility of smooth separate color saturation of the color channels red, green and blue which makes the production of colored anaglyphs possible even with critical difficult colors.

For more information to ColorCode 3-D™-technique see chapter 6.1.



Anaglyph image (gray red/cyan)



Anaglyph image (color red/cyan)

Anaglyph images can be viewed with the help of a pair of anaglyph glasses on the monitor or in printed form. The right assignment of the color filters (red or blue/green) with the corresponding eye (left or right) is important, that means the red filter is meant for the left eye, the cyan, the green or blue filter is meant for the right eye. Basically, the color filters can be exchanged. If so, the two basic images have to be exchanged or dyed differently as well.



object "3D" in front of the
image level



object "3D" upon the image
level



object "3D" behind the image
level

With the help of the alignment possibility in the program, errors which occur when taking the images (e.g. vertical shifting) can be removed but also certain effects can be reached. So, the 3D image can be shifted three dimensionally (stereoscopic) towards the front (to the viewer) or to the back (away from the viewer) by horizontal shifting, which are carried out after the images have been taken. All options can be saved in so called project files without changing the two basic images.



both basic images are aligned vertically
correct



basic images show a vertical shift

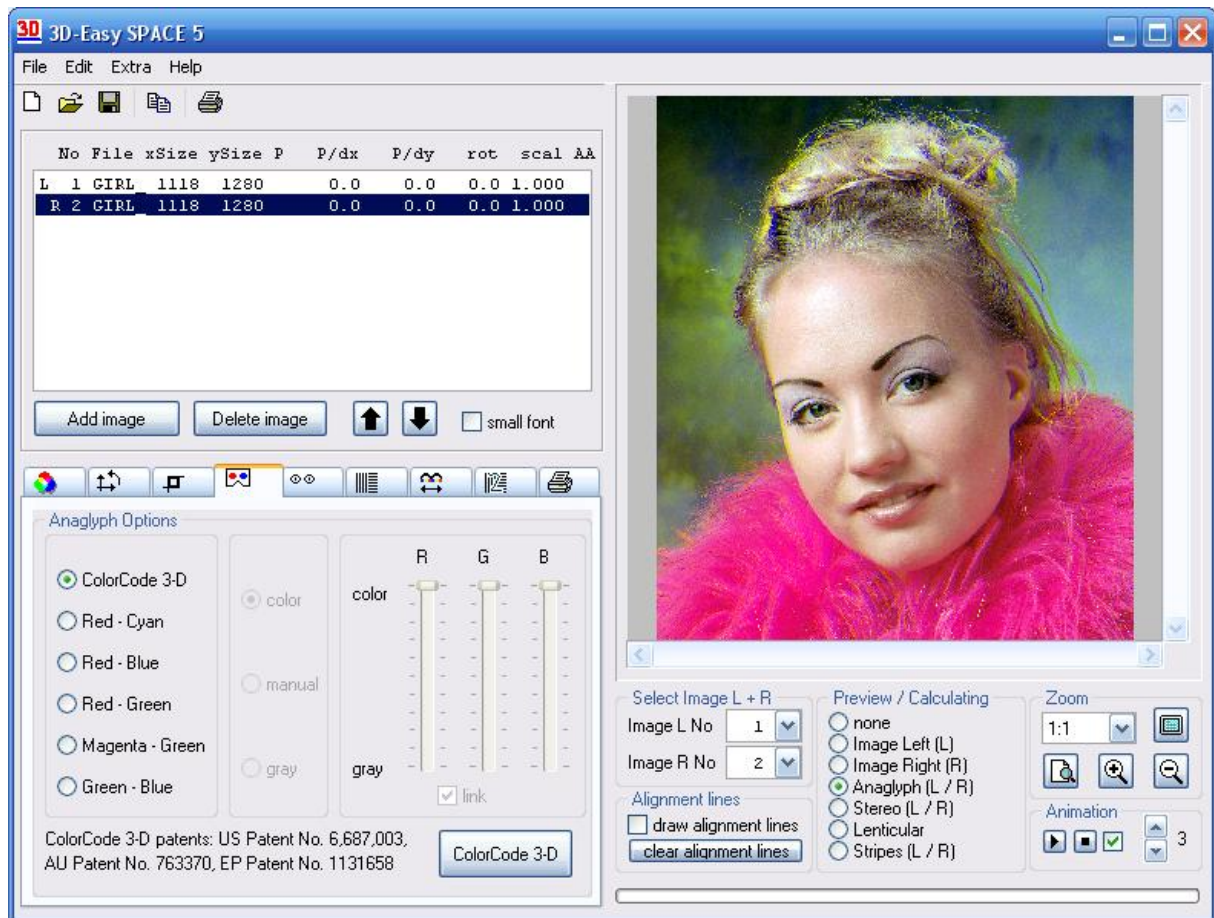
It is also possible to save the aligned images individually. The CD-ROM contains examples images, from which Anaglyph images can be generated with only a few mouse clicks.

3.1.2 Step by step to the anaglyph image

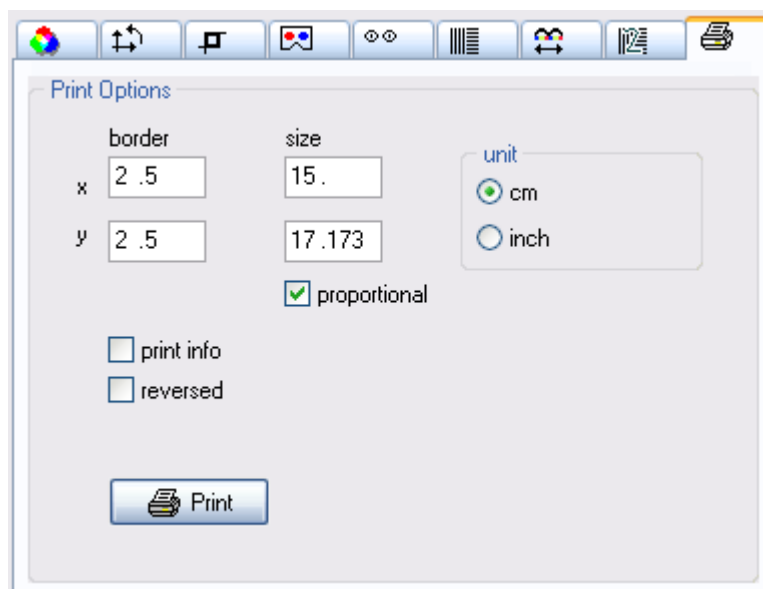
Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

The following steps show how an anaglyph image can be produced from two basic images and printed. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\STEREO\GIRL\GIRL_L.TIF
3. load 2nd image: D:\IMAGES\STEREO\GIRL\GIRL_R.TIF
4. in group box "Select", choose image 1 for Image L
5. in group box "Select", choose image 2 for Image R
6. select the option "Anaglyph L / R" in the radio group "Preview / Calculating"
7. select tab control "Anaglyph options" and select option
 - "ColorCode 3-D" (*Standard and Professional Edition*)
 - "Red / Cyan" > "gray" (*Home Edition*)



8. put on a ColorCodeViewer™ (*Standard and Professional Edition*) or the red/cyan anaglyph glasses (*Home Edition*) and see the anaglyph image in the preview
9. select tab control "Print options" and enter the following border values x and y: each 2.5 cm; size of the image x: 15 cm, close all inputs with ENTER or tab key, image size is calculated automatically



10. press button "Print" and print image on a color printer
11. view the printed ColorCode 3-D image with a ColorCodeViewer™ (*Standard and Professional Edition*) or the red/cyan anaglyph glasses (*Home Edition*)

The following experiments should be carried out in order to get more familiar with the program:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "My Anaglyph"; the file extension ".3DE" is given automatically (see details chapter 2.6.)
- **put on glasses reversed** (change color filter) and see the incorrect 3D-preview
- select in the tab control "Anaglyph options" **all kinds of anaglyphs** after another
- select further options „colored“, „manual“, „gray“ in succession
- select option „manual“ and change saturation for the color channels red, green and blue
- **change the brightness, contrast and saturation** (see details chapter 2.12)
- enable and disable the checkbox "**print info**" and print it
- enable and disable the checkbox "**reversed**" and print it
- **disable** the checkbox "**proportional**" and enter width and height of the image as you wish, afterwards enable checkbox "proportional" again
- **exchange the images** (in group box "Select", choose image 2 for Image L; in group box "Select", choose image 1 for Image R), see the image with the pair of anaglyph glasses, when doing this put on glasses the right way and reversed)
- **shift the image horizontally**: this is carried out with the help of arrow buttons (left, right); see 3D-impression
- **shift the image vertically**, this is carried out with the help of arrow buttons (up, down), see effects
- turn an image to the left or to the right and enlarge or reduce the selected image; this is carried out with the help of arrow buttons, see effect
- try buttons and scroll enlarged image in group box "Zoom"
- select "Image L" and "Image R" in succession in radio group "Preview / Calculating"
- **select any 2 images out of the 10 single images** out of the folders
D:\IMAGES\LENSES\3D\...for the 3D-lenticular technique and produce different anaglyph images
- **load the project file** "MyAnaglyph.3DE" from the hard disk if the first 'experiment' has been carried out.
- **load the other example project files**, which are already there, and print the produced image.

3.2 Flips with 2 images, using the 30-lpi lenticular card

3.2.1 Short introduction

With the help of special lenticular material it is possible to produce own flip images, which are known from the professional field. 2 up to 4 images are used when producing simple flips.

The program *3D-Easy SPACE* produces a new image out of the already existing single images. The images are decomposed into small stripes and are composed again. The stripes and the lenses run horizontally in a flip.

The corresponding lenticular card must be put upon the printed "striped image" (with the flat side downwards). When the lenticular card, which is firmly fixed on the image, is toppled and turned to the front and backwards, the flip effect or the animation will be visible.

When producing flips, alignments can be carried out like producing anaglyph images. All options can be saved in a project file.

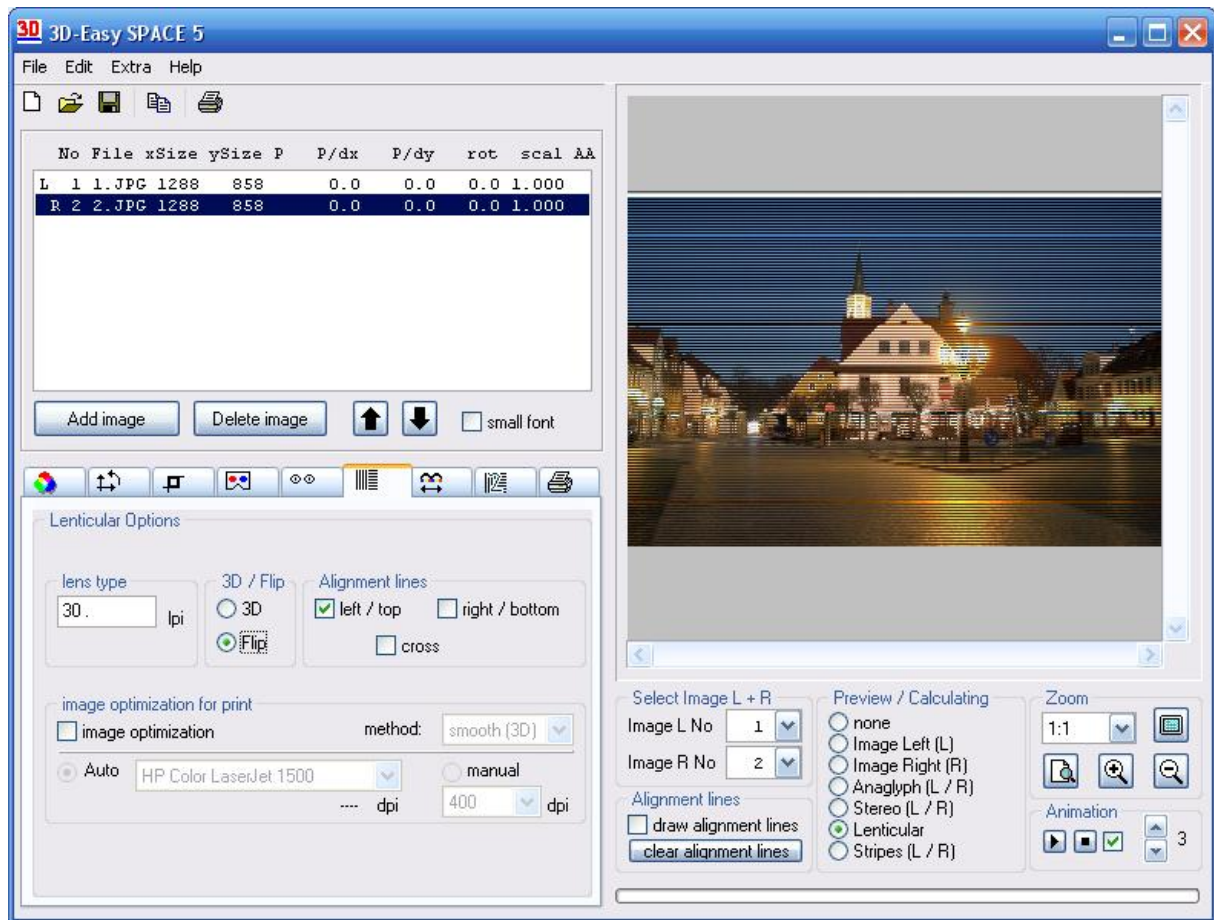
Examples of images are contained on the CD-ROM, out of which flips can be produced with only few mouse clicks.

3.2.2 Step by step to the lenticular flip

Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

The following steps show how 2 basic images can be used to produce a "day/night flip" and how it can be printed. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\LENSES\FLIP\DAYNIGHT\1.JPG
3. load 2nd image: D:\IMAGES\LENSES\FLIP\DAYNIGHT\2.JPG
4. select tab control "Print options" and enter the following values
borders x and y: each 2.5 cm; size of the image x: 15 cm, close all inputs with ENTER or tab key, image size is calculated automatically
5. select the option "Lenticular" in the radio group "Preview / Calculating"
6. select the tab control "Lenticular options" and select in radio group "3D / Flip" the option "Flip"
7. enter the value "30" (lpi) in input field "lens type" and close with ENTER



8. print image on a black/white or on a color printer
9. put the 30 lpi-lenticular card on the printed image and put it in the exact position
 - smooth surface of the lenticular downwards (lays on the printed image); structured surface - these are the lenses - upwards, to the viewer
 - lenses of the lenticular run horizontally
 - the alignment stripes which are on the printed image on the upper edge, have to run parallel to the lenticular of the lenticular card; "stair effects" have to be avoided (see chapter 2.15)
 - small movements upwards and downwards have to be carried out, the parallelism of alignment stripes and lenticular have to be maintained in order to get an optimal impression of the image
 - no hollow space has to be between lenticular card and image.

A permanent fixation of image and lenticular card is described in chapter 4.

It is recommended to work with a maximum printing resolution and the use of printing paper of high quality / high resolution.

To get more familiar with the program, the following 'experiments' should be carried out:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "My Flip"; the file extension ".3DE" is given automatically (see details in chapter 2.6)
- select the tab control "Lenticular options"; enter the value "**40**" (**lpi**) in input field "lens type" and close with ENTER; print the image; afterwards put 40 lpi lenticular card upon it
- enabling of „image optimization“ („Auto“ and „method: hard (flip)“ and print image

- **load the project file "MyFlip.3DE"** from the hard disk if the first 'experiment' has been carried out.

3.3 Animation, using the 30-lpi lenticular card

3.3.1 Short introduction

It is possible with the help of special lenticular materials to produce animations, which have been known in the professional field (depiction of sequences or processes).

Depending on the effect, one also speaks about "Zoom" (to make it gradually larger and smaller) and morphing (transmuting of objects). The program *3D-Easy SPACE 5* supports image sequences up to 10 images (*Home Edition*), 20 images (*Standard Edition*) and 99 images (*Professional Edition*).

The program *3D-Easy SPACE 5* produces a new image out of the already existing single images. The images are decomposed into small stripes and are composed again. The stripes and the lenses run horizontally in an animation.

The corresponding lenticular card has to be put upon the printed "striped image" (with the flat side downwards). When the lenticular card, which is firmly fixed on the image, is toppled and turned to the front and back, the flip effect or the animation will be visible.

When producing animations, alignments can be carried out like producing anaglyph images. All options can be saved in a project file.

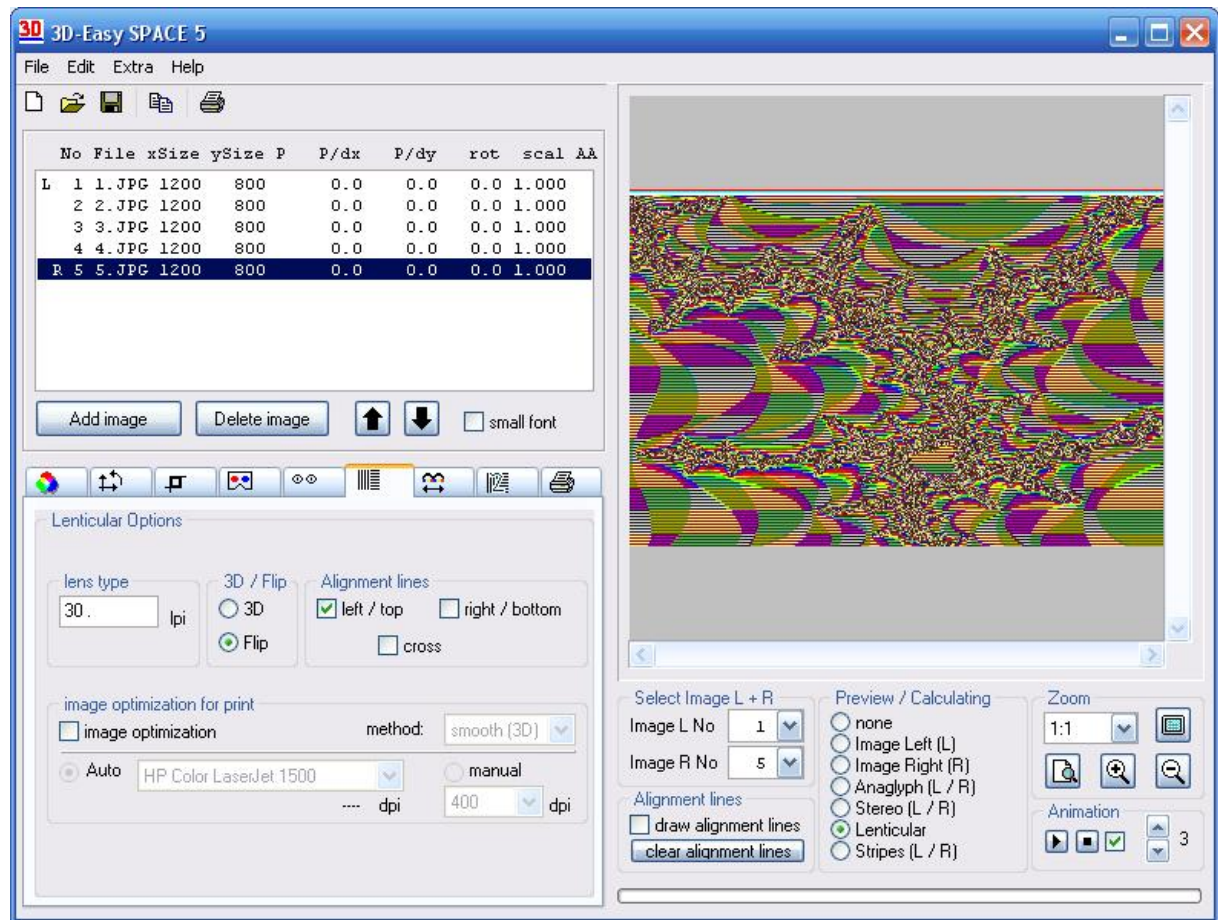
Examples of images are contained on the CD-ROM, out of which animations can be produced with only a few mouse clicks.

3.3.2 Step by step to the lenticular animation

Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

The following steps show how 5 basic images can be used to produce a "Fractal color animation" and how it can be printed. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\LENSES\ANIMATIO\FRACTAL2\1.JPG
3. load 2nd image: D:\IMAGES\LENSES\ANIMATIO\FRACTAL2\2.JPG
4. load 3d image: D:\IMAGES\LENSES\ANIMATIO\FRACTAL2\3.JPG
5. load 4th image: D:\IMAGES\LENSES\ANIMATIO\FRACTAL2\4.JPG
6. load 5th image: D:\IMAGES\LENSES\ANIMATIO\FRACTAL2\5.JPG
7. select tab control "Print options" and enter the following values
borders x and y: each 2.5 cm; size of the image x: 15 cm, close all inputs with ENTER or tab key, image size is calculated automatically
8. select the tab control "Lenticular options" and select in radio group "3D / Flip" the option "Flip"
9. enter the value "30" (lpi) in input field "lens type" and close with ENTER
10. select in radio group "Preview / Calculating" the option "Lenticular"



11. print image on a color printer
12. put the 30-lpi lenticular card on the printed image and put it in the exact position:
 - smooth surface of the lenticular downwards (lays on the printed image); structured surface - these are the lenses - upwards, to the viewer
 - lenses of the lenticular run horizontally
 - the alignment stripes which are on the printed image on the upper edge have to run parallel to the lenticular of the lenticular card; "stair effects" have to be avoided
 - small movements upwards and downwards have to be carried out, the parallelism of alignment stripes and lenticular have to be maintained in order to get an optimal impression of the image
 - no hollow space has to be between lenticular card and image.

A permanent fixation of image and lenticular card is described in chapter 4.

The demand on the printing resolution is raising with the increasing number of used single images.

That is why it is recommended to work with a maximum printing resolution and the use of printing paper of high quality and high resolution.

The selected animation form consists in a color animation, the geometrical form is identical on all images. That is the reason why a print on a color printer is necessary. If you have an animation, which means the object moves or changes its form; the print also works on a black/white printer.

To get more familiar with the program, the following 'experiments' should be carried out:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "My Animation"; the file extension ".3DE" is given automatically (see details in chapter 2.6)
- select the tab control "Lenticular options"; enter the value **"40" (lpi)** in input field "lens type" and close with ENTER; print the image; afterwards put 40 lpi lenticular card upon it
- enabling „image optimization“ (option: "Auto" and method: "soft (3D)") and print image
- start image animation with button "start animation" and change speed of animation, finish animation with button "stop animation"
- **load the project file** "MyAnimation.3DE" from the hard disk if the first 'experiment' has been carried out.

3.4 3D-image, using of the 40-lpi lenticular card

3.4.1 Short introduction

With the help of *3D-Easy SPACE 5* your own 3D-lenticular images can be produced. The production of perfect 3D images is definitely the most demanding applications of the software. In contrast to most of the other 3D-techniques (e.g. the anaglyph technique), not only 2, but a whole series of single images of an object are used with the 3D lenticular technique. The software *3D-Easy SPACE 5* considers 10, 20 or 99 single images for the production of a 3D lenticular image, it depends on the program version. In contrast to flips and animations, the printed image stripes and the stripes of the lenticular material run vertical when using the 3D lenticular images.

Like the flips and animation images, the basic images are decomposed into stripes and are composed to a new image.

The corresponding lenticular card (with the flat side downwards) has to be put upon the printed "striped image". The 3D-impression arises because both eyes look at the lenses with different view angles.

An exact alignment of the basic images is necessary when producing 3D lenticular images, which is supported by *3D-Easy SPACE*. Here, it is an advantage to use the anaglyph preview, which is contained in the program. All options can be saved easily in a project file. The above-mentioned high demand of lenticular images refers to the production of appropriate 3D basic images. It also refers to the necessary printing resolution (400 dpi physical resolution necessary when using 40 lpi lenticular cards and 10 basic images).

Example images are contained on the CD-ROM, from which 3D-images can be produced with only a few mouse clicks.

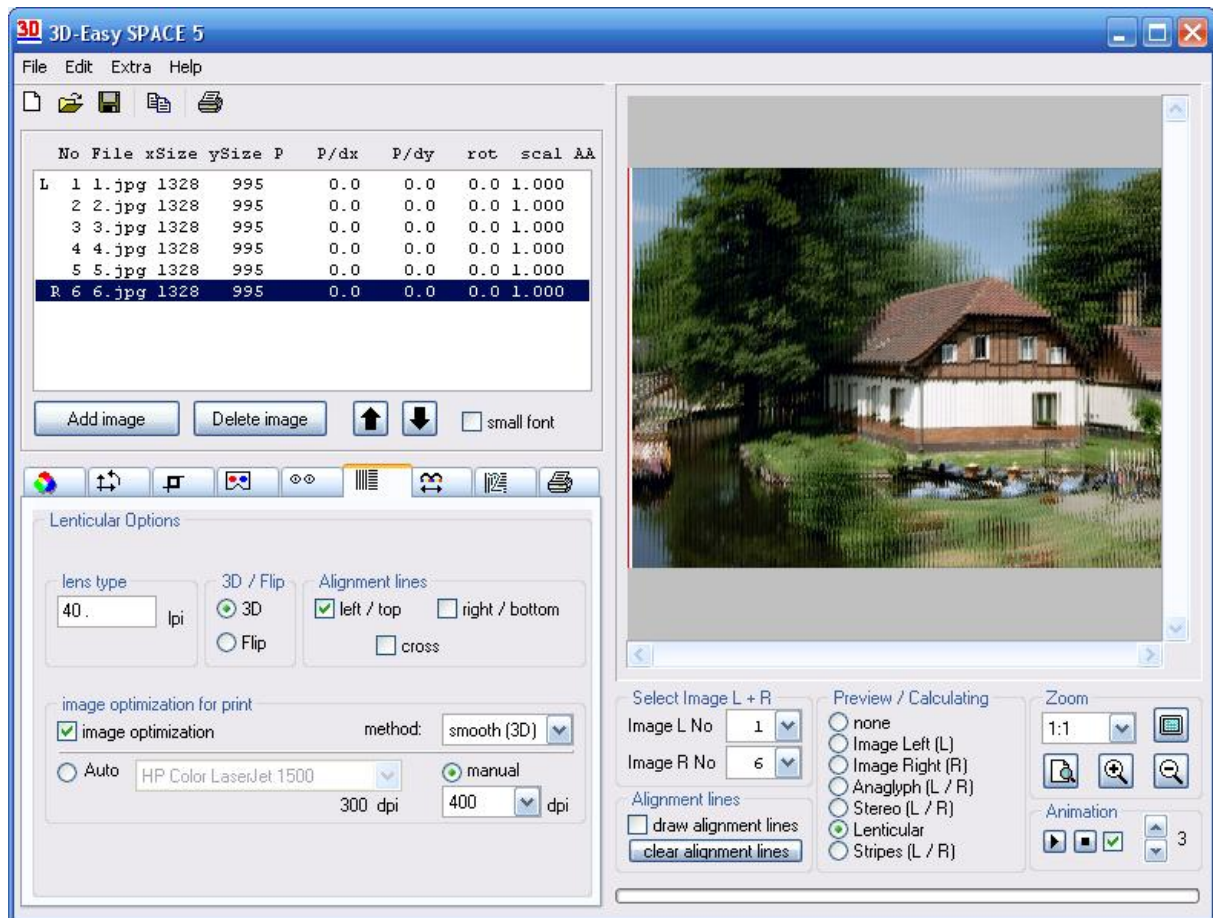
3.4.2 Step by step to the 3D-lenticular image

Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

The following steps show how 6 basic images can be used to produce a 3D lenticular image and how it can be printed. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\LENSES\3D\SPREE\1.JPG
3. load 2nd image: D:\IMAGES\LENSES\3D\SPREE\2.JPG
4. load 3d image: D:\IMAGES\LENSES\3D\SPREE\3.JPG
5. load 4th image: D:\IMAGES\LENSES\3D\SPREE\4.JPG
6. load 5th image: D:\IMAGES\LENSES\3D\SPREE\5.JPG
7. load 6th image: D:\IMAGES\LENSES\3D\SPREE\6.JPG
8. select tab control "Print options" and enter the following values
borders x and y: each 2.5 cm; size of the image x: 15 cm, close all inputs with ENTER or tab key, image size is calculated automatically

9. select the tab control "Lenticular options" and select in radio group "3D / Flip" the option "3D"
10. enter the value "40" (lpi) in input field "lens type" and close with ENTER
11. select in radio group "Preview / Calculating" the option "Lenticular"



12. print image on a black/white or on a color printer
13. put the 40-lpi lenticular card on the printed image and put it in the exact position
 - smooth surface of the lenticular downwards (lays on the printed image); structured surface - these are the lenses - upwards, to the viewer
 - lenses of the lenticular run vertical
 - the alignment stripes which are on the printed image on the left edge have to run parallel to the lenticular of the lenticular card; "stairs effects" have to be avoided
 - small movements to the left and to the right have to be carried out, the parallelism of reference stripes and lenticular have to be maintained in order to get an optimal impression of the image
 - no hollow space has to be between lenticular card and image.

A permanent fixation of image and lenticular card is described in chapter 4.

The demand on the printing resolution is high with this selected 3D-scene. That's why it is recommended to work with a maximum printing resolution and the use of printing paper of high quality and high resolution.

To get more familiar with the program, the following 'experiments' should be carried out:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "My3DImage"; the file extension ".3DE" is given automatically (see details in chapter 2.6)
- start image animation with button "start animation" and change speed of animation, finish animation with button "stop animation"
- **anaglyph view**
 - in group box "Select", choose image 1 for Image L
 - in group box "Select", choose image 2 for Image R
 - select the option "Anaglyph L / R" in the radio group "Preview / Calculating"
 - select tab control "Anaglyph options" and select option "anaglyph gray red/cyan"
 - put on anaglyph glasses; judge anaglyph image in the preview
 - select image 3, image 4 image 6 for Image R and judge anaglyph image (especially **the raising depth impact**)
 - select option "**Lenticular**" in the radio group "Preview / Calculating"
- enabling of "image optimization" (option: "Auto" and method: "soft (3D)"), print image, put corresponding lenticular card over it
- select the tab control "Lenticular options"; enter the value "**30" (lpi)**" in input field "lens type" and close with ENTER; print the image; afterwards put 30 lpi lenticular card upon it
- enable and disable the checkbox "**print info**" and print it
- enable and disable the checkbox "**reversed**" and print it
- **disable** the checkbox "**proportional**" and enter width and height of the image as you wish, afterwards enable checkbox "proportional" again
- **load the project file** "My3D-Image.3DE" from the hard disk if the first 'experiment' has been carried out
- **load some of the already existing examples** of project files (*.3DE) and print the corresponding image.

The following steps should be carried out in case there is no 3D-effect:

- maintaining the 40-lpi lenticular
- maintaining the maximal printing resolution and use of printing paper of high resolution
- disabling of the single images step by step, start with disabling of image 6, afterwards image 5 etc. and printing of the calculated lenticular images
- due to this 6, 5, 4 (declining) basic images are used for the calculation of the lenticular image and the demand on the printing resolution is reduced
- less than 4 single images to calculate a 3D-scene should not be used, otherwise the viewing direction of the lenticular card is too restricted.

3.5 Stereo images

3.5.1 Short introduction

Stereo images can be produced with the program *3D-Easy SPACE 5*. The corresponding images for the left and right eye are arranged (printed) side by side or one under the other (KMQ). Stereo images are usually viewed with stereo viewers (3D-Viewer). The two basic images are of a certain maximal size and have a certain distance; this depends on the type of viewer. The program *3D-Easy SPACE 5* supports 10 different viewer-formats.



Different stereo viewers: the program *3D-Easy SPACE 5* calculates and prints the corresponding pair of stereo images for all depicted viewers.

Moreover, own formats can be defined with *3D-Easy SPACE - Standard* and *Professional*. For this, values for "frame size", "image size" and "image distance" have to be entered.

A very precise alignment of the basic images is necessary with the production of stereoimages; it is supported by *3D-Easy SPACE* easily. It is of advantage to use the anaglyph preview, which is contained in the program. Much information from chapter 3.1.1 (anaglyphs) are valid for stereo images as well; especially the information on how to produce an image (stereo cameras) and alignment. **All pairs of anaglyph images are pairs of stereo images at the same time and the other way round.**

All program options can be saved in a project file.

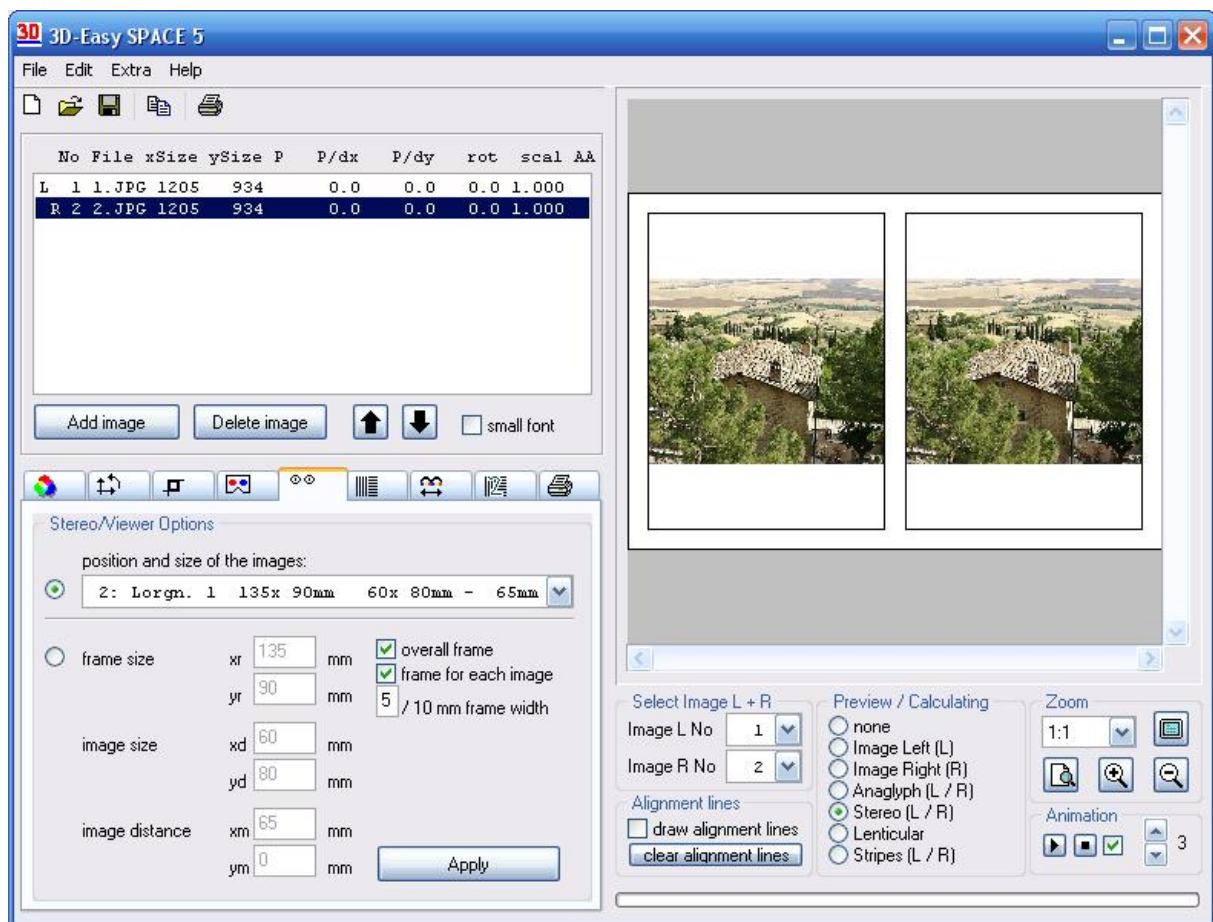
There are example images on the CD-ROM, from which stereo images can be created with only a few clicks.

3.5.2 Step by step to the stereo image

Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

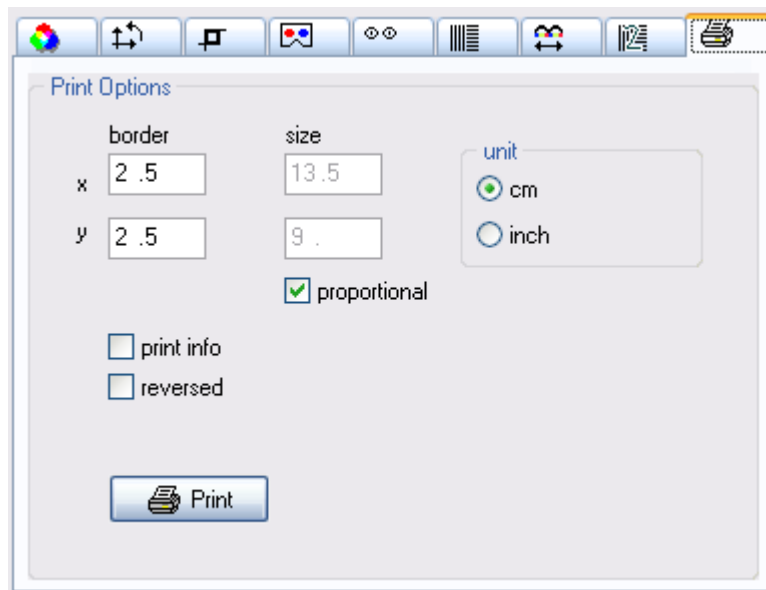
The following steps show how stereo image can be produced and printed out of two basic images. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\STEREO\TUSCANY1\1.JPG
3. load 2nd image: D:\IMAGES\STEREO\TUSCANY1\2.JPG
4. in group box "Select", choose image 1 for Image L
5. in group box "Select", choose image 2 for Image R
6. select the option "Stereo L / R" in the radio group "Preview / Calculating"
7. select tab control "Stereo options" and select option "2. Lorg. 1 ... "



User interface of the Software *3D-Easy SPACE -Standard 5*
(We hold the right to change the product without notice).

8. select tab control "Print" and enter the following values
borders x and y: each 2.5 cm; close all inputs with ENTER or tab key; **the values for the image size cannot be changed because they are fixed with the selection of the viewer type in the tab control "Stereo"**



9. print image on a black/white or on a color printer
10. view printed image with or without stereo-viewer

The demand on the printing resolution is rising with the reduction of the printed image size. That is why it is recommended to work with the maximum printing resolution and the use of printing paper of high quality and high resolution.

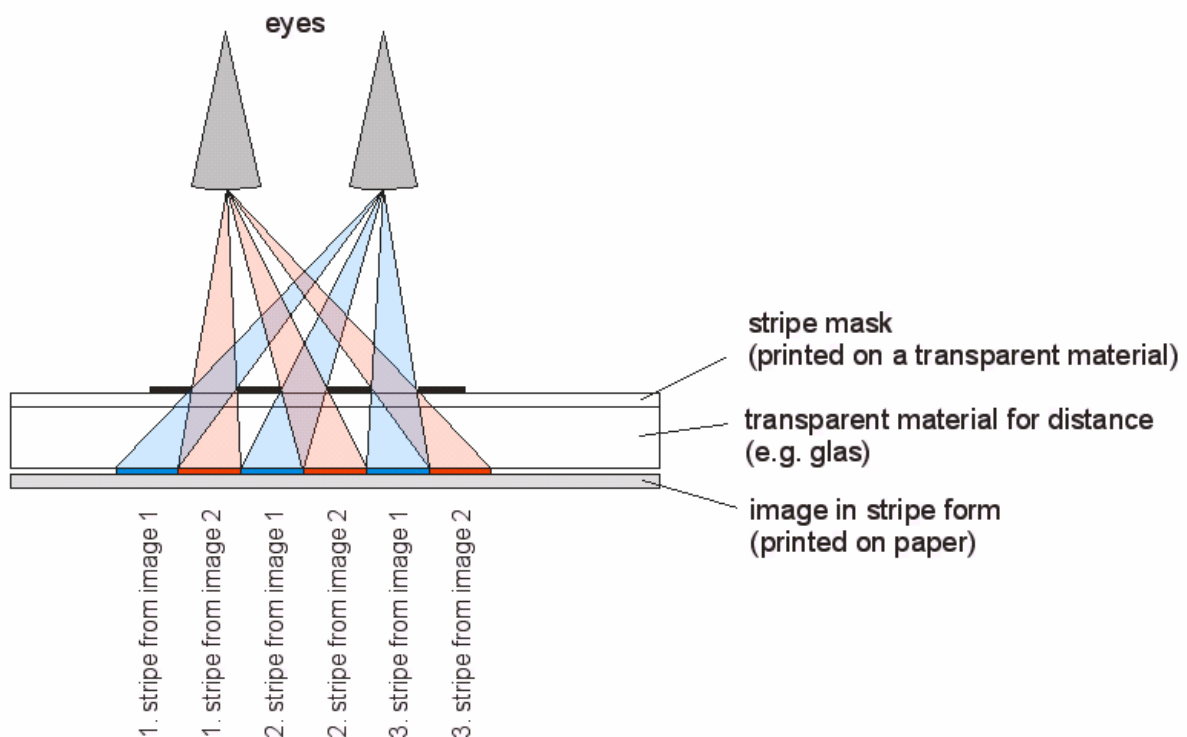
To get more familiar with the program, the following 'experiments' should be carried out:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "My Stereo-Image"; the file extension ".3DE" is given automatically (see details in chapter 2.6)
- select the option "**Anaglyph L / R**" in the radio group "Preview / Calculating"; put on anaglyph glasses, see the anaglyph image in the preview; afterwards select option "Stereo L / R" again
- **Cross view**
 - in group box "Select", choose image 2 for Image L
 - in group box "Select", choose image 1 for Image R
- **Parallel view (default option)**
 - in group box "Select", choose image 1 for Image L
 - in group box "Select", choose image 2 for Image R
- select the **other stereo formats** from the combo box;
- enable or disable the check boxes in the tab control "Stereo"; the importance of each single option is explained in chapter 2.7.5; press button "**Apply**" for a new calculation of the image
- **load the project file** "MyStereo-Image.3DE" from the hard disk if the first 'experiment' has been carried out
- **load some of the already existing examples** of project files (*.3DE) and print the corresponding image.

3.6 3D-Barrier image (only available in *Professional Edition*)

3.6.1 Short introduction

The parallax Barrier Method serves the depiction of 3D-images (vertical stripes). This procedure can also be applied for animations (horizontal stripes). The basic principle of the barrier-technique is based on a stripe mask, which is arranged parallel and with only a small distance (some millimetres) in front of the stripe image. Each eye sees the corresponding image parts of the stripe image; the image parts for the other eye are covered due to the black invisible stripes. The following image shows the principle:



Principle of the Barrier-Method, here simplified depiction with 2 images (pair of stereos)

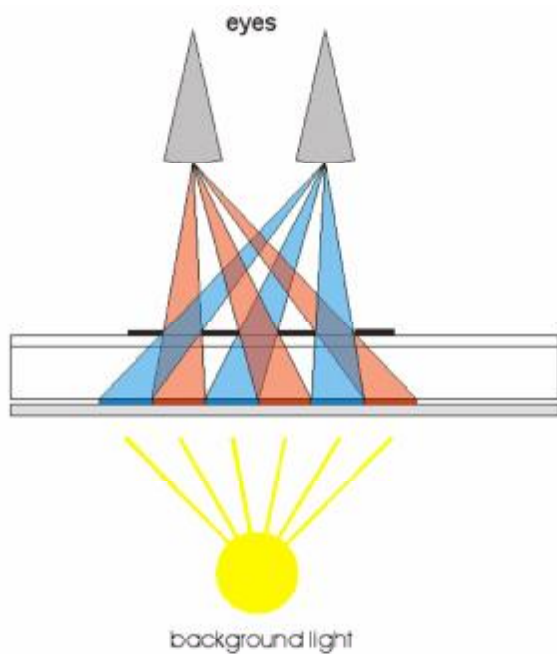
There are no lenticular materials used with the Barrier method. Glass is between the stripe image and the stripe mask in order to have the same distance between the two images.

There must be 2 prints with this method:

- stripe mask (black stripes on transparent material)
- actual 3D or animation image in stripe form

The calculation and the print of both images are carried out by *3D Easy SPACE 5 - Professional*.

The disadvantage of this method is that the barrier-method is rather dark because of the stripes. A background light can lower this negative effect.



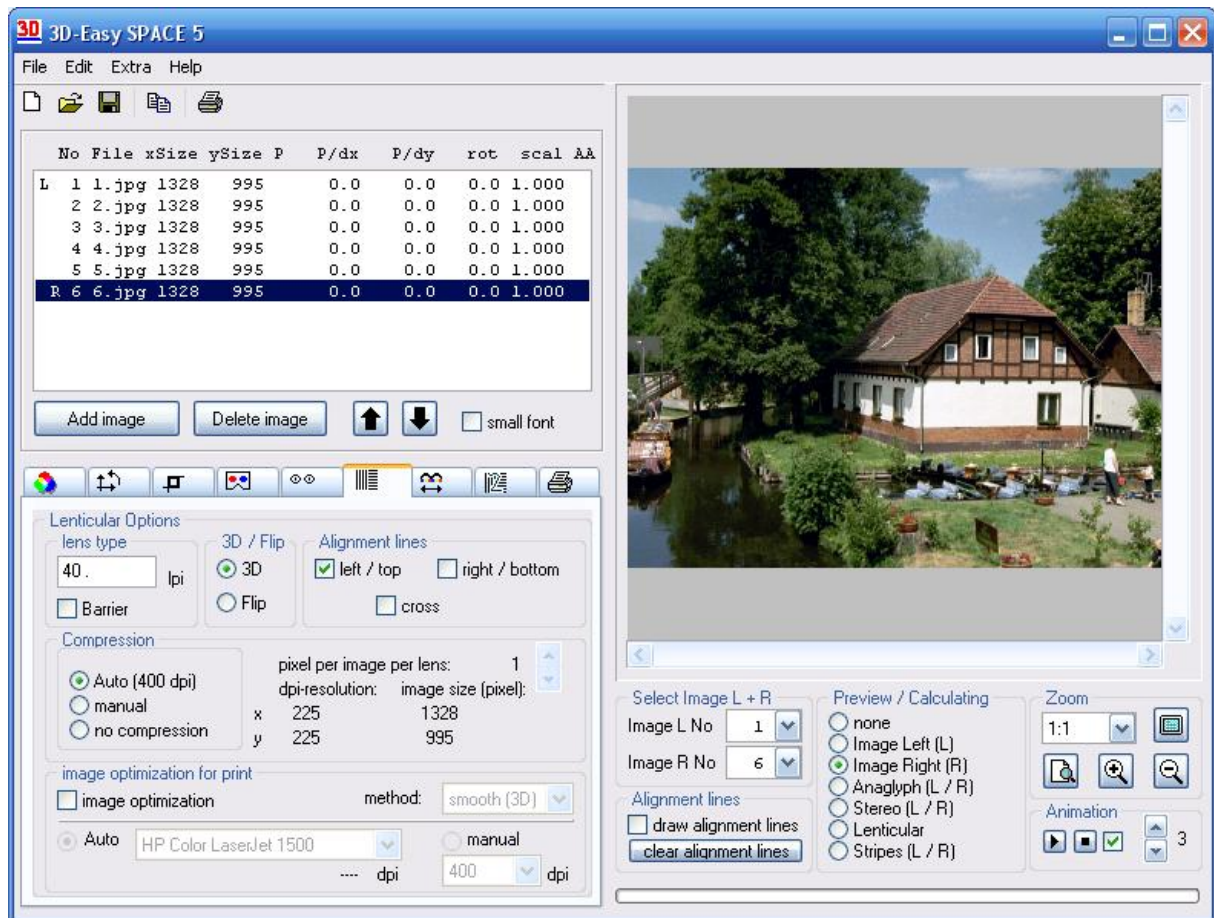
A background light compensates a bit the loss of brightness caused by the stripe mask. A further disadvantage of the barrier method is that position of the one who looks at 3D images is rather limited. If the position of the one who looks at the image changes, an "Inverting" of the stereo effect will happen.

3.6.2 Step by step to 3D barrier images

Unexperienced computer users should read chapter 2 completely before going any further because the following program functions are described in details.

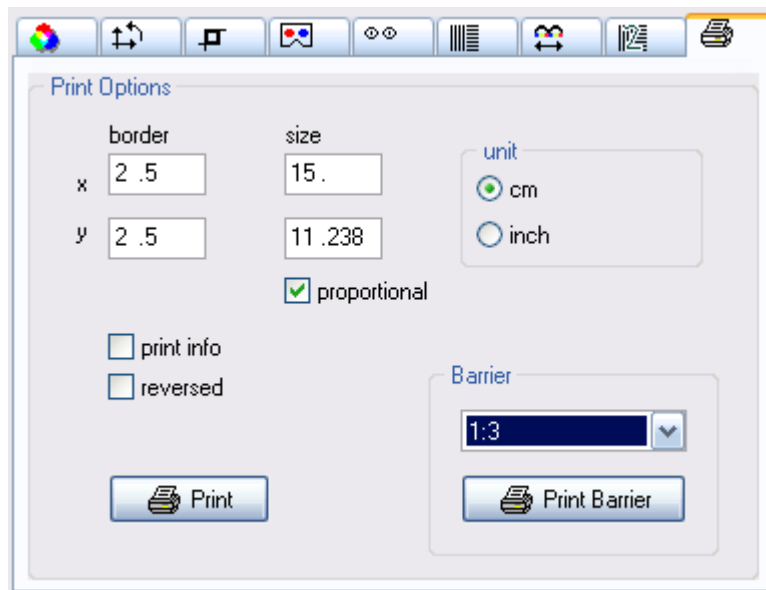
The following steps show how 4 basic images can be used to produce a 3D Barrier image and how it can be printed. The used drive letter "D" may have to be substituted by the CD- or DVD-drive letter, which is used at your PC configuration.

1. start the program
2. load 1st image: D:\IMAGES\LENSES\3D\SPREE\1.JPG
3. load 2nd image: D:\IMAGES\LENSES\3D\SPREE\2.JPG
4. load 3rd image: D:\IMAGES\LENSES\3D\SPREE\3.JPG
5. load 4th image: D:\IMAGES\LENSES\3D\SPREE\4.JPG
6. select tab control "Print options" and enter the following values
borders x and y: each 2.5 cm; size of the image x: 15 cm, close all inputs with ENTER or tab key, image size is calculated automatically
7. select the tab control "Lenticular options" and select in radio group "3D / Flip" the option "3D"
8. enter the value "20" (lpi) in input field "lens type" and close with ENTER
9. the check box "Barrier" must be checked
10. select in radio group "Preview / Calculating" the option "Lenticular"



11. select the tab control "Print options" and press button "Print"; you get the image in stripe form
12. select the proportion "1:3" in the panel "Barrier"; a stripe mask of 4 stripes is created by this option, one of the stripes is transparent, the other 3 stripes are black; print sizes (borders and above all size of the image) are not changed
13. press button "Print Barrier" and print image on transparent film, then you get a stripe mask
14. the arrangement of stripe mask, glass and stripe can be seen in the above description; the alignment of stripe mask and stripe image is carried out with the help of reference stripes

The demands on the printer can be more or less compared with 3D lenticular prints. In practical operation, there are only a few single images processed to a 3D Barrier image though because the more numbers of images you have, the more the brightness diminishes.



The use of different materials (paper and transparent film) and their printing characteristics as well as the variable distance between stripe image and stripe mask force to make lots of experiments in order to get good results.



Sequence with the barrier-print: printed stripe image > glass > stripe mask

To get more familiar with the program, the following 'experiments' should be carried out:

- **save** the current options as a **project file** on the hard disk, e.g. under the name "MyBarrierImage"; the file extension ".3DE" is given automatically (see details in chapter 2.6)
- select the tab control "Lenticular options"; enter the value "**15" (lpi)**" in input field "lens type" and close with ENTER; afterwards carry out the above mentioned steps 9-12
- select the proportion "1:1" and "1:2" in the panel "Barrier" in tab control "Print option" and print the stripe mask (button "Print Barrier")
- **load the project file** "MyBarrierImage.3DE" from the hard disk if the first 'experiment' has been carried out.

4 Fixing a printed image on a lenticular card

4.0 General Information

After having printed a lenticular image, the question is how to fix the lenticular card and the printed image permanently. There are several procedures for this. The image has to be printed out on different materials, this depends on the procedure.

The following rules have to be taken into consideration independent of the materials used:

- print with high printing resolution (adjustable in print dialogue)
- printing materials of high resolution such as printing paper of high resolution or adhesive film of high resolution are necessary
- material qualities such as color truth (faithfulness), UV resistive ness and water sensitivity are important depending on the purpose of the final lenticular product, but they are secondary compared to the printing resolution of the material
- the lenticular (structured user interface of the lenticular card) always faces the viewer, the smooth surface of the lenticular card covers the printed image completely
- it is important for the quality of the "final product" to have an exact alignment of lenticular card and printed material
- between the printed material and the lenticular card must not be any hollow space

Following are simple fixing methods, which are cheap and can be carried out by any home user without special knowledge or techniques (up to a size of about A4).

4.1 Mechanical procedures

The mechanical fixation is the easiest and cheapest fixation technique. The lenticular card and lenticular image cannot move out of place when both materials are pressed together permanently.

Mechanical fixation help, we can recommend simple photo frames (frameless), which can be bought in every shop. These frames mostly consist of a solid backside, glass for protection and 4 compression springs.



front of the photo frame



back of the photo frame

The compression springs press glass and backside together so that materials between glass and backside are also fixed firmly. When the printed and cut lenticular image as well as the lenticular card are put between the backside of the image frame and the protection glass and when there is a pressure with the help of the 4 compression springs, then you have already achieved the necessary fixation.



sequence with mechanical fixation: back of the photo frame > printed lenticular image > lenticular material > glass of the photo frame

The use of the protection glass has two advantages: The lenticular is protected mechanically and the lenticular card does not get dusty.

Different sizes of photo frames are available in stores, such as the size 15x10 cm / 6x4". Some products have small deviations concerning their size. It is recommended to use larger image frames (they are only a few millimetres longer) because the lenticular cards fit perfectly between glass and backside. Otherwise there can be problems when fixing the 4 compression springs.



mechanically fixed 3D-lenticular image

Due to the mechanical stability of the 30 and 40 lpi lenticular cards, one does not need protection glass.

You also have to take into consideration the general information described in chapter 4.0.

A big advantage of mechanical fixation is that 3D and flip images can be exchanged as often as you want to exchange images without using up lenticular material.

4.2 Glue methods

4.2.0 General

In contrast to mechanical procedures, glue methods except adhesive procedures, have the disadvantage that the lenticular material is "used", which means it is not possible to separate printed image and lenticular material later. Furthermore, there is only one attempt with sticking: lenticular material, which is not placed exactly or enclosed bubbles, makes the image unusable or lead to heavy quality loss.

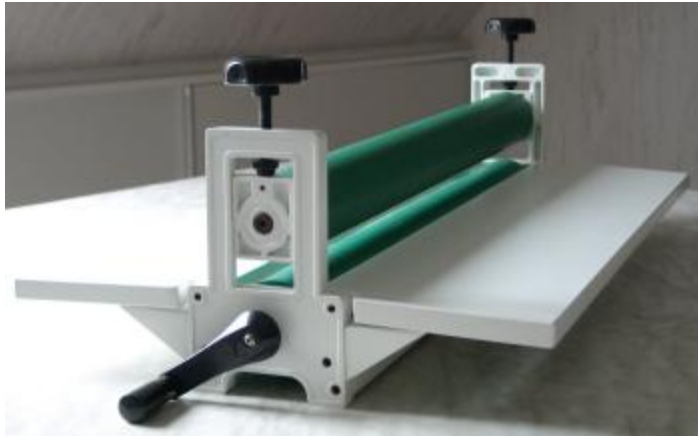
There are also three big advantages of the glue method:

- later slipping of the image and the lenticular material is excluded
- the lenticular material has full contact to the printed image and leads to a high image quality
- the production of larger lenticular images (larger than A4) is possible without quality loss (no hollow cavities between lenticular material and printed image)

The full-flat contact of printed image and lenticular material is an important quality feature (no hollow cavities and aerial inclusions).

Glue methods, especially the procedure with self-adhesive lenticular material, have a big advantage compared with mechanical fixations. With mechanical fixation and use of normal picture frames, this contact can be reached up to an image size of about A4. Larger image formats require special picture frames e.g. thick and heavy acrylic glass to provide the necessary compression also on a larger surface.

To achieve a good result while sticking together, especially to provide aerial inclusions, we recommend special equipment. The use of an easy mechanical laminator is recommended for the production of lenticular images, which are stuck together, from a size of about 30x20 cm.



The laminator illustrated on the photo consists of two rubber barrels. The upper barrel can be altered in height (adaptation to thickness of the lenticular material and adjustment of pressure).

It is important that the barrels do not consist of too hard material in order to avoid damage to the lenticular material.

With the production of small glued lenticular images, a hand barrel can be used to press image and lenticular material together.



The printed image is pressed evenly to the lenticular material by repeated rolling (alongside and crosswise). The illustrated hand barrel can be purchased in shops, which run office or art products).

If this equipment is used, you have to be careful that glue material or glue does not contact the barrels. Otherwise the following barrel procedures will defile the barrels.

In preparation of a sticking fixation, two tips should be considered:

- a calibration should absolutely be carried out before fixing (see chapter 2.16); with selfadhesive lenticular material, the protective foil remains on the glue layer (the low thickness of this protective coating leads only to low divergences with the calibration and can be neglected)
- we recommend printing the adjustment stripes in all edges when printing the lenticular image (see chapter 2.15) to place the lenticular material as accurate as possible

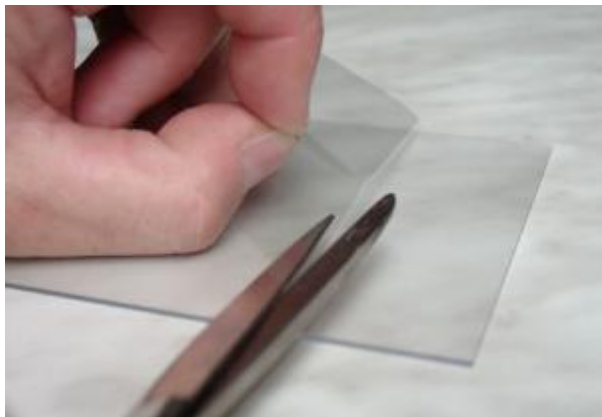
Please also note the general hints described in chapter 4.0.

4.2.1 Self-adhesive lenticular material

The back of the self-adhesive lenticular (plain side) material is already provided with a glue layer. The glue layer is also covered with a protection foil. Self adhesive lenticular material are offered in the *3D-Easy - WebShop* in 30 lpi, 40 lpi and 60 lpi (depends on availability). With self-adhesive lenticular material, larger lenticular images in very good quality can be produced.

The fixation of the self-adhesive lenticular material on the printed picture is as follows:

1. if a laminator is used, the height of the upper barrel has to be set so that the lenticular material fits through and the barrels press on to the material
2. at the self-adhesive lenticular material, the protection foil of the glue layer is raised gently and a stripe of about 1,5 up to 2 cm is cut parallel with the lens course;
pay attention with the material because the exposed glue layer enters a lasting glue connection with the smallest touch with other objects; the glue layer will be damaged if one attempts to set the agglutination free



3. the printed picture is put on the table the way that the right part (with 3D pictures) or the lower part (with flip or animation) sticks out above the table margin (approx. 3-5 cm) but is not dejected
4. the self-adhesive lenticular material is placed with the lens page upwards on the picture that the uncovered glue layer also sticks out above the table and does not contact the picture



5. the lenticular material is aligned precisely with the help of the alignment stripes; with 3D images, it should be taken into consideration that a very good 3D impression is achieved if one looks at the picture exactly vertically from above; this can be achieved by a slight lateral movement of the lenticular material



6. if the adjustment is perfect, the lenticular material is fixed in this position with one hand, while with the other hand the picture, which hangs down, is pressed against the lenticular material with the glue area, which lies freely; you should start pressing only in the middle and go on pressing the external areas; because the sticking area is narrow, small aerial inclusions can be removed rather simply by gentle painting



7. now the picture reattached in this manner is inserted in the middle of the laminator (lens page down), the paper is slightly held up and the protective foil is removed of the glue layer



the lenticular material is stuck together with the picture by pressing the crank; while the picture is dragged by the barrels, the paper must remain lifted



8. by repeated rolling in different directions, the agglutination is finished

If a hand barrel is used instead of a laminator, the steps have to be carried out similarly. After removing the protective foil, the paper is rolled steadily on to the self-adhesive lenticular material with a hand barrel and not with the laminator.

A second person that fixes the lenticular material on the table certainly provides help with the first attempts.

Please also note the general hints in chapter 4.0 and 4.2.0.

4.2.2 Attatching the double sided adhesive material

The printed image and lenticular material can be fixed permanently with the help of double sided adhesive material. We recommend the use of very thin adhesive material. You can find such material in the *3D-Easy - WebShop*.



double sided adhesive material, which can be bought in nearly all specialized shops

Point 4.2.1 describes the fixing. First the double sided adhesive material is put on the back of the lenticular material entirely.

There is also a second procedure which can be used:

- normal printing of the lenticular on water resistant paper of high resolution
- the printed side faces to the viewer



- removal of the first protection film of the double sided adhesive material
- rolling out the double sided adhesive material on the printed side evenly and entirely; the adhesive material covers the entire printed image



- removal of the second protection film of the double sided adhesive material



- the lenticular card with the smooth side pointed downwards has to be carefully aligned to the image; avoid to touch the adhesive material
- now put the lenticular material upon the second adhesive material evenly and entirely



- cut paper and adhesive material which is to large



- the 4 side edges can be protected with the help of a transparent adhesive strip.

Moreover, the general information described in chapters 4.0. and 4.2.0 have to be taken into consideration.

The described adhesive technique can only be carried out one time per lenticular card. Therefore, one has to be careful with the alignment.

4.2.3 Spray glue

When using spray glue, the lenticular card and the printed lenticular image are fixed permanently. To do so, transparent, clear glue is the most convenient, but the best glue is spray glue. This glue is available in office supply stores. There are many different producers and all kinds of glue. The success of this technique depends on the compatibility of the glue and paper.

The following steps are necessary for the production:

- normal printing of the lenticular on water resistant paper of high resolution
- the image is to be cut (do not cut the alignment stripes)
- the printed side faces to the viewer
- the transparent glue must be put evenly and on the entire surface of the smooth side of the lenticular card (the glue can also be put on the print but this depends on the kind of paper; it is important that the glue does not soak the paper and that the size of the paper does not change due to that)
- the fixation is carried out by carefully aligning the alignment stripe (left or top), afterwards the print is rolled out upon the lenticular card
- due to the glue effect, the exact alignment has to be done very fast by slight moving and turning
- the 4 side edges can be protected with the help of a transparent adhesive stripe

Moreover, the general information described in chapters 4.0 and 4.2.0 has to be taken into consideration.

When using the glue, the direction for use of the producers has to be taken into consideration. It is recommended to test how the glue and the lenticular card work together first at a small place. There may be glues consisting of acids, which can damage the lenticular material and can make it unusable.

4.3 Adhesive methods

When using the adhesive method, a permanent fixation of lenticular card and printed lenticular image is obtained by a self-adhesive on the printed material upon the lenticular card. This is possible by using a self-adhesive film, which is available in stores. This film can be printed on and it has a high resolution.

Following steps are necessary for its production:

- reversed print of the lenticular image on a adhesive film which can be printed on and which is of high resolution; the reversed print is supported directly by the program *3D-Easy SPACE 5*
- the image of the adhesive film is cut (do not cut the alignment stripes)
- the side of the adhesive film which is not printed and which is self-adhesive is fixed on the smooth side of the lenticular card
- the direction of the printed side of the adhesive film shows away from the viewer (that's why the reversed print)
- the fixation is carried out by carefully aligning the alignment stripe (left or top) and then the adhesive film is rolled out over the lenticular card
- the fixation and the rolling can be carried out several times because it is a adhesive connection and not an glue connection
- optical disturbing air bubbles between adhesive film and lenticular card can be avoided by less use of water between adhesive film and lenticular card (note advice of producer, water must not come in to contact with the printed side otherwise the printed image will be blurred)
- in order to protect the printed image which is on the backside, a self glue white material which can be bought in shops can be put on it (e.g. white self-glue paper)
- the 4 side edges of the product which consists of 3 materials (from the front to the back: lenticular card, self-adhesive film, self glue white material) can be protected with the help of a transparent adhesive strip.

Moreover, the general information, described in chapters 4.0 and 4.2.0, has to be taken into consideration.

4.4 Other methods

Besides the mentioned techniques, there are more possibilities of fixation. These other methods are used mainly in the professional field, for instance lamination or the direct print of the lenticular image on the backside of the lenticular material. Due to the high demands on the hardware, these methods are very difficult to carry out for the home user.

5 Production of 3D-images or animations

5.1 Production of 3D-images of big natural objects

5.1.1 Use of a normal camera (1 lens)

Bigger objects or scenes from an expansion of about 50 cm / 20 " in each direction and smaller objects which are either fixed somewhere and cannot be moved or which are too big to be put on a rotating plate, are taken with the method of "camera shifting".

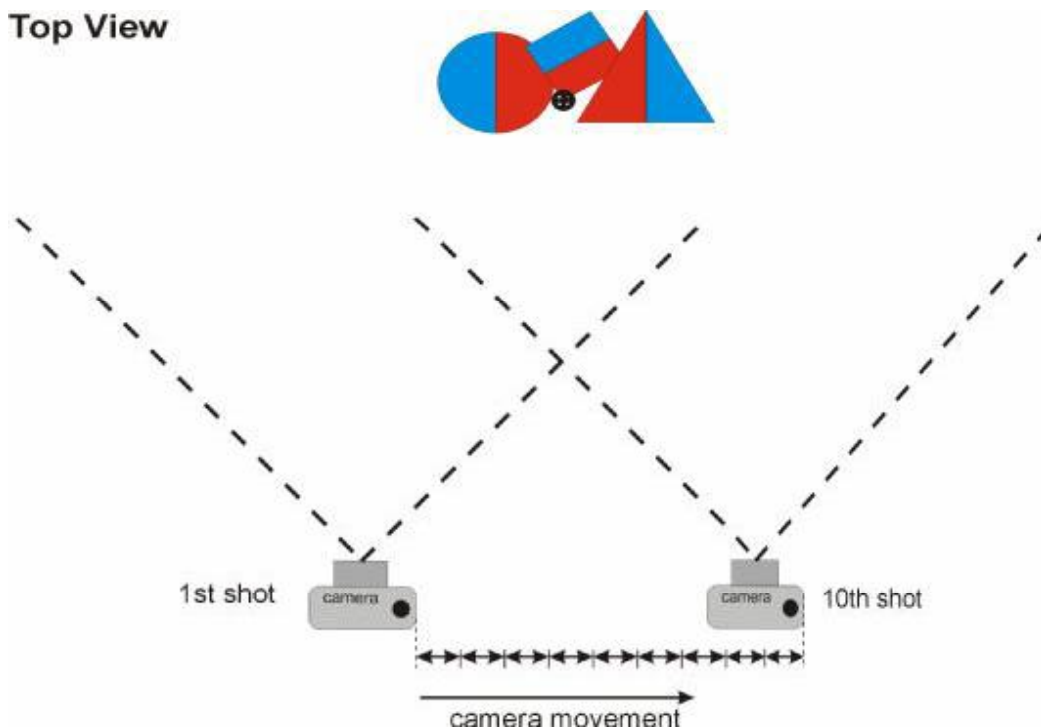
When shifting the camera, the object remains at its original position. More light sources can be used which are fixed in addition to the natural light. The use of a flashlight on a 3D-image only appears natural if shadows and reflexes of the light of the object do not disturb it. At a short distance between flashlight and objective, which is often the case with many (miniature) camera and digital cameras, the shadow, which develops, can be accepted because the shadow out of the sight of the objective is hardly recognizable.

The single takes of the image are based on the following rules:

- a) look for a central reference point of the object that is, if possible, in the front quarter of the whole scene; move the camera to left for the first shot
- b) adjust the camera towards the object
- c) take the first image of the object
- d) maintain the optical camera options (exposure time, aperture, focal length)
- e) horizontal shifting of the camera of about 1 cm / 0.4" to the right (parallel movement)
- f) take the 2nd image of the object
- g) repeat the steps d), e) and f) for the further images

The following picture gives you an impression of the arrangement and the parallel movement of the camera:

Top View



The camera should be shifted on a plane surface, e.g. a board with cm division [step e)].

Experienced photographers can take the photos without any additional equipment. Little deviations upwards and downwards or distortions can be corrected afterwards with alignment functions of the software *3D-Easy SPACE*.

A special tripod with a movable part on which the camera is fixed is recommended for professional works.



Self made special tripod to produce basic images for a 3D lenticular image

The camera movement of 1 cm per image, explained above in step e), refers to the description of a natural 3D-impression when using 10 images.

The amount of 1cm / 0.4" camera shifting per image which is described in step e) refers to the reproduction of a natural 3D-impact when using 10 images.

That means that there is a camera movement of 9 cm / 3.6" (approximately eye distance)

between 1st and 10th image.

If instead of 10 only 5 images are used, a camera movement of about 2 cm / 0.8" is required in order to get the eye distance 6-8 cm / 2.4-3.1" between the 1st and the 5th image.

If an object is photographed from different points in a circle, the camera objective has to be arranged towards the centre. A 3D portrait of a head with 20 single images is typical for that. The single images obtained by the circle camera movement have the same optical features like single images which are generated by object rotation with a fixed camera („rotation plate“, chapter 5.2), especially features such as distorted image edges.

The camera shifting can be enlarged to make the 3D effect stronger. That can even go so far that a village or a small town that is shot from a mountain looks like a "dolls house". This effect is called liliputism.

The following table serves as a guideline for the production of this "liliputism effect":

camera distance to the object	3D-image with 10 single images, shifting distance per image to obtain natural 3D-effect	3D-image with 10 single images, shifting distance per image for 3D "liliputism effect"
A	B	C
50 cm / 20"	1 cm / 0.4"	1 cm / 0.4"
1 m	1 cm / 0.4"	2 cm / 0.8"
5 m	1 cm / 0.4"	10 cm / 4"
10 m	1 cm / 0.4"	20 cm / 8"
50 m	1 cm / 0.4"	1 m
100 m	1 cm / 0.4"	2 m

The values of the camera movement per image in table column "C" should be regarded as maximum values. They presuppose that there is no disturbance in the foreground between camera and the remote object reference point. The camera shifting per image should be between the stated values of the table columns "B" and "C" depends on the 3D-effect one wants to obtain.

The contrary of liliputism is called gigantism. A lowering of the plastic impression is reached by reducing the distance of both camera positions. The depicted objects seem to be giant.

With normal camera shots, foreground, middle- and background are taken in order to produce image depth. With real 3D-images this can lead to optical irritation, make the following experiment: one keeps the index finger with a distance of about 40 cm / 16" in front of the face and looks with both eyes at the finger. The objects in the background seem to be doubled. If one closes one eye and leaves the other eye open, (this corresponds with the normal photography with one objective), the double images vanish in the background. If one looks with both eyes upon the background, then 2 fingers appear in the foreground. This double effect should be taken into consideration when composing a 3D-image. That's why it is recommended to shoot the main object only. No other objects should be visible in front of this. The background of the image should be discreet or not too far away from the main object. This can be obtained for instance by using non-depth focus or by shooting in front of a wall or an artificial wall.

If one notes the above mentioned rules a) and b), it has the effect that this point is the clearest one visible on the final 3D lenticular image. The point is situated directly on the image level. A corresponding anaglyph image would not show any color differences at this location.

The 3D-sitting room which is contained on the CD-ROM has been produced with a camera shifting of 3 cm / 1.2" per image.

The use of special stereo cameras (they have 2 objectives with about eye distance) to produce 3D-lenticular basic images is normally not possible or does not give any advantages. On the one hand, the above mentioned camera shifting of about 1 cm / 0.4" is not supported, on the other hand a stereo camera only supplies 2 images, but 5 up to 10 images are required. A stereo camera is suited for the production of anaglyph images.

With the method of camera shifting that is described above, only unmovable objects or scenes such as landscapes, houses, cars etc. can be shot. It is not possible with the described method to make a photo of a party with persons who move. The shot of portraits is possible though. For this it is necessary that the person to be photographed has a relaxed position and does not change this position throughout the shootings.

5.1.2 Use of a special camera (several lenses / NIMSLO)

The use of stereo-camera is useful to produce simple pairs of stereo images or anaglyph images. A very simple stereo camera is the Loreo camera (see the picture).



stereo camera "Loreo" with stereo-viewer

At least 4 images are necessary for the production of 3D lenticular images. Only a few special cameras have been developed for this purpose, but they are mostly used in professional fields.

The NIMSLO camera, which has been produced at the beginning of the 80s, has 4 lenses. 3D amateurs can also afford this camera because it is not very expensive. The NIMSLO (the name goes back to their inventors Dr. Jerry **Nims** and Allen Kowk Wah **Lo**) was developed to produce own 3D postcards. The development of the film and the production of 3D postcards were carried out in special labs though. The NIMSLO takes 4 images at the same time; on the negative each NIMSLO-single image is as big as a conventional half frame.



NIMSLO-camera with 4 lenses and movable double flash light

With the help of the software *3D-Easy SPACE* and lenticular cards, own NIMSLO-3D postcards can be produced without using special labs.

The following steps are necessary:

- 3D images are taken with the NIMSLO; use of normal 35mm color negative film (ISO 400 / 27 or ISO 100 / 21)
- development of the film in conventional photo laboratories
- images are digitalized from film
 - either by professional scanning; digital images are available on CD-ROM (e.g. Kodak photo-CD) or
 - film or images are scanned with normal home scanners with a built-in transparency cover (special slide scanners, also available for home users, reach very good results)
 - paper images of the photo lab are scanned
- digitalized images are processed with the software *3D Easy SPACE 5*



the 4 images of 1 shot are processed easily with *3D-Easy SPACE 5*

Several NIMSLO examples are saved in the folder `\IMAGES\LENSES\3D\NIMSLOxy\` of the *3D-Easy - CD-ROM*.

Besides the NIMSLO there are further special cameras with e.g. 3 lenses. There is also an alternative but expensive possibility: several conventional cameras can be used parallel (cascade). Stereo photographs use this method very often to represent objects (landscapes) in depth. Both cameras, which work synchronously, are arranged 50 cm from each other. The production of 3D images on the basis of a lenticular technique requires at least 4; better 6 or more cameras, which work parallel.

5.2 Production of 3D-images of small natural objects

The production of 3D-images of small objects, about the size smaller than 50 cm / 20", is carried out preferably with the method of object rotation.

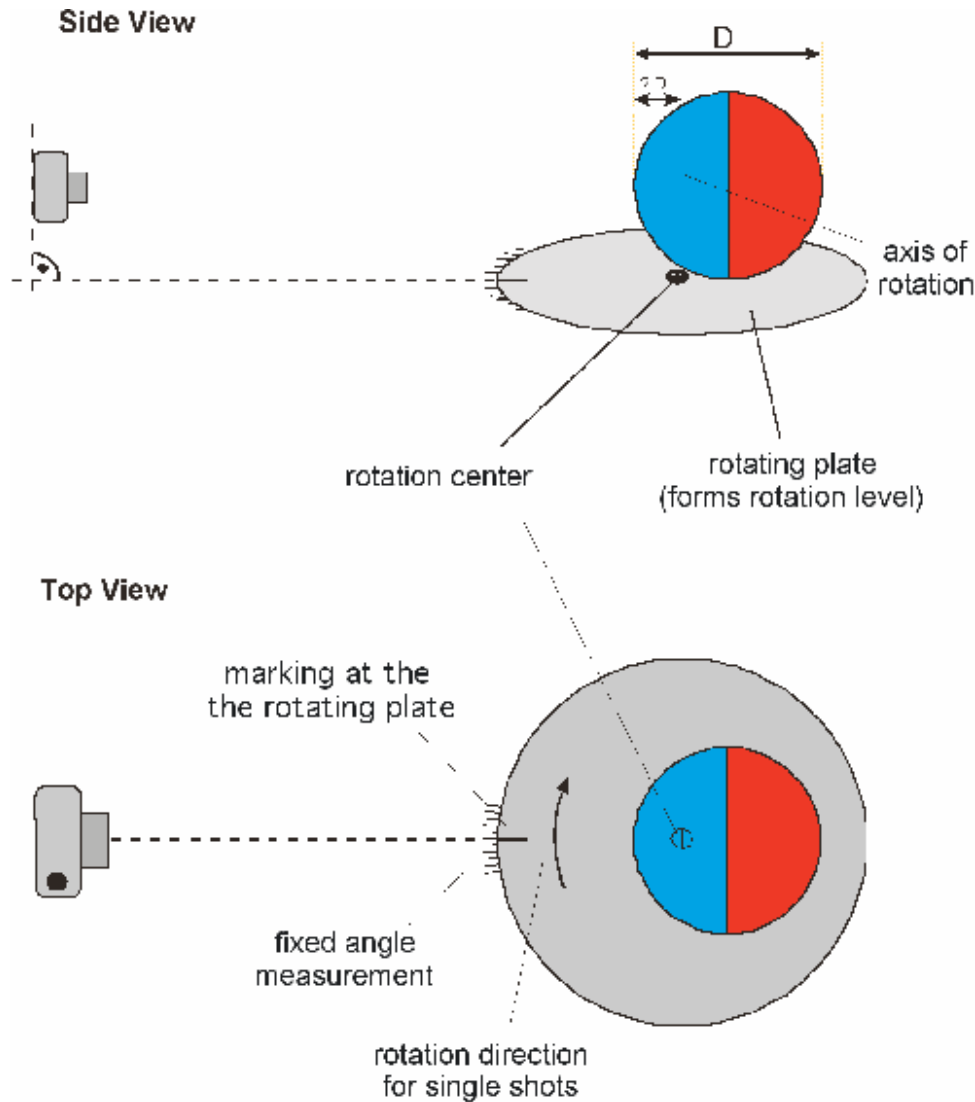
The following rules have to be taken into consideration when using object rotation:

- the object which has to be photographed is slightly rotated with the help of a rotating plate; parts of the object which have to be photographed are above the rotation centre of the rotating plate
- the camera is fixed at one point out of the rotating plate
- camera direction and rotation level of the rotating plate run parallel
- a distance of 50 cm / 20" supplies good results in most cases; the camera distance should be the distance of at least one "object size", there can also be a larger distance to the object which is compensated by use of a zoom objective (zoom function); macro shootings of only a few mm - cm / inch distance are also possible
- if there is a 3D-image consisting of 10 single images, a rotation of the rotating plate of about 1° per image is to be carried out in order to reach a rotation angle of about 9° between first and tenth image
- the rotation direction of the rotating plate is carried out clockwise seen from the top
- the object or the scene should be 1/4 in front of the rotation centre; the rest of the scene is behind it
- the camera direction is aligned on the axis of rotation of the rotating plate
- all object points along this rotation axis are directly on the image level; a corresponding anaglyph image would not show any color differences at this place
- perfect lighting means that the light sources are fixed on the rotating plate and that the light sources rotate together with the plate; if there is good diffuse object lighting, the lighting can also be fixed outside of the rotating plate
- the use of a camera flash is also allowed if reflexes and shadows in the image are not visible or not disturbing
- the fixation of an artificial background, which is situated on the plate, is recommended.



Use of the rotation principle

These photos were made with an ordinary digital camera with makro function with the help of the rotation plate.

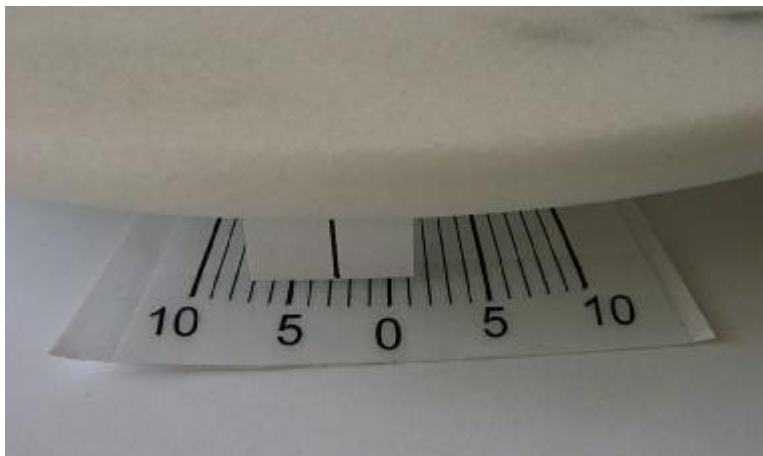


How you can build your own rotating plate:

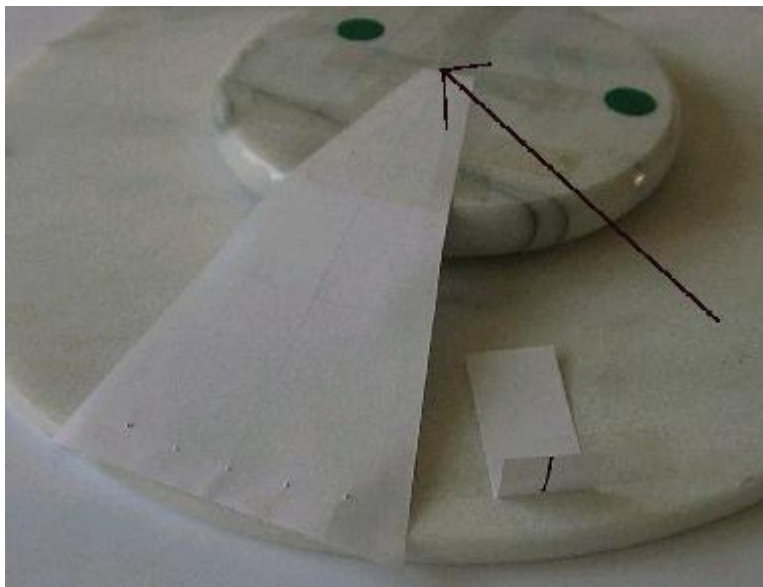
- use a plate which can be bought in shops (such as rotating plates for big cakes)
- about 30 cm / 12" diameter, good ball bearing, only a few vertical vibrations when rotating
- determine marking of the centre of the rotating plate, start rotating the plate and while the plate rotates put a marking in an "estimated" centre; middle point of the little circle which has developed is rotation centre of the rotating plate
- build fixed angle measurements with a graduation at the bottom of the plate
- build a marking technique at the rotating plate, which rotates together with the plate



rotating plate (arrow shows towards the rotation centre of the rotating plate)



unmovable angle measurement, marking rotates with the plate



backside of the rotating plate (arrow shows towards the rotation centre of the rotating plate, it is apex of the angle measurement at the same time)



position of the object, which is to be photographed (arrow shows towards the rotation centre of the rotating plate)



Perfect lighting

The source of lighting is fixed at the rotating plate. Object and lighting must always have the same angle during all single shootings.

Fixation of the rotating plate

In case the rotating plate cannot be fixed at the exact position (the rotating plate rotates a little bit), the following tip will help: a piece of cloth is put between the rotating edge of the plate and the table. The piece of cloth has the effect of a permanent retardant.

macro shootings

If the camera has to be very near the object when having macro shootings and thus the camera has to be just above the rotating plate, the following appliance will help: a small pad (e.g. books) is built on the left and on the right just beside the rotating plate. A board is put on this pad, on which the camera is placed. In no case should the object be shifted towards the edge of the rotating plate and outside the rotation centre. The reference point of small objects should be exactly above the rotation centre of the rotating plate, which means above the axis of rotation.

shootings from the front, from above and inclined above

The camera, or more precisely, the middle point of the objective, should have the height of the object centre and the camera direction should run parallel towards the rotation level. In order to photograph an object from above or inclined above, the **object** itself on the rotating plate **has to be turned on the same position** until the desired view direction is reached. **The camera remains on its fixed original position and direction.**

In no case should the camera be focused from inclined above towards the rotating plate.

If so, the images would be optically distorted when composing the single images to a 3D lenticular image, although the single images itself are completely correct. The distortion of the final image results in non-parallel rotation level and directional view. This method is not recommended due to the mentioned reasons.

The effect of gigantism is reached with the described procedure of object rotation. The photographed objects seem to be too big. But this is the only way to photograph small objects in depths. Gigantism is closely connected with 3D-macrophotography.

5.3 Production of artificial 3D-worlds (not part of the software)

The Production of artificial 3D worlds is possible with the use of 3D graphic programs. The artificial worlds are treated as internal three-dimensional objects. Lots of influences (such as lighting but also camera position and camera direction) have an influence on the image that is calculated by computer. Artificial 3D image series can be produced artificially if the virtual camera position and its direction are changed. The “snowman parade”, which is contained, on the CD-ROM is an example for artificial calculated 3D scenes. In general, all 3D computer programs can be used for this purpose. They must have the following characteristics:

- the program must be able to calculate (central) perspective images; most 3D-programs fulfil these requirements
- the camera movement must be well supported; small exact changes of positions and directions of up to 10 single images are required
- the single images must be saved into files; in case a direct saving of single images or the making of a screenshot is not possible, photographing the content of the screen can then provide this premise

The already mentioned “snowman parade” had been calculated with the help of the program POV, a Ray-Tracing program that is free of charge.

The use of other special 3D-programs such as garden planner, flat planner, 3D maps of the worlds, programs for astronomy or even 3D computer games are also possible if the abovementioned characteristics will be fulfilled.

All these statements, which are described in chapter 5.2, chapter "shootings from the front, above and inclined above" have to be taken into consideration when producing 3D worlds by the computer. The parallelism of the view direction and rotation level of the scene or the camera movement must not be changed. This can be reached if the camera height and the height of the camera aim (=object reference point) are identical with all "shootings".

Moreover, 3D effects can be obtained when conventional 2D images are shifted to the front or backwards. A 2D basic image is copied in all 10 single images. It has to be paid attention that the 2D basic image is saved at the same vertical position (y-value is the same for all images).

The 2D basic image has to be shifted from single image to single image by only a few pixels but always the same amount of pixels to the left or to the right. Due to this the 2D image can be shifted in the 3D space backwards and towards the front. The result can be checked by the anaglyph method. The single images that have to be obtained this way can be complemented with the described method of further 2D basic images. With this method, one gets a 3D image, which contains different plain 2D images with different space depth. This principle can be applied on already produced "real" 3D images in order to integrate e.g. text information additionally. The single images can be processed to a 3D lenticular image with the program *3D-Easy SPACE 5*.

5.4 The 2D - 3D conversion (not part of the software)

A 2D - 3D conversion is a technique to produce 3D images out of normal photos, drawings and paintings. The 2D basic image has already an effect of depth. Apart from some exceptions (such as the image of a plane object), each photography or painting has a depth (perspective depiction and/or depth of focus). It is the experience of the people, especially the knowledge of the proportions of different objects that leads to a depth also with a 2D image. Therefore, it is not possible to carry out a fully automated 2D - 3D conversion of an image. A 2D - 3D conversion is realizable with high manual efforts and the use of graphic software with layer function. One of the difficulties with this 2D - 3D conversion is that with the production of further images different (theoretical) camera positions has to be taken into consideration. Parts of an image, which have been covered before are now visible and must be visualized. Due to this reason, there is always a bit “imagination” necessary. The project „Astronomer“ on the CD *3D-Easy SPACE* is an example for the realisation of a very good 2D - 3D conversion, even 7 images were generated. The single images have been made available by courtesy of Bernardo Galmarini from Argentina.



2D/3D-conversion of the painting "Astronomer"

The single images, which have been produced with 2D - 3D conversion, can be processed with the help of the program *3D Easy SPACE 5*. The software *3D Easy SPACE 5* does not support the 2D - 3D conversion though.

5.5 Production of anaglyph images and stereo images

The production of basic images for the anaglyphic method and the production of stereo lenticular images can be regarded as a special case in terms of the production of about 10 single images for the 3D-lenticular procedure. In fact, any 2 images can be selected out of the 10 single images for the 3D lenticular procedure, out of which an anaglyph image or a pair of stereo-images are produced. There are different depth impacts of the room, which depend on what kind of images is selected. Due to these mentioned reasons, the statements in chapters 5.1, 5.2 and 5.3. on how to produce own images are also applicable on the anaglyph method. In this case only 2 images are produced though.

Real anaglyphic images require a camera movement of about 2.3 - 3.2" / 60-80 mm (is eye distance). With more remote objects, a parallel view direction should be selected, with near objects, the camera has to be aligned on a mutual reference point. Fast and good results are obtained with stereo cameras, which have been mentioned earlier.

Impressive anaglyph images can be obtained with very big camera distances (basis width) and big objects such as clouds or mountains, which have been photographed out of a plane in short time intervals.

5.6 Production of lenticular animations

The 3D lenticular technique is a good method to produce simple animations without further devices. Concerning the lenticular technique, one can find very often categories such as flip, zoom, morphing, animation and 3D. There are also other criteria's, which can be defined such as:

- 3D
- flip
- animation with the subcategories
 - change of position / change of direction of object or camera (e.g. starting rocket or moving camera)
 - change of form (e.g. quick-motion camera of an blossoming plant bud)
 - change of color (e.g. color-fractal-animation)
 - change of characteristics of the objective (e.g. zoom function of the lens)

With this, the term animation in its general meaning is applied to any change of condition.

The kinds of animation often occur in mixed form, e.g. if one wants to depict how an car engine works or a morphing animation, from which form and color of an object change gradually in another object. The use of the layer-technique (image levels) on a lenticular animation is possible as well. Different map material (topographic maps and political maps, images of satellites etc.) of a region can be processed into a lenticular map. The depiction of objects concerning chronological aspects (e.g. day times or seasons) also belongs to the category animation.

The above-mentioned categorization variants represent at the same time all possible uses of animated lenticulars. When producing basic images, the limits of the lenticular technique have to be taken into consideration. The limit to only a few single images and the lowered contrast compared to conventional images belong to this fact.

Basic images for the program *3D-Easy SPACE 5* can be provided via scanning of printed images, video grabbing, direct image import of digital image sources or the calculation / providing of images with the help of other software.

After the images have been provided, they can be processed via the program *3D-Easy SPACE* to a lenticular animation.

The software *3D-Easy SPACE* produces lenticular-animations with horizontal image stripes. In special cases (big lenticular projects with big distances between viewer and lenticular image) it is useful that the animations change if the viewer passes by (vertical image stripes). The special lenticular animation with the option „3D“ in tab control „Lenticular Options“ has to be generated.

5.7 Production of lenticular flips

Usually 2 up to 4 single images are used when producing flips.

Flips can be roughly divided into the following 2 categories:

- depiction of completely **different images**, such as
 - single portraits of a family including changing fonts
 - a table to exchange money
 - depiction of technical devices (normal and sectional view)
- **a shorter** depiction of an **animation** (see chapter 5.6), e.g.
 - wink with the eye, in turn eye open and close or
 - all before after or reason/effect-situations.

Portraits of members of a family can be scanned and then be processed into a "family flip" with the software *3D-Easy SPACE*.

The software *3D-Easy SPACE* produces lenticular-flips with horizontal image stripes. In special cases (big lenticular projects with big distances between viewer and lenticular image) it is good that single images alternate when passing by (vertical image stripes). The lenticular flip has to be generated with the option „3D“ in the tab control „Lenticular Options“.

6 Questions and answers

6.1 Questions and answers to anaglyphs

Can I use anaglyph glasses when already wearing prescription glasses?

Yes, people who wear prescription glasses can use anaglyph glasses as well. Anaglyph glasses are worn in front of the prescription glasses.

Does the anaglyph technique work only on the monitor or also on printed material?

The anaglyph technique works with both screen and printed material.

What does anaglyph mean and how does it work?

You can find detailed information regarding anaglyph procedures in chapters 3.1 and 5.5 in the manual.

Can those who are color-blind see a stereoscopic effect on anaglyphs?

Yes, because the color filter first “sorts out” the corresponding image parts independent of human view and only then these filtered image parts are seen.

What is ColorCode-3D™?

ColorCode 3-D is a patented Danish state-of-the-art 3D Stereo system. This technology has the following features:

- Full color reproduction
- Excellent 3-D reproduction (depth impression)
- Very low or no “ghosting”
- The ColorCode 3-D image looks almost like an ordinary 2D image
- ColorCode 3-D works with all computer displays, digital projectors and printers
- All conventional 3-D Stereo material on digital form can be ColorCode 3-D encoded, such as stereo pairs (Left and Right image) based on photographs and computer graphics etc.
- The only accessory required is a ColorCodeViewer™ (ColorCode 3-D glasses).

Is a yellow-blue anaglyph the same as ColorCode-3D?

No, the yellow-blue Anaglyph has a lot of limitations compared with ColorCode 3-D. If a 3-D Stereo image contains saturated red, yellow and green objects the yellow-blue anaglyph will only show very little or no 3-D effect. Further the yellow-blue anaglyph will generally have a lot more chromatic ghosting than a ColorCode 3-D image and a lot of sheen colors. Finally ColorCode 3-D will reproduce cleaner colors than a yellow-blue Anaglyph. A complex patented color correction and encoding algorithm in combination with the special designed and patented filters in the ColorCodeViewer delivers the described advantages.

How to produce a ColorCode 3-D image?

A ColorCode 3-D image can be produced in one of two ways:

- Either by using the ColorCode 3-D CS Plus™ or CX Pro™ encoding algorithm
- *3D-Easy SPACE Standard and Professional* has the ColorCode 3-D CS Plus™ Dual encoding algorithm built-in.

How to view a ColorCode-3D image (ColorCodeStereogram)?

To view a ColorCode 3-D image you will need a ColorCodeViewer.

Is the ColorCode-3D system used anywhere else apart from 3D-Easy SPACE?

Yes, ColorCode 3-D is in use in the following software and areas:

- Cult3D™ Designer 3.5
Interactive 3-D Stereo Objects for the Web - by Cycore.
- Stereo On Screen
Program to present Full-screen Cult3D™ Objects in ColorCode 3-D - by Declic3D.
- Easyviz™
Medical 3-D Stereo Visualisation - by Medical Insight.
- VisuAll™ Tool-set, Stereo & Phantom
Hardware Accelerated Real-time 3-D Stereo Visualisation & VR - by Digital Arts & ColorCode 3-D Center.
- ColorCodeEncoder™ SDK
Hardware Accelerated Edition of the ColorCode 3-D encoding - by ColorCode 3-D Center & Digital Arts.
- ColorCodeEncoder™ SDK
hardware accelerated edition of the ColorCode 3-D Encoding - from ColorCode 3-D Center & Digital Arts.
- ColorCodePlayer™
Player for 3-D DVD's, MPEG2 and AVI files made for Shutter Glasses – Interlaced (Interleaved, Field Sequential) and Side By Side - to be viewed in ColorCode 3-D format on PC and Screen - by ColorCode 3-D Center.
- ColorCode 3-D Large Format films (IMAX):
Encounter In the Third Dimension (3D Mania), SOS Planet and Misadventures in 3D – by nWave Pictures / Adventures in Animation 3D by WGBH Enterprises.
- ColorCode 3-D DVD's
A series of 3-D DVD's made for nWave Pictures / Escapi.

There are sold far beyond 3 million ColorCodeViewers world-wide at this time.

Is it possible to use, publish and release ColorCode-3D-images produced with 3D-Easy SPACE free of charge?

Yes, the ColorCode-3D images processed with *3D-Easy SPACE* can be used privately and commercially without any restrictions. However, you will have to make sure that you have the right to use the image(s) you are processing (copyright). The use of the ColorCode-3D trademark and logo is strictly forbidden unless you have a written permission from ColorCode-3D Center, Denmark.

6.2 Questions and answers to the lenticular technique

Which specific steps are necessary to produce a 3D lenticular image?

1. load images in the program *3D-Easy SPACE*
2. calculate the lenticular image
3. print the image
4. put the lenticular card over the image and fix it. Ready.

Step by step instructions are explained in great detail in chapter 3 of the manual.

The different methods on how to fix lenticular cards on a printed image are explained in chapter 4. Chapter 5 gives you extensive information regarding how to produce basic images.

The lenticular card has a smooth and a structured surface. Which side has to be turned towards the printed image, which side has to be turned to the viewer?

The structured surface, this is the lenticular, has to be turned towards the viewer, the smooth surface contacts the printed image.

How can the lenticular card and the printed image be fixed exactly?

There is a detailed instruction manual in Chapter 2.15 of the manual.

Why is it necessary to take e.g. 10 images instead of the usual 2 basic images when applying the 3D lenticular technique?

Both eyes look at the lenticular with different angles. Also, because of the distance of the eyes which is different and individual and because of the flexible view on the 3D-image (distance and angle). Therefore, 10 different basic images guarantee that you will always see at least 2 different basic images, even if you move your head or if you move the lenticular card. If you have 3D lenticular images with only 2 basic images, e.g. an anaglyphic image, the lenticular card has to be looked at from a certain angle and distance to obtain an 3D effect. In case you have different angles or viewer positions, the basic images can even be exchanged. As a result, you would not have a 3D effect.

Do the lenticulars have to run horizontal or vertical?

This depends on how you want to use it. The lenses run horizontal with flip images and animations. The single images can be seen if you tilt the lenticular card over to the front or to the back.

The lenticulars run vertical on 3D images. The left eye looks with a different angle on the lenticular card compared to the right eye. Both eyes see different stripes of the 10 single images.

Are there any differences with the lenticular material?

Yes, there are differences. Lenticular material differs concerning material, lens density and view angle.

Can I save the new produced lenticular image as a JPEG-image?

We advise you against doing that. The use of JPEG lowers the needed saving space on the computer but distorts the image. JPEG belongs to the so-called compressions with losses of information. In fact, the losses of images are low but if you use a lenticular, each single detail is important.

Basically, all graphic file formats that do not cause image losses while saving/compressing can be used such as Windows BMP-format. JPEG can be used though when loading single basic images.

Is it true that a 3D effect rises if the number of single images rises as well at the same moment?

No, that is not true. There are different series of single images and they depend on the view angle of the lens and on the distance between eye and lenticular cards.

The rise of the number of single images has a positive effect on the general impression though because picture jumps between single images can be reduced when moving the picture.

Can I print the lenticular card directly?

There are several reasons against printing at home:

- it is not possible to position the lenticular card exactly without any shift or distortion before and after the print process
- the ink of the normal ink jet printers are not suitable to print on films
- lenticular material is very rigid and therefore, when trying to bend it could damage the printer

Even if lenticular material is used which has a special film on the back side and can be bent easily, there is still the above mentioned problem to position it correctly.

Lenticular material can be printed directly when using professional print machines.

Is the production of lenticular cards a new invention?

No, first works started in 1896. The lenticular technique was further developed in the middle of the 20th century especially by the Frenchman Maurice Bonnet.

With the improvement of the technical possibilities and the lowering of the production costs, 3D postcards in bigger amounts were produced in the 50s and especially in the 60s of the 20th century. But since some years home equipment such as computers and printers have attained the efficiency and precision to produce lenticular prints.

How can I produce my own 3D-images?

3D-images can be produced by even and constant shifting of the camera and also by the use of a rotating plate. Another 3D-source is artificially produced images, e.g. the use of 3D graphic programs (e.g. POV-Ray) or screenshots of 3D computer games. Furthermore, 3D effects can be reached when 2D-images are shifted in 3D space (e.g. a flat photo or text information in front of 3D-backgroundimages). The single images out of a short film taken by the camcorder are usable as well.

Chapter 5 of the manual contains detailed information to this topic.

Where can I buy lenticular cards?

Lenticular cards and other 3D products can be purchased in the *3D-Easy - WebShop*. You can find more and present information on the *3D-Easy - Homepage* under www.3D-EASY.de.

Are there any differences between conventional 3D images and 3D lenticular images concerning the 3D camera perspective?

There are only a few differences: The theoretical distance between both eyes should be

extended (about factor 1.2...2) because normally the viewer is not able to see both outer images (image stripes) at the same time. On the other side, the images should be photographed and aligned the way that the object is mainly behind the image surface. There is detailed information to this topic in chapter 5 of the manual.

6.3 Questions and answers to the software *3D-Easy SPACE*

What does "EASY" mean?

Easy means without great difficulty or effort. This is exactly the aim of the product: The *3D-Easy Complete Kit*, especially the corresponding software *3D-Easy SPACE*, does not require any special 3D or computer knowledge or any other special knowledge. You will have fast success because the program is easy to use and clearly structured. Moreover, it contains detailed documentations and has examples of images on the CD-ROM. All necessary items are contained in the *3D-Easy Complete Kit*. The program *3D-Easy SPACE* does not require any additional graphic software.

Does the software *3D-Easy SPACE* run on a MAC or LINUX?

At the moment, there are no special program versions which run on MAC or LINUX. However, using Windows and other operating systems, *3D-Easy SPACE* can be used with an emulation software / virtualisation software.

Is *3D-Easy SPACE* able to stretch my basic images so that I can print certain sizes of an image?

Yes, this is exactly the "Easy"-principle: The stretching of lenticular images is carried out according to the size of the printed image the user wants to have.

Especially with scanning images manually it happens very often that single images differ slightly concerning their pixel sizes. Do all single images have to have the same pixel measurements?

No, *3D-Easy SPACE* accepts different pixel sizes in version 2 to avoid time-consuming corrections.

What does dpi and lpi mean?

The abbreviation dpi (=dot per inch) characterizes the resolution of the printer and indicates how many dots can be printed within one inch (1 inch = 2.54 cm). Normal dpi-values are 600, 720 or 1200.

The abbreviation lpi (=lens per inch) indicates the lens density of the lenticular material that means how many lenses should be contained within one inch. We use 30 lpi, 40 lpi and 75 lpi lenticular cards.

Is there a network version of the *3D-Easy SPACE*?

No, *3D-Easy SPACE* is a stand-alone program but can be used in the local area network. Please note that the purchase of a license only permits the use of the program on one computer at a certain time. You can find further copyright information in chapter 8 of the manual.

The given value for the print border or the size of the image is different compared with the printed image. What can be done?

A given value for the print border or the size of the image is only used when the corresponding input field has been left by ENTER, the tabulator key or a mouse click outside the input field.

Close all changed values for instance with the ENTER button.

The image is printed only partly or it contains obviously faulty stripes? What can be done?

The reason for the uncompleted image prints is mainly the lack of memory capacity of the printer. That's why this problem can often only be solved by increasing the memory capacity of the printer. The printing resolution can be reduced alternatively. This means that less single images are allowed to be selected for the processing.

The manual of the printer should contain more information for this kind of faulty situation. With certain configuration measures, the described faulty situation can possibly be avoided.

What kind of printing resolution is necessary?

Our tests have shown that remarkable results can be achieved from a 600 dpi printing resolution. If the lenticular widths is relatively big, such as 30 lenses per inch and if approximately 5 images are processed, you can get really good results with a 300 dpi-printer as well. Due to our special software methods you can always produce impressive 3D images with normal home printers.

Can I use my black/white printer?

Partly. For printing anaglyph images, there must be a color printer available. But the lenticular technique also works with black/white prints. Stereo images (side by side or top down) can be printed in black/white.

How can I fix the printed-paper on the lenticular cards?

The different methods on how to fix the lenticular card on the printed image are described in great detail in chapter 4 in the manual.

How can I find out the printing resolution of my printer?

First, you should look for the printing resolution (mostly indicated in dpi=dot per inch) in your printer manual. The program *3D-Easy SPACE* prints the current used printing resolution as additional information at the bottom of the printed image. For this, you must check the check box "Print Info" in the program *3D-Easy SPACE*.

Please note that most printers can be changed in printing options. Please select the highest possible resolution when printing.

Why does the printing resolution (dpi) not fit, which is determined by *3D-Easy SPACE*, with the values from the Windows printer dialog?

3D-Easy SPACE determines the dpi-values over functions of the operating system. Very often very high dpi-values are accepted in special printer driver dialog, which lead to inner printing optimization. *3D-Easy SPACE* does not get this information.

Why do originate lenticular images differ in size with different pixel measures on different PCs sometimes?

Normally, the same source conditions always lead to the same results, in particular to identical lenticular images with the same pixel dimensions.

Different lenticular images with different pixel dimensions can only originate, if the option "Auto" of the lenticular print optimization is active (option available in version 4 or higher).

The option "Auto" takes into consideration the current printer options and leads to printer optimized pixel resolutions. A printer change or a change of its characteristics (printer resolution) can lead to lenticular image files different in size although the source conditions are the same.

How can I get the best results?

You already have good chances of success with our software *3D-Easy SPACE* and the lenticular cards distributed by *New Art Illusion*. However, the following has to be taken into consideration:

- use a printer with the highest possible printing resolution
- use print paper with a high resolution, do not use normal print paper
- try to avoid empty spaces between prints and lenticular material

What can I do if the program does not give any useful results?

Please carry out the following steps in this order:

- carry out the example projects on the basis of the step by step instructions which are shown in chapter 3 of the manual
- check if the highest possible printing resolution has been selected (printing options)
- check if printing paper of high quality and high resolution has been used (do not use normal paper)
- the calibration (pitch test) which is contained in the program *3D-Easy SPACE* should be carried out with lenticular images
- enabling of integrated image optimization when you print lenticular pictures
- check if the printed lenticular image has the right position beneath the lenticular card (lenticular (structured surface) upwards to the viewer)
- press the lenticular card on the paper firmly, try to avoid empty spaces, see also chapter 4.0
- check if alignment stripes left or on the top run parallel to the lenticular, afterwards parallel movement to receive the best optical impression, see also chapter 2.15

If you are not satisfied with the result after having carried out the described steps, please carry out the following steps:

- reduce the amount of basic images gradually, see also chapter 3.4.2
- try the different lenticulars with the corresponding prints.

If you still could not obtain satisfying results with the examples of images although you have taken all the above-mentioned measures into consideration, please contact our hotline, which is free of charge (email: hotline@3D-EASY.de). Please give us all the information that is shown under the image as a result of the activation of additional print information (see chapter 2.14).

I see a Moiré-effect (disturbing patterns) on the lenticular. What can be done?

Moiré-effects can arise when printing resolution and lenticular have the same resolution (or rather multiple integer). In this case:

- change the printing resolution and/or
- use a different lenticular and/or
- please change the number of images to be processed (e.g. 9 instead of 10 images)

When using laser printers Moiré-effects occur more often, but using an ink jet printer will cause this effect to be reduced.

Why does 3D-Easy SPACE runs differently fast on PCs which have a similar performance?

The described reaction can occur with viruses protection programs with permanent monitoring, especially with frequent writing operations and reading operations of the hard disk.

An activated viruses protection function can lower the original speed under certain circumstances on up to 30%. If ever, the virus protection should only be switched off

occasionally during the calculations. In this time, no further programs should be started due to security-technical reasons. It is not recommended to switch off the virus protection permanently.

6.4 Questions and answers to the *3D-Easy - 1-Click-Auto-Alignment*

What is the aim of the function "*3D-Easy - 1-Click-Auto-Alignment*"?

The aim is the complete and full automatic correction (shift, rotation, scaling) of 3D source images in order to reduce vertical deviations in the middle of the images which have to be aligned. Furthermore, there is also a reduction of the horizontal deviation.

The *3D-Easy - 1-Click-Auto-Alignment* aligns source images with high accuracy, without any further manual user settings. A manual alignment of the source images, which is demanding in time and requires a certain expertise, is no longer necessary with *3D-Easy - 1-Click-Auto-Alignment*. The results of the *3D-Easy - 1-Click-Auto-Alignment* are usually much better than those which were aligned manually.

Due to the reduction of the horizontal deviation, the position of the 3D window is located in the middle of the depicted scene. The position of the 3D window can be simply adjusted with the possibilities of the manual alignment in *3D -Easy SPACE* (here horizontal shift by 3D-serial shift or with reference points and operated option „only horizontal shift“).

What are the special features of the new function "*3D-Easy - 1-Click-Auto-Alignment*"?

The *3D-Easy - 1-Click-Auto-Alignment* is a very powerful function to auto align 3D lenticular source images (normally at least 4). *3D-Easy SPACE* is the first and only lenticular software worldwide with such an auto alignment. The *3D-Easy - 1-Click-Auto-Alignment* can also be used for the perfect auto alignment of 3D stereo images pairs.

Further special features:

- no use/installation of additional software, driver, plug ins etc. are necessary
- all functions are contained in the program *3D-Easy SPACE* (Standard or Professional)
- if desired, there is a pixel detailed pre -and post alignment possible under the graphic user interface of the program
- the results obtained just after the automatic correction can be estimated very well by the animated preview
- the processing of very large images is supported (e.g. larger than 10.000 x 10.000 pixel per image)

During the shift, there are „non-integer pixel values“ after having used "*3D-Easy - 1-Click-Auto-Alignment*". Do „non-integer“ pixel shifts make any sense, e.g. 3, 4 pixel to the left?

Pixels are the smallest picture elements and cannot be split up any further. „Non-integer“ pixel shifts are useful in following situations:

- with shifts only (without rotation and scaling), „non-integer“ pixel shifts are applied with bicubic interpolations because the „neighboring“ pixels are considered in the calculation
- „non-integer“ pixel shifts are applied in combination with rotation and / or scaling with the method „next neighbor“ as well as with „bicubic interpolation“.

There are „non-integer“ pixel shifts or sub-pixels in version 5 of the software

3D-Easy SPACE with the introduction of the function *3D-Easy - 1-Click-Auto-Alignment* and "bicubic interpolation".

The values for „non-integer“ shifts are saved in the 3DE-project file.

What kind of images are not suitable for "*3D-Easy - 1-Click-Auto-Alignment*"?

Animations or flip images are not suitable for *3D-Easy - 1-Click-Auto-Alignment* because differences in images in vertical direction are wanted (e.g. rising blossom). This is the reason why images should not be aligned with *3D-Easy - 1-Click-Auto-Alignment*.

If the *3D-Easy - 1-Click-Auto-Alignment* cannot find an optimum, it will be shown with a "-" in the file list. Such cases occur if the image contents are not suitable for an automatic alignment (e.g. none or only a few striking points or if the image contents differ too much from each other).

6.5 Questions and answers to the 3D-EASY - WebShop

How does the 3D Easy - WebShop work?

You will be taken to our 3D-Easy - WebShop over our homepage www.3D-Easy.de . Select either the German or English language and then click the „shop“ button. Click again on „3D - Easy -WebShop“ to reach the pages of the 3D-Easy - WebShop. The internet connection for your purchase is safe.

The 3D-Easy – WebShop is in German and English language available.

Ordering works as follows: (last modified: July 2007):

- Click the button "Artikel - Products"
- Select a product group
- Click the item you wish to order. A detailed product description should appear.
- Click the button "In den Warenkorb / Add to basket“, the selected item/items will be placed in your basket
- You can see the current contents of your basket, all selected products and their prices are shown.
- Normally, only one product is placed into your basket, but you can purchase more items if you wish. To order more items, change the number of products and press the „Aktualisieren - Refresh“ button. Your new total, including shipping costs is now calculated.
- With the button „Fortsetzen / Buy more“ you can continue shopping (selection of further products)
- To place your order, press the button „Zur Kasse / Continue“.
- Then you must enter the address that the invoice or products should be shipped to. If your adress does not have „Straße / Street“ and „Nr. / No.“, please fill in the field „Nr.“ with *.
- On the next page, you can select your payment type. Maybe the payment „Pay on Delivery“ is not possible to the country you would like the goods to be shipped. You have to determine the way the goods should be delivered, it depends on the selected country. On the page „Versand - Shipment“ of the 3D-Easy - WebShop, you will find the countries and the possibilities of payments each country offers
- On the next page, you will get a summary of your order. If you agree with the General Terms of Business, you can submit your order by pressing the button „Bestellen / Ordering“. If you select „PayPal – Online“, you will be taken to Pay Pal’s website automatically and you will receive the necessary instructions.
- If your email-adress is correct, you will get a confirmation of your order via email after placing your order.
- The products will be sent out immediately. Shipping time is dependent upon the country where the product is to be shipped. For detailed information see the homepage of German Post/DHL. Products are shipped to foreign countries by air mail.

What types of payment are accepted?

There are three acceptable forms of payment:

1. Account transfer (advance payment)
2. PayPal – Online (pay with credit card via PAYPAL)
3. P.O.D. (Pay On Delivery; only possible in some countries)

If I experience difficulties when ordering in the 3D-Easy - WebShop and cannot place an order, what steps should I take?

Most online shops require Cookies. Cookies are small files which are saved from the internet server onto the hard disk. Cookies are essential to online shopping as they allow your basket to not be mixed up with another shopper's basket. Cookies are not viruses and are therefore not dangerous.

Cookies can be allowed or blocked by an option in the internet browser. To place an order, Cookies must be allowed on your computer. There are different options which depend on the version of your internet browser. After completing your order, you can block Cookies again.

Do I have to place an order via 3D-Easy - WebShop?

The internet connection to order products via *3D Easy - WebShop* is secure. All necessary information to place an order is available. This is the reason why the order should be carried out via *3D-Easy - WebShop*. If it is not possible to order in our *3D-Easy - WebShop* in certain cases, the order can also be sent to our email address (hotline@3D-EASY.de) or via fax. You should name the item/items to be purchased, the number of items, the address of invoice and delivery and type of payment.

7 Ordering possibilities

You can purchase an extensive range of 3D products in our *3D-Easy - Web Shop*:
***www.3D-EASY.de* ->Select Language -> Shop -> 3D-Easy - WebShop.**

If you have special requests such as:

- different measures of lenticular cards (e.g. 40 cm x 40 cm) or
- a discount if you would like to buy more (from 10 pieces of any article)

please contact us via email at the following address:

hotline@3D-EASY.de .

8 Copyright

© Copyright - *New Art Illusion*, 2007. All rights reserved.
Products can be changed any time without prior notice.

Trademarks

Windows is a trademark of Microsoft Corporation.

ColorCode 3-D, the ColorCode 3-D logo, ColorCode CS Plus and ColorCodeViewer are trademarks of ColorCode 3-D Center ApS, Denmark, used under license. All other trademarks or product names used in this manual are trademarks of the respective holders.

Text-copyright

Any copying of the manual including the tables and pictures either in full or partly is prohibited unless you have got a written permission from *New Art Illusion*.
This does not affect the right to quote.

Software-copyright

The versions of the program *3D-Easy SPACE* including all documentation and images is under copyright of *New Art Illusion*.

The user/purchaser/holder of the program is not allowed to disassemble / recompile or to trace the original program code or to change the program in any way.

The software *3D-Easy SPACE* is a standalone software. It may be used in a computer network, but only under the following conditions: At any given time only one copy of the program may be active, i.e. the program may not be used simultaneously on more than one computer. In cases where it is needed to run more than one copy of the software simultaneously the necessary licenses must be acquired. The software including all documentation and images may only be copied as a backup. Any production of copies, sale and passing on to third parties is prohibited.

The software must not be lent, borrowed, leased or rented to any third party.

The implemented ColorCode 3-D™ technology is protected by patents:

US Patent No. 6,687,003, AU Patent No. 763370 and EP 1131658.

Image-copyright

The example images on the CD can be used without any restrictions for private purposes.

Commercial use of these images is prohibited unless you have got a written permission from *New Art Illusion*.