

# Cine Film Image Cleaner (Version 4.3)



## Content:

- [Introduction](#)
  - [Prerequisites](#)
- [Installation and Invocation of Cine Film Image Cleaner](#)
- [General Remarks](#)
- [The Cine Film Image Cleaner Main Window](#)
  - [The Buttons to Control the Cleaning Process](#)
  - [The Area to Maintain the Cleaning Parameters](#)
  - [The Film Image and Analysis Pattern Presentation Canvases](#)
  - [The Lower Button Bar](#)
- [Workflow for Manually Controlled Cleaning](#)

## Introduction:

The **Cine Film Image Cleaner** eases the cleaning of the individual frames of a cine film that has been scanned with CineToVid from dust and dirt spots.

To do this, the program compares image pixels of consecutive frames of a cine film to detect significant differences in color and grey values. It creates an analysis pattern that has 4 different levels for 4 different cleaning levels.

Based on this analysis pattern the cleaning of special picture areas can be triggered by selecting the area to be corrected with the mouse. To clean the area, the pixels with heavy color differences are replaced by the pixels of the reference frame (source frame) that immediately precedes or alternatively immediately follows the frame to be cleaned. The cleaning level used for each area can be selected from the 4 previously defined cleaning levels.

In special cases the repair information can also be retrieved from the image to be cleaned itself. But this does not support different cleaning levels.

## Prerequisites

The **Cine Film Image Cleaner** is a Java Application. To run this application you need a SUN Java Virtual Machine (also called a Java Runtime Environment - JRE Version 1.5 or better) installed on your computer. You can download the SUN JRE for free from "<http://java.com/en/download/index.jsp>".

**Do not use the Microsoft VM. It does not support the required functions.**

To run the program a large computer screen should be available. Recommended is a screen with a resolution of **1280x1024 pixels** or more. The minimum resolution is 1024x768 pixels. For screens with a resolution from 1024x768 pixels or more, but lower than 1280x1024 pixels a slightly modified layout is used in order to show all needed information.

## Installation and Invocation of the Cine Film Image Cleaner

The **Cine Film Image Cleaner** is provided as a ZIP archive (together with **CineToVid** and the **Image Stabilizer** in the "**Super 8 Cine-Film to Video**" Suite). This archive contains the Java JAR files with the "Executable" and this help file with the required images.

To install the product simply unpack the archive to a directory of your choice (e.g. *D:/PROGRAMS/CineToVid*) with a standard unpacker like **WinZip** or **PowerArchiver**. If not already there, during unpacking, the **CineToVid** directory with all required subdirectories will be generated and loaded with the expanded files.

The Image Cleaner can be started as a tool out of the program "CineToVid".



In this case the JAR file must be located in the same directory as the JAR File of CineToVid. But the program can also be started as independent program.

To start the program as **independent program** you need to call the "JAVA" program provided by the Java Runtime Environment (JRE). The "JAVA" program (*java.exe*) is located in the "**bin**" subdirectory of the directory to which you have installed the JRE {normally called "jre.x.y.z" located in the "c:/programs" directory where "x.y.z" represents the version of the JRE (e.g. 1.5.0)}.

To start the program as **independent program** you have to enter the following commands into a command screen:

[ **Note:** in the provided example it is assumed, that the JRE is in "C:\Java\jdk1.6" and cinecleanerJAR.jar is in "D:\Programs\CineToVid" ] .

```
D: (to switch to drive D)
cd Programme (to switch to the user directory)
C:\Java\jre1.6\bin\java.exe -Xms128M -Xmx768M -jar D:\Programme\CineToVid\cinecleanerJAR.jar
```

Be sure to enter line 3 as ONE single line with no carriage return or line feed. Otherwise the command interpreter of your operating system gets a problem.

The parameters **-Xms128M** and **-Xmx768M** are required to allocate an appropriate amount of storage for the Java program (in this example the minimum amount of allocated storage is 128 MB, and the maximum amount of allocated storage is 768 MB). If not used, the program will run out of storage and you get a "not enough storage" exception from the JRE.

**CineToVid\cinecleanerJAR.jar** has to be provided exactly as specified here because Java is case sensitive.

To ease program invocation you can create a "**PicCleaner.bat**" file, or - if Pearl is installed on your machine - a "**PicClean.pl**" file (content see below, of course adjusted to your installation with respect to the used drives and directories).

```
@args = ("c:");
system (@args) == 0 or die "system @args failed: $?";
@args = ("cd c:\\Programme");
system (@args) == 0 or die "system @args failed: $?";
@args = ("k:\\Java\\jdk1.6\\bin\\java.exe", "-xms128M", "-xmx768M", "-jar", "C:\\Programme\\S8ToAVI\\cinecleanerJAR.jar");
system (@args) == 0 or die "system @args failed: $?"
```

## General Remarks:

Scanned Super 8 frames have to be blown up significantly to create a video. A factor of 40 for linear enlargement respectively a factor of 1600 for area enlargement (presented on a 17 inch screen) are normal.

Besides the picture of course also all dust and dirt spots on the film are enlarged in the same ratio. A bit of fluff which hardly can be seen by the bare eye will grow to a large black beam in the enlarged image. It is therefore essential to do the scanning in an environment that is as clean as possible. But whatever you do, it will be impossible to avoid dirt and dust completely. There always will be some dirt on the film, which will be recognized in a quite embarrassing manner during film projection because the human eye and brain has been trained since millions of years to recognize little and short movements (as which the dust spots appear when watching the film) very effectively.

Because it is impossible to eliminate all dust and fluff during the scanning process, it will be necessary (in order to create a technically good video) to remove remaining dirt spots manually from the movie frames. This can be a very time consuming task, because there is no programable algorithm, that can sufficiently well distinguish between dirt spots and valid picture elements. What is an easy task for the human brain (to recognize what is a dirt spot and what not), is an unsolvable problem for a computer program. Automatic cleaning of cine film frames therefore is (at least for the time being) almost impossible.

**Cine Film Picture Cleaner** was developed in order to make manually controlled cleaning of film frames as simple and as easy and by that as fast as possible.

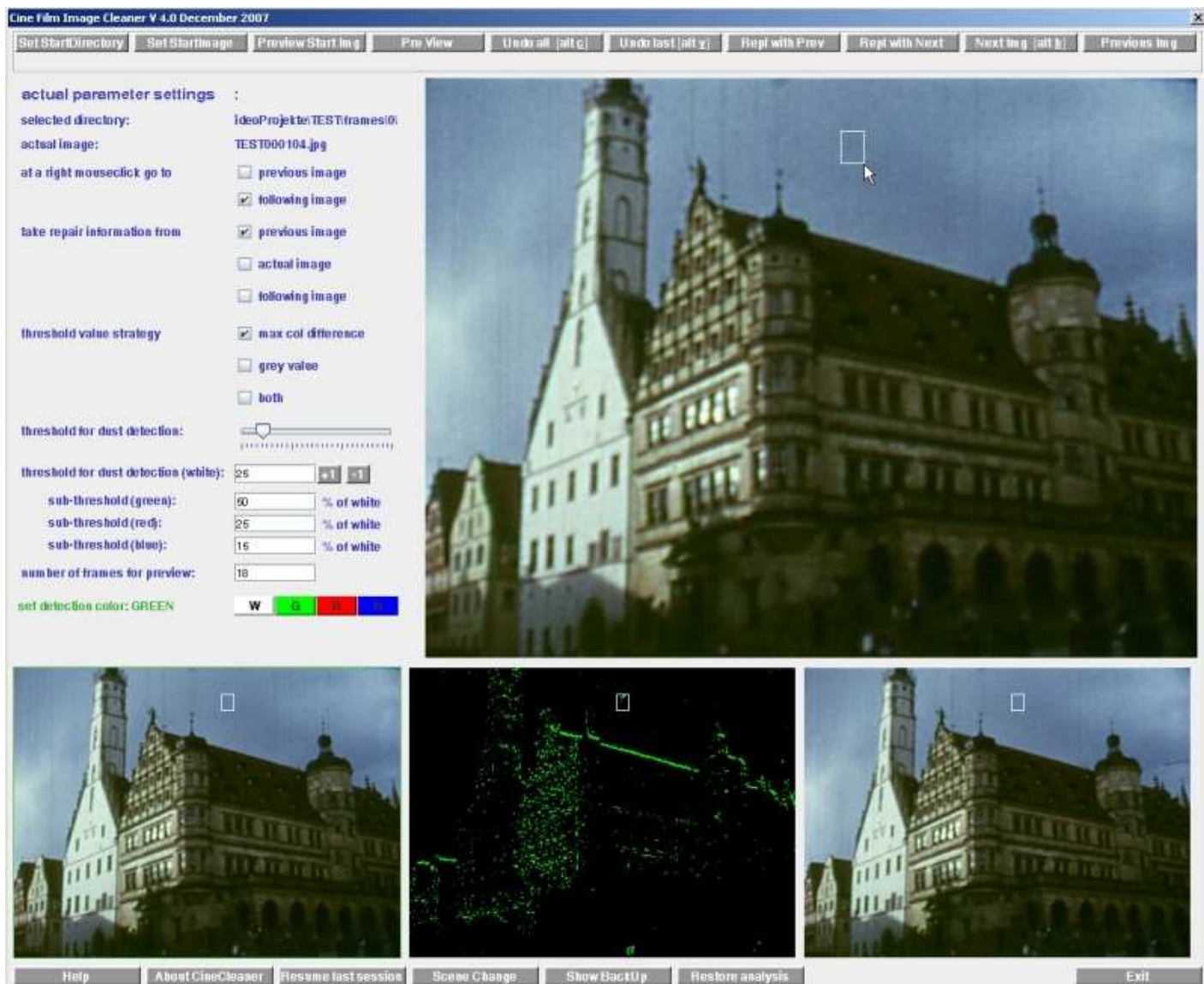
**Cine Film Picture Cleaner** always analysis the pixels at the same coordinates of three consecutive frames of a movie for havy deviations in the base colors (red, green, blue) or (alternatively) in their grey value. Prerequisite for this is, that the consecutive images are relatively similar, which is normally the case for movie frames. Exceptions are scene changes and areas with heavy movements or also scenes that are blurred ( e.g. for scenes taken without a tripod). The threshold values for the deviations that are not acceptable individually can be set for 4 cleaning levels.

The result of an analysis is presented as an analysis pattern. The 4 cleaning levels are represented by 4 colors (white, green, red, blue). White is the color for the most restrictive cleaning (narrow cleaning area, color deviations respectively grey value deviations are high). Blue represents the least restrictive cleaning (wide cleaning area, color deviations respectively grey value deviations are small). Green and red are in between.

With **Cine Film Image Cleaner** the mouse is used to select the area to be cleaned. This is done by dragging the mouse in the presented analysis pattern over the area to be cleaned. The selected cleaning level determines, which pixels are changed to the color of the pixel in the source frame and by that eliminates a visible dirt spot. Only those pixels are changed which have a color deviation bigger than the defined threshold value for the active cleaning level.

## The Cine Film Picture Cleaner Main Window

The **Cine Film Image Cleaner** main window controls the various actions required to clean cine film frames from visible fluff and dirt spots.



The window has several sections: the control button bars, the message line, the parameter maintenance area and the canvases to present the image to be cleaned, the reference images and the analysis pattern.

## The Buttons to Control the Cleaning Process

The **Cine Film Image Cleaner** is designed to perform and control the cleaning process almost completely with the mouse. But to prepare the cleaning process and to handle some special cases several cleaning parameters have to be set or changed. This is controlled primarily via the control button bar. The bar comprises 10 buttons, that can be used to control the process in addition to the mouse.

### Set Start Directory

This button opens the operating specific file location dialog in order to select the directory that contains the images to be cleaned.

### Set Start Image

This button is used (via the file selection dialog) to determine the image, at which the cleaning process shall start.

### Preview Start Image

This button sets the first image of a preview. The preview start image is the image, that appears X frames before the actually presented image for cleaning. The value X is set via parameter field **number of frames for preview** located in the parameter maintenance area of the main window.

### Preview

This button starts a preview. A preview shows the selected number of frames in slow motion so that the cleaning result of this section can be verified.

#### **Undo all [Alt c]**

This button is used to reset all changes applied to the actually presented image. The image appears uncleaned again. This is of interest, if the cleaning attempt shows an unacceptable result. This function can also be invoked via the acceleration key combination *Alt c*.

#### **Undo last [Alt v]**

This button is used to reset the last change applied to the actually presented image. This is of interest, if this cleaning attempt shows an unacceptable result. This function can also be invoked via the acceleration key combination *Alt v*.

#### **Next Image [Alt b]**

This button is used to save the currently processed image and to present the next image in the directory. When an image is saved, the changes are made permanent, they cannot be reset again. This function can also be invoked via the acceleration key combination *Alt b*. A *click onto the right mouse button* also triggers this function.

#### **Previous Images**

This button is used to save the currently processed image and to present the preceding image in the directory. When an image is saved, the changes are made permanent, they cannot be reset again.

#### **Repl with Prev**

With this button the content of the currently processed image is replaced by the content of the **preceding** image. This function is of interest at positions, the film has been spliced or if an image is strongly blurred, extremely bright or extremely black e.g. due to the inertia of the aperture.

#### **Repl with Next (mit nachfolgendem Bild ersetzen)**

With this button the content of the currently processed image is replaced by the content of the **following** image. This function is of interest at positions, the film has been spliced or if an image is strongly blurred, extremely bright or extremely black e.g. due to the inertia of the aperture.

### **The area to maintain the cleaning parameters**

#### **Selected directory**

This field shows the full name (with path) of the library, that contains the images to be cleaned. This field is set, as soon as the directory has been determined via button **Set Start Directory**.

#### **Actual image**

This field shows the name of the currently processed image.

#### **At a right mouse click got to**

Via these checkboxes it is determined, in which direction the cleaning proceeds if controlled by the mouse. If "**previous image**" is selected, than a click onto the right mouse button will save the actual image and the image located before the actual image is presented. This results in a backwards cleaning process. If "**following image**" is selected, than a click onto the right mouse button will save the actual image and the image located after the actual image is presented. This results in a forward cleaning process. This is the default setting.

#### **Take repair information from**

Via these checkboxes it is determined, from which image (source image) the correction information will be taken.

If "**previous image**" is selected, the repair information is taken from the preceding image. This is the default setting, because the preceding image is normally already cleaned.

If "**actual image**" is selected, the repair information is taken from the actual image itself. This is a special case, which should be applied, if - caused by a hand movement or by a scene change shown in the film - neither the preceding nor the following image provides good repair information.

In this case the pixel color of the pixels at the rim of the marked area is dragged into the cleaning area. This functions sufficiently well, if the area to be cleaned is relatively homogeneous with respect to color and brightness and the area to be cleaned is relatively small.

If "**following image**" is selected, the repair information is taken from the following image.

**Threshold value strategy**

Via this checkmarks is determined, which threshold strategy shall be applied to the cleaning process. The following selections are available:

- **max color difference:** as comparison criteria the highest color difference between the 3 base colors (red, green, blue) of a pixel is used. Maximum of delta-red, delta-green, and delta-blue.
- **grey value:** as comparison criteria the gray value difference between a pixel is used.  $(\text{delta-red} + \text{delta-green} + \text{delta-blue}) / 3$ .
- **both:** as comparison criteria a combination of both strategies is used. For each pixel the strategy is used, that yields the largest difference.

**Threshold for dust detection**

Via this slider the highest allowed threshold value (for level white) can be set rapidly. Allowed values vary from 4 to 154. A reasonably good value for the *white threshold* is 24. This is a field for experimentation to find out, what in the actual situation is the best value for effective cleaning.

**Threshold for dust detection [white]**

This field shows the value, set via the slider. With button  and  the value can be fine adjusted.

**Sub-threshold [green]**

This field is used to set the threshold value for level **green**. The threshold is determined as a percentage of the *white level*. Default value 50 %.

**Sub-threshold [rot]**

This field is used to set the threshold value for level **red**. The threshold is determined as a percentage of the *white level*. Default value 25 %.

**Sub-threshold [blue]** (Stufenschwellwert [blau])

This field is used to set the threshold value for level **blue**. The threshold is determined as a percentage of the *white level*. Default value 15 %.

**Number of frames for preview**

This field is used to set the number of frames that shall be shown during a preview. Default is 18. That is the number of frames for 1 second film presentation in the Super 8 Standard.

**Set detection [analysis] color**

These 4 buttons are used to set the desired level for an actual cleaning. Pressing one of these button causes the presentation of the related analysis pattern, which gives an impression of the cleaning potential. A change in the level is possible at any moment, that means, different areas of an image can be cleaned with different levels. The darker a level color is (in the sequence white, green, red, blue), the more pixels will be involved in the cleaning process.

**The Film Image and Analysis Pattern Presentation Canvases**

The main window of the **Cine Film Image Cleaner** program comprises 4 canvases, 3 for film images and one for the analysis pattern.

The **image to be cleaned** is shown a s large image in the upper window area.

The image preceding the image to be cleaned is shown as small image in the lower left corner of the window. The image following the image to be cleaned is shown as small image in the lower right corner of the window.

**The image, that is selected as source for the repair information, has a small green border.**

Between the preceding and following image the analysis pattern is presented. The analysis pattern shows **areas potentially to be cleaned** in the actual image as colored pixels. The shown pixels deviate more than the selected threshold from the pixels at the same coordinates in the preceding as well as in the following image. The applied threshold value is indicated by the color of the pixels in the analysis pattern.

**The Lower Button Bar**

The lower button bar in the main window of the Cine Film Image Cleaner shows additional, during the normal

cleaning process rarely used buttons. These are:

### Help

Via this button the *short help* is shown or hidden.

### About Cine Cleaner

Via this button the *About Dialog* is shown or hidden.

### Resume last session

Via this button the cleaning parameters of the last (interrupted) session are set. This allows to continue an interrupted session at the interruption point. These parameters are stored in the INI file.

### Scene Change

Via this button a position of a scene change in the movie can be saved to the INI file. The file name of the scene start image and the scene end image is recorded. This allows to ease segmentation of the video file during video generation with CineToVid, because CineToVid can read this information.

**Annotation:** If in CineToVid an Apple Quicktime video file (default of CineToVid - file type .MOV) is generated, than this generated file may not exceed 50 MB. Long videos therefore have to be segmented smartly.

### Show Backup

Via this button the **Backup Image** is presented in the analysis pattern canvas. The backup image contains all replaced pixels of the image to be cleaned. If the backup image is presented, than - via the standard selection mechanism - these saved pixels can be reapplied to the original image.

By that it is possible to undo a special segment of an image without losing other corrections, which might have been already applied.

### Restore Analysis

This button brings back the analysis pattern if overridden by the backup image. This reestablishes the normal cleaning process.

### Exit

Terminates a session.

## Workflow for Manually Controlled Cleaning

The following paragraphs show, how a manually controlled image cleaning works.

To clean movie images manually the following actions have to be performed:

- Select the "start image" via button "Set Start Directory" and button "Set Start Image" and the presented file selection dialog,  
or resume an interrupted session via button "Resume last session".
- The image to be cleaned, the preceding as well as the following image and the analysis pattern are shown.
- Probably the cleaning parameters have to be adjusted in the parameter maintenance area.  
Especially you have to take care, that - depending on your image material - the cleaning level thresholds are set appropriately. Fluff and dirt should appear as areas with a relatively sharp demarcation in the analysis pattern. The analysis image should be relatively dark but it should allow for reasonable differentiation.  
To set the correct values you may have to experiment a little but you will develop pretty soon a good feeling for good parameter values. The slider and input fields allow easy and fast adjustment of your parameters to your optimum.

**actual parameter settings :**

selected directory: **ideoProjekte\DFLT\Frames\0\**

actual image: **DFI000430.jpg**

at a right mouseclick go to  previous image  
 following image

take repair information from  previous image  
 actual image  
 following image

threshold value strategy  max col difference  
 grey value  
 both

threshold for dust detection:

threshold for dust detection (white): **24**

sub-threshold (green): **50** % of white

sub-threshold (red): **25** % of white

sub-threshold (blue): **15** % of white

number of frames for preview: **18**

set detection (analysis) color: **W G R B**

Fields to Adjust the Cleaning Parameters.

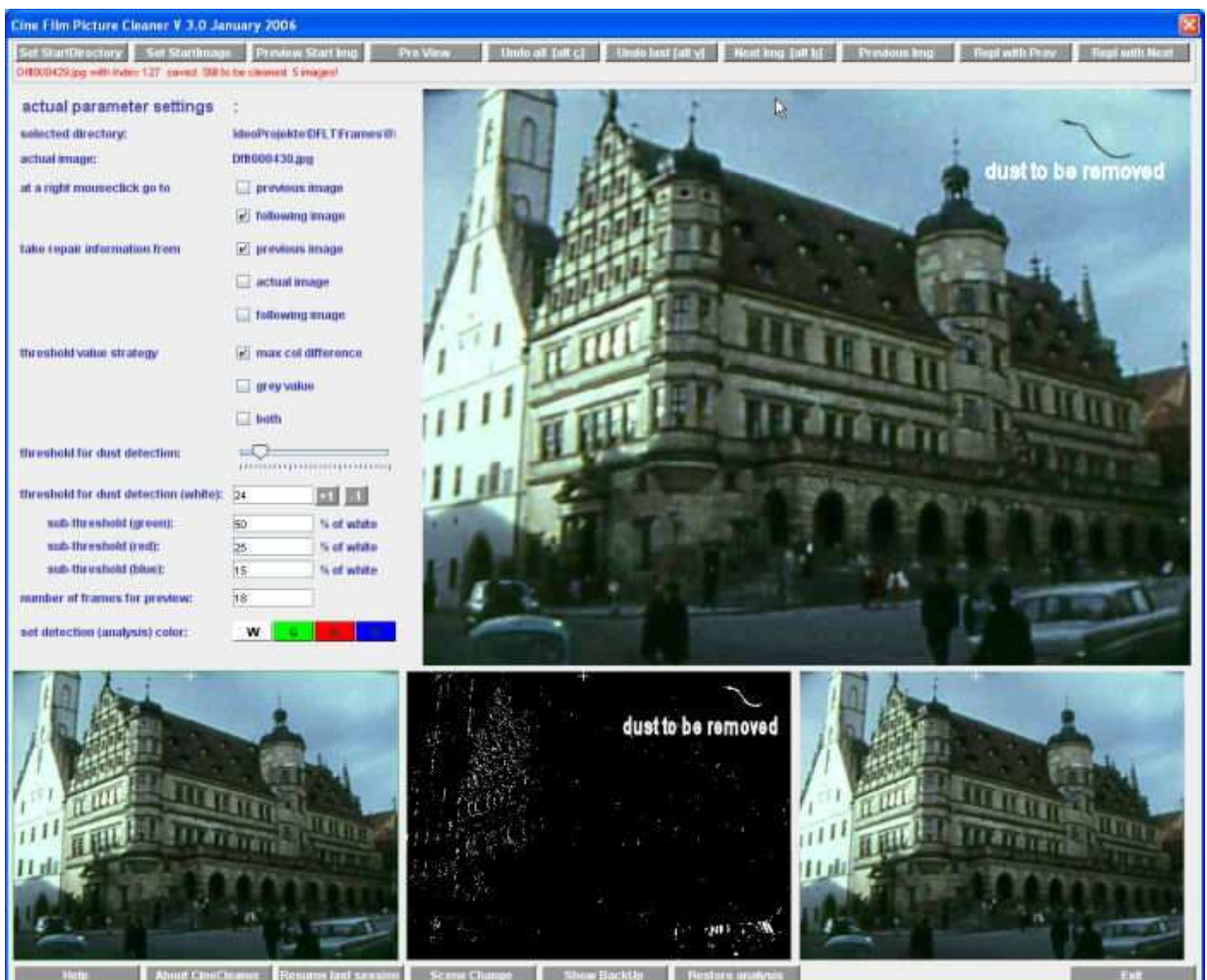
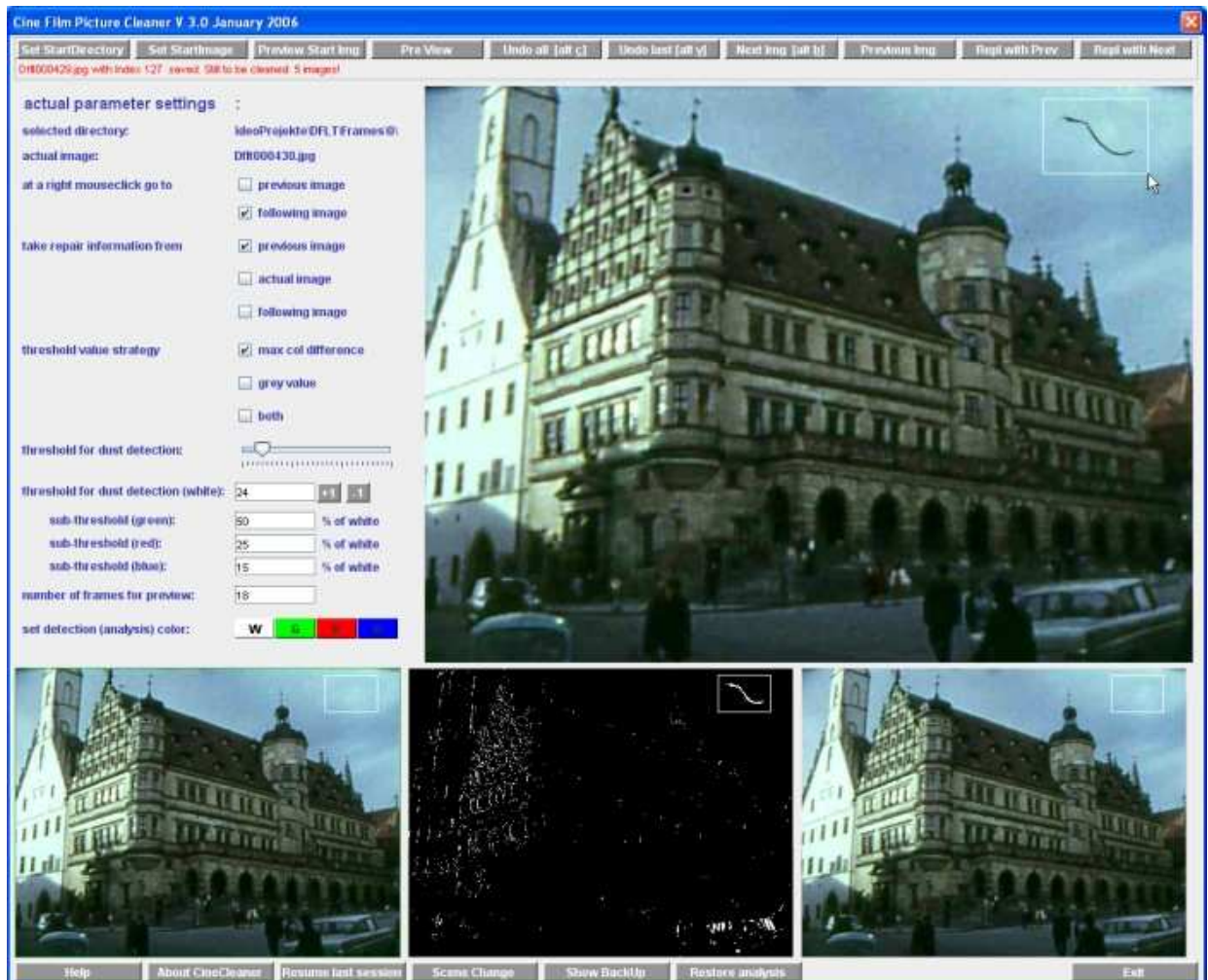


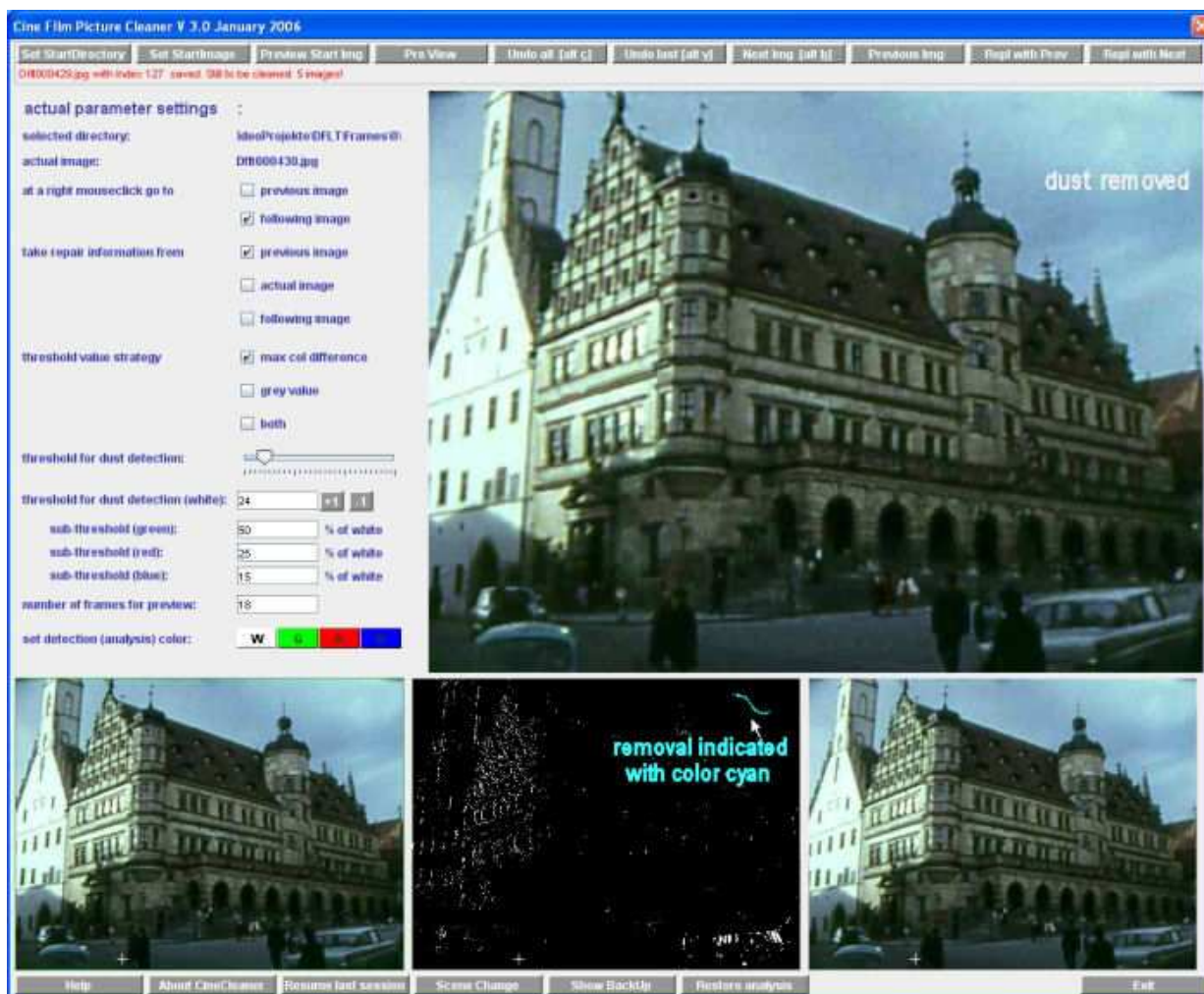
Image Cleaner window with image to be cleaned (top), analysis pattern (center), source images (lower left and right).

- Search for distorted areas in the image. Dust and fluff can be detected in the original image as well as in the analysis pattern. In the analysis pattern look for white (or colored) spots. But colored pixels are not only generated by dirt. They can also be the result of a heavy relative movement shown in the images. You need some training to differentiate between dirt and relative movement, but you will be pretty soon able to distinguish it with high precision. If you place the mouse pointer over a potentially disturbed area, you can easily verify by comparison with the surrounding images, whether you see a dirt spot or a movement in the image.
- If you have located a dirt spot, you have to check, if the actual cleaning level is appropriate for the desired cleaning action. If needed, you may have to adjust the cleaning level. Cleaning level **white** and **green** should be the standard levels. But in some cases you may have to switch to **red** or even **blue**. Switching is done by clicking onto a colored button in the lower region of the parameter maintenance area.



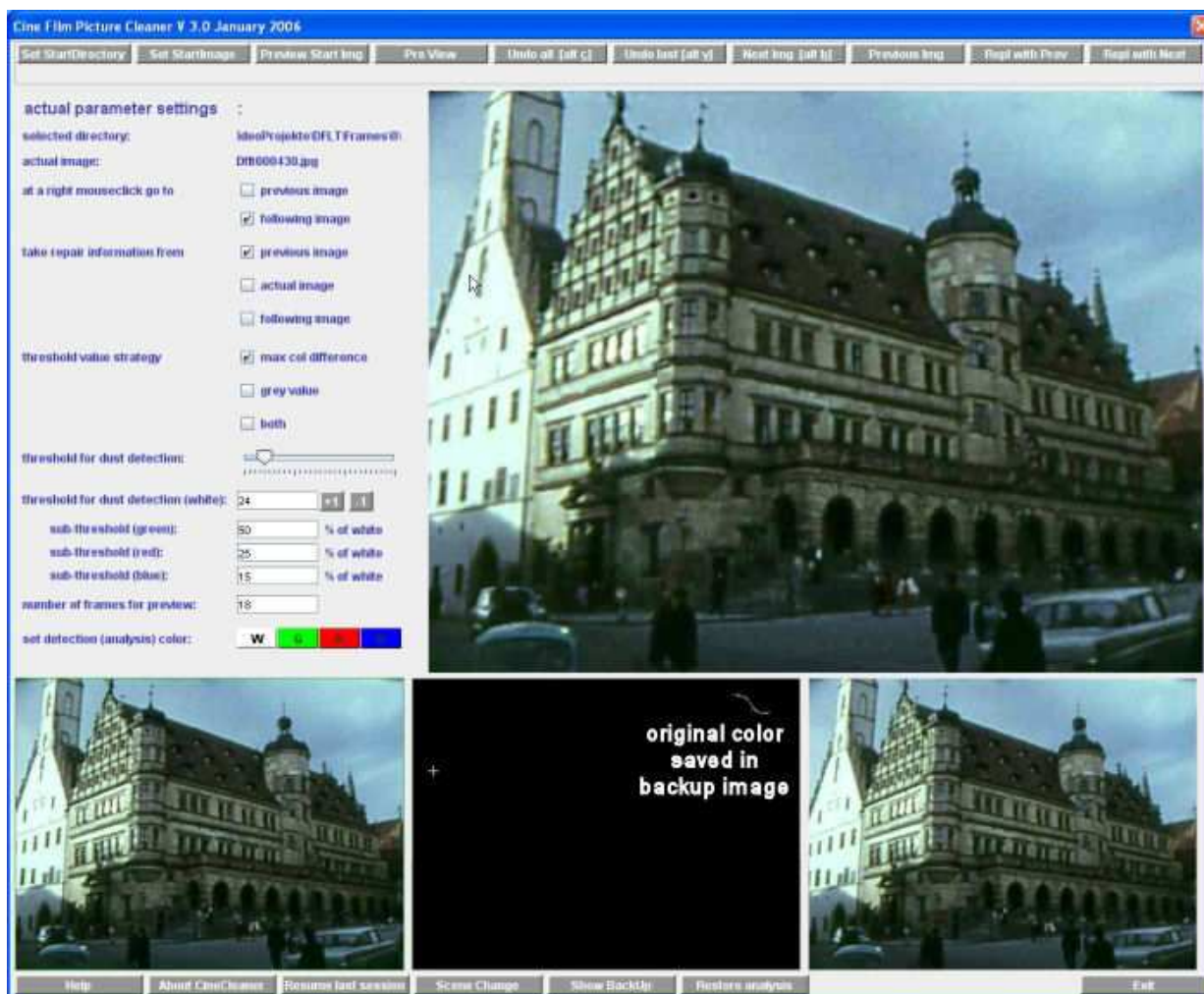
Selection of the cleaning area in the actual image (top). The identical area is also marked in the other canvases.

- Is the cleaning level set appropriately, you can mark the area to be cleaned with the mouse. To do that move in the actual image the mouse pointer to the upper left corner of the area to be marked. Then press the left mouse button and drag (with the left mouse button pressed) to the lower right corner of the desired area. The marked area is framed with a white rectangular as long as the left mouse button is pressed and shown in all 4 canvases in order to allow verification of the correctness of the cleaning area with respect to the available repair information. The area is repaired as soon as you release the left mouse button. If you want to interrupt a cleaning action, just drag the mouse outside the actual frame. The changed pixels are indicated by the color **CYAN** in the analysis pattern. Is the cleaning not sufficient you may have to select a less restrictive cleaning level (green, red, or blue). A cleaning may be reset via button **Undo last**.



Cleaning performed with the preceding image as source of the repair pixels.

- To check the cleaning you can show the backup image via button **Show Backup**. The backup image just contains those pixels, that have been replaced in the original (actual) image. If it seems necessary - due to unsatisfactory cleaning result - you can copy back these pixels to the the actual image. This is possible as long as the backup image is presented in the center canvas. Only pixels, that have not the color black (x000000) are stored back.



The original pixels in the backup image can be stored back if needed.

- If all fluff and dust is cleaned up, the image can be saved. This is done by clicking the right mouse button, by clicking onto button **Next image**, or by alternatively using the acceleration key combination **Alt b**. The image is only saved, if really changes have been applied.

If the cleaning of a cine film image sequence has been finished, the sequence is ready for processing by the CineToVid Movie Generator in order to generate a video file.

#### Annotation 1:

At scene changes often (if the film has been spliced at this position) appear images with heavy distortions. This images hardly can be cleaned. But with the buttons **Repl with Prev** or **Repl with Next** these images can be replaced by the previous or following image of the film without changing the length of the scene. This is important, if the sound shall be used also.

#### Annotation 2:

If you want to generate separate video files from special scenes (see CineToVid "Generate Movie" - potential length restriction) than you can use button **Scene change** to record the position of such a scene change (saves the name of the file containing the first scene image). CineToVid can use this information to set a scene start and end during the video generation process.

Last changes: March 17, 2009 WK