ImageSplit User Manual

Version 1.7

December 2022

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Document Purpose

This document describes the functionality of ImageSplit.

Overview

ImageSplit is an application for selecting parts of an image containing one or more photos. It can only be run from Caption Pro, and the extracted photos can be captioned by Caption Pro. Images can be loaded directly from a scanner or from image files produced by a scanner or a camera. Photos can be detected automatically with a choice of two algorithms, by manually defining regions (splits) on the loaded image or a by combination of both methods. The detection algorithms have a number of parameters which can be adjusted for optimum results.

Splits are de-skewed and can be sub-divided, rotated, inverted or have their sharpness, contrast or brightness adjusted either singly or as a group. Splits can be saved as JPEG files for subsequent captioning by Caption Pro.

ImageSplit requires Windows 7 or newer (64-bit operating system) with .Net 4.6.1 Framework. It is installed and uninstalled as part of Caption Pro, and can be launched via the File->ImageSplit option. If splits are saved, Caption Pro operates on all files contained in the ImageSplit save folder. These files can be loaded via the Caption Pro File->Folder(s) option.

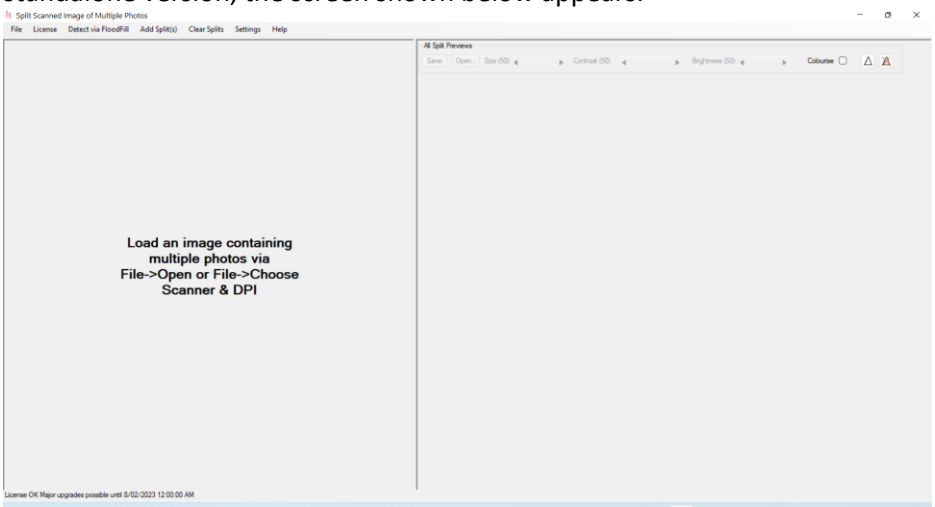
Operation

Licensing

The demo license limits the sum of files extracted and captions applied to 25, over a period of 30 days after installation. A paid license allows permanent unlimited file extraction and processing. Major upgrades are included for the license duration.

Start Screen

After File->ImageSplit is clicked from Caption Pro, or after clicking the ImageSplit icon for the standalone version, the screen shown below appears:



The current automatic detection algorithm (either Floodfill or Rect (rectangle detection)) is indicated by the second menu item.

Images can be loaded from files or from a scanner. The scanner and scan resolution are selected from the File-> Choose Scanner & DPI menu option:

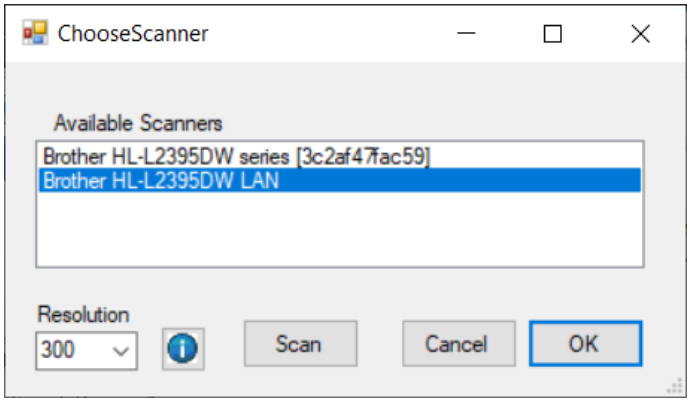


Figure 1 Scanner and Resolution Selection Screen

The connection to scanners uses the Windows Image Acquisition (WIA) protocol, and for wireless connections, such as those shown above, the same scanner may appear more than once. Either connection will work, but one may have higher resolutions available than the other.

As there are hundreds of different types of scanner in use, connection to all of them via the WIA protocol may not be successful. If connection errors or errors in scan operation are encountered, the scan should be saved as a 24-bit colour file in any of the following formats: JPEG, BMP, TIFF or PNG. The file should then be loaded into ImageSplit.

The resolution of the scanner defaults to 300 dpi (dots per inch) as this is available on nearly all scanners. However, an A4 flatbed scanner with this resolation will generate an image of approximately 2400 x 3500 pixels (8.5 megapixels). If the scanned image contains 6 x 4 inch photos with a 3:2 aspect ratio, each extracted photo will be about 2 megapixels in size (2000 x 1000 pixels). This resolution is adequate for display on electronic devices, such as phones, tablets or standard desktops, but will not be adequate for high-resolution display or printing at the common 6 inch by 4 inch paper size. A resolution of 600 dpi is required for this purpose, but scanning and processing times will be longer. Smaller photos (as were common up to the middle of the 20th century) will require a higher resolution scan, but result may be particularly rewarding, as these small images were often contact prints from large negatives with high resolution.

Image Conditioning for Automatic Detection

When scanning paper photos it is possible to change the background colour, the scan resolution and the colour depth (grey scale or colour). The required resolution is discussed in the previous section. The standard scanner background colour is white, which is suitable for colour photos but the flood-fill algorithms may fail for black-and-white images using the default threshold value where white appears at the edge of the photo. Adjusting the threshold may improve performance, but a black background may give better results. Other colour backgrounds may be used, but small changes in the colour across the background may occur and prevent the flood-fill algorithm from working. Changing the background location (by dragging the circle shown at the top or side of the image), or using rectangle detection rather than flood-fill may help.

Using greyscale or colour scans on black-and white photos may give different results for each algorithm - which is better depends on individual photos. ImageSplit works in 24-bit colour or 8-bit greyscale images for any input file format. JPEG format only supports these two bit depths. TIFF files support 48-bit colour, but ImageSplit does not work with this bit depth. TIFF also supports 16-bit greyscale and ImageSplit will work with these images, but splits will lack contrast.

Images or scans of photo album pages often have a textured background between photos, which may disrupt automatic detection of photos using the flood-fill algorithm. The Rectangle algorithm may give better results. Where there is a colour difference between the background and the photos, colour adjustment to make the background close to white may improve the performance of the flood-fill algorithm.

Photo albums pose particular problems as shown in the camera image below, which was generated using flood-fill detection

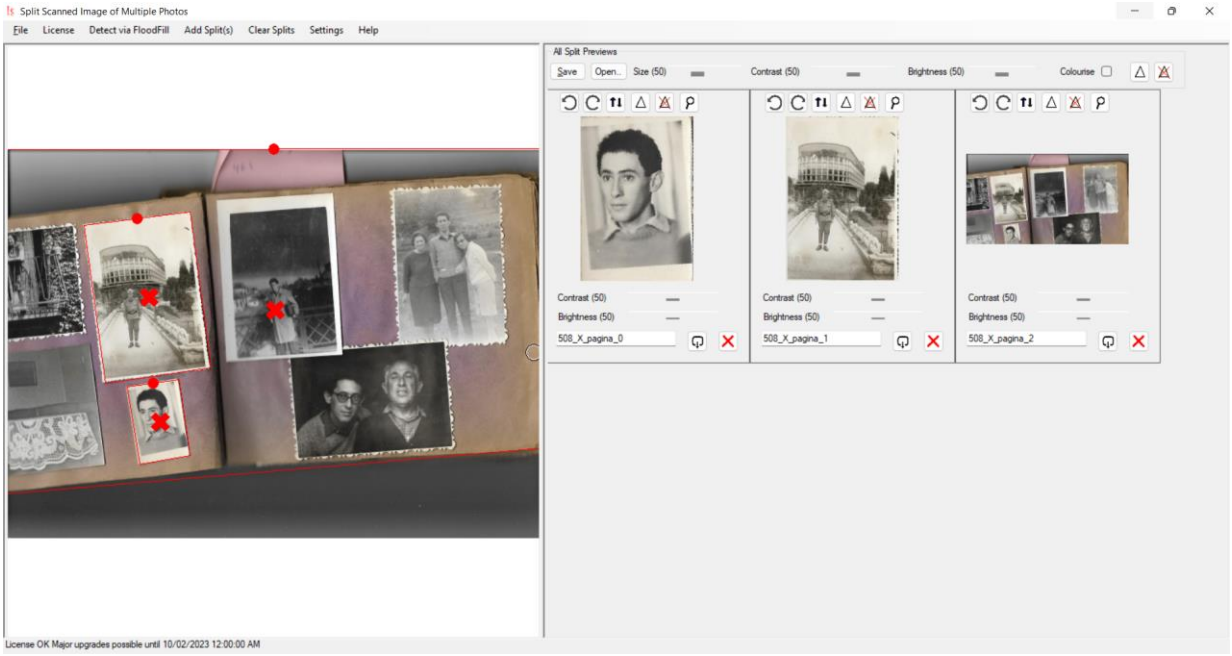


Figure 2 Photo Album Page

The first problem is that one of the rectangles detected (shown in the rightmost split) includes most of the album page and two other images within it. The background pixel is at the middle of the right-hand side. The rectangle enclosing the other two is not precisely square (a tolerance of 10 degrees is allowed) and the left and right edges are not visible. If this rectangle is not deleted, unexpected behaviour may occur if other rectangles are adjusted,

Photo detection from scans of negative strips or contact sheets can be easily accomplished using the split subdivision capability, but the resolution should be high enough to make individual images displayable on the desired device. For 35 mm negatives or contact sheets, a resolution of 1200 dpi will be required for display on mobile phones. Post processing to invert individual negative images using a product such as IrfanView will be usually be required.

Flood-fill algorithm

The flood-fill detection algorithm used by ImageSplit extracts edges from the image displayed on the screen using the Sobel edge filter and then performs a flood-fill from a point outside any of the photos contained in the image. The screen image is generated by fitting the scanned image or loaded file to the dimensions of the image display area. The loaded image aspect ratio is retained and white padding is applied where required. Quadrilaterals with internal angles deviating by less than 10 degrees are then detected in the boundary of the flood-filled region. These will commonly be rectangles, but not always as shown below. Note that the split image is shown as the largest rectangle fitting within the quadrilateral.

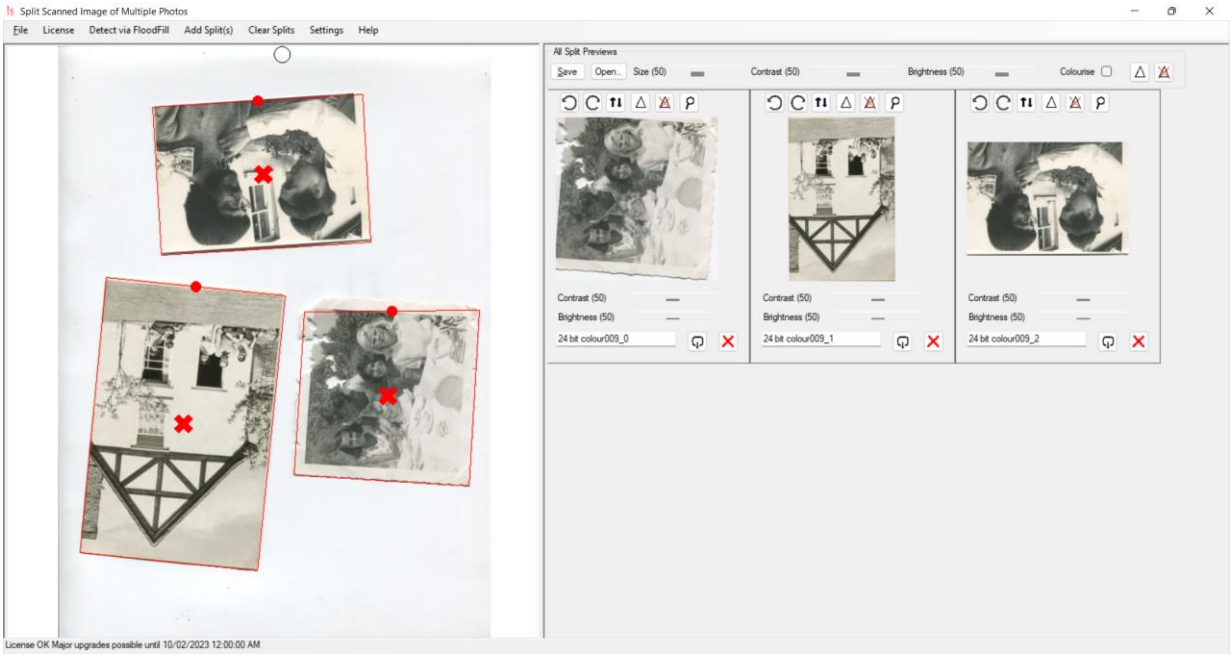


Figure 3 Flood-fill detection showing non-rectangular photo at middle left

Detected regions may also overlap as shown below. In this case one of the splits should be deleted before any manipulation is attempted.

Figure 4 Overlapping detected regions

This algorithm is best suited to images with a uniform or slowly varying background between the photos, as is obtained by placing individual paper photos on a flatbed scanner. For this reason, photos should be separated from each other on the scanner bed or in the camera image by a few mm, and should not touch the edges of the scanned area if padding is not used. Increasing the threshold value may help to detect closely spaced photos. Most domestic flatbed scanners will only scan a region of A4 size (297 x 210 mm, or 11.7 x 8.5 inches) or slightly less, even though the glass area, or platen, is larger than this (300 mm x 224 mm in one case). Parts of photos outside this area will be truncated, but the truncated image will usually be detected. The flood-fill algorithm is generally more robust than rectangle detection.

Rectangle detection

The rectangle detection algorithm converts the scanned image to greyscale and uses the SimpleShapeChecker class to detect individual photos. A threshold value can optionally be applied which sets all pixel values in the converted image to their maximum value. Rectangle detection performs better than flood-fill where the background between photos is not uniform. This can occur with photo album scans and images, where patterned backgrounds may be used or fading makes the edges lighter than the centre. Using this threshold can allow edges to be detected where there is little contrast between the image and the background. This may occur with black-and-white prints. Reducing the threshold value increase the likelihood of detecting a photo, at the expense of accuracy in defining its boundary. If the prints have a white border, using a dark background for the photos is helpful for improving detection

Avoiding truncation

If truncation is to be avoided, care should be taken to include all of the photos within the A4 area, which is often marked beside the glass area. This limits the number of 6 x 4 inch (150 x 100 mm) prints to two, if truncation is to be avoided. If truncation of the sides of images is acceptable, three images can be placed as shown below. Parts of the photos outside the red A4 boundary will be truncated, but all three images will be automatically detected as the scanner places a white border around the scanned image.

If existing scans are to be used where the photos touch the edges of the scan area, the Pad Image option in settings can be used to add a white border to the loaded image, which will improve detection.

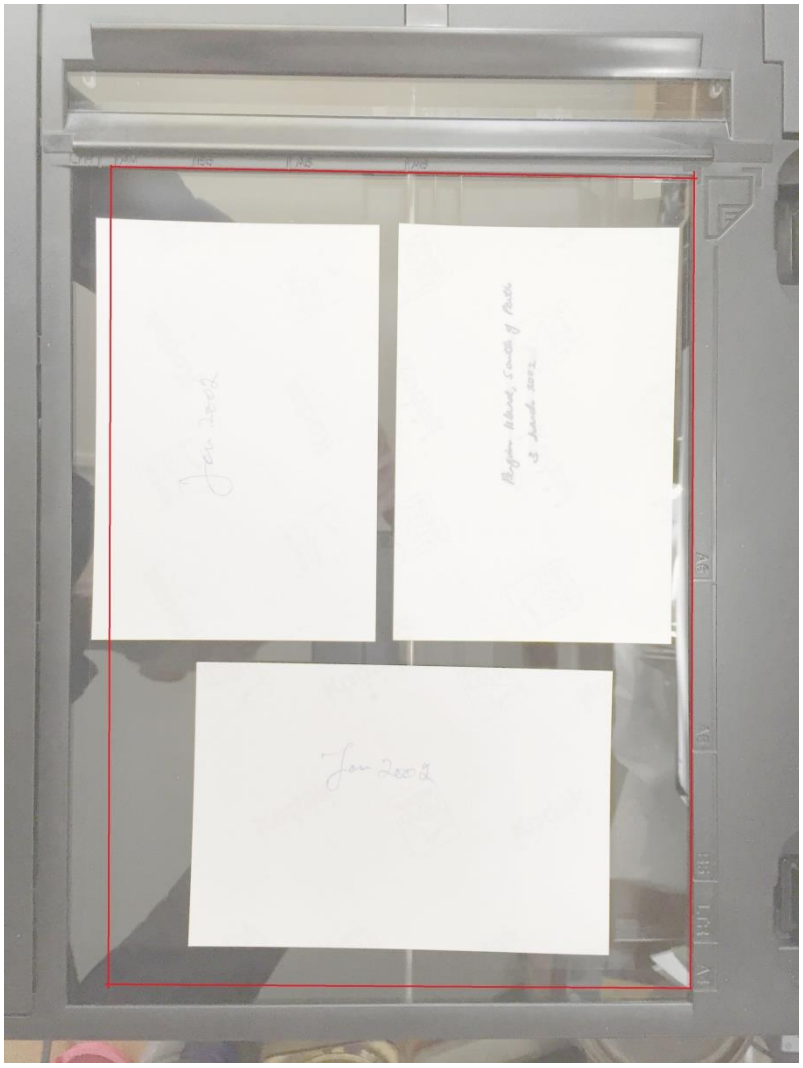


Figure 5 Placement of three 6 x 4 inch prints on a A4 scanner.

Scanner or Camera?

Photo albums pose particular problems: they are frequently larger than A4 size and the pages will not fit onto an A4 scanner. If a part of a page is scanned, photos will be truncated and the fixed location in the centre of the shortest edge of the image will not identify the background correctly. The background location is defined by a circle (visible at the top of the loaded image in Figure 6). This can be dragged to a location between photos for best results from automatic photo detection.

Photographing a number of photos may be more convenient than using a scanner. In this case, the camera should be directly above the photos, which should be placed on a plain background and illuminated with natural light if possible. Avoid including edges in the image. Files from cameras are generally only suited to producing splits for computer devices, as few have an image size greater than 12 megapixels. This limitation can be minimised by only including one or two photos in each image.

There are a lot of web pages and videos on the topic of digitising colour slides. A search for this term will reveal many of them. The service is widely available professionally and there are also DIY methods, some involving dedicated hardware. ImageSplit is not necessary for this task, but the captioning facility of Caption Pro may be useful.

Image Loading and Photo Detection

Once the scanner and resolution have been selected, clicking Scan (or using hotkey Alt-FS) in the screen shown in Figure 1 or selecting the File->Scan option initiates scanning. 8, 24 or 48-bit depth scans can be processed. 8-bit greyscale scans are converted internally to 24-bit colour. Alternatively, files can be loaded via the File->Open menu option. By default, automatic photo detection with the default flood-fill algorithm is applied once the image is loaded from a scanner or a file to give a display similar to that shown below:

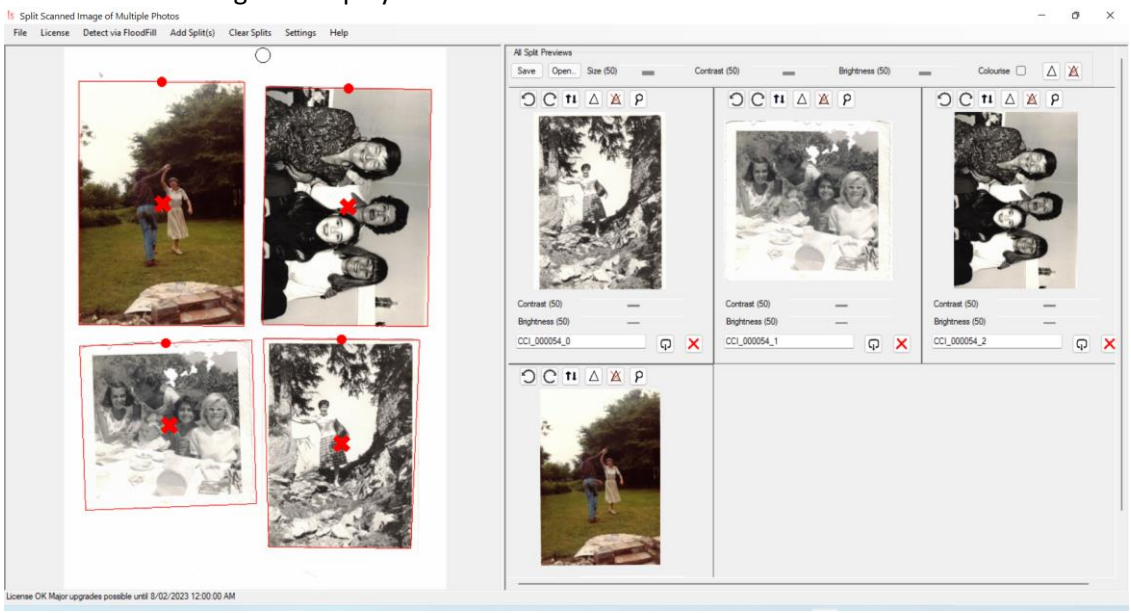


Figure 6 Screen after Detection of Photos

The left-hand pane of the screen shows the loaded image with detected photos framed in red, and the right-hand Preview pane shows the de-skewed extracted photos. Dragging the vertical splitter bar sideways increases or decreases the screen area of each pane. Dragging the red dot at the top of each frame sideways rotates the frame, and double-clicking on the red X in the centre deletes the frame, the associated preview in the right-hand pane and any file saved from the previews.

If at least one split is created, the All Splits Preview box is enabled as shown above, allowing all splits to be saved via the Save button (or hotkey Alt-S), and their brightness, contrast and sharpness changed. Grey-scale splits can also be colourised using a web service by checking the Colourise box. If colourisation is the only function required, a single split can be created from the whole of the loaded image via the Add Split(s) menu item.

Colourising

Colourising black-and-white photos was once performed manually using painted-on dyes, but the process is now more commonly performed on digital images using artificial intelligence methods involving neural networks, with generally satisfactory results.

Photo detection times will be much longer when colourisation is used, and an Internet connection is required. The longest dimension of colourised splits is limited to 800 pixels, making colourised images only suitable for display on electronic devices. Examples of raw and colourised splits are shown below. If higher resolution colourised images are required, there are a number of web and local applications available which can be found by searching for "Colorization applications" on your search engine of choice. Colourisation works best on images with "average" compositions – see here for a longer discussion of this topic.

Figure 7 Examples of colourised (top) and grey-scale (bottom) splits

The Size scrollbar varies the size of all the previews, which are re-arranged to maximise use of the right-hand pane. The number beside the each of the scrollbars varies can be varied between 0 and 100, with a default value of 50. The Open button opens the Splits folder.

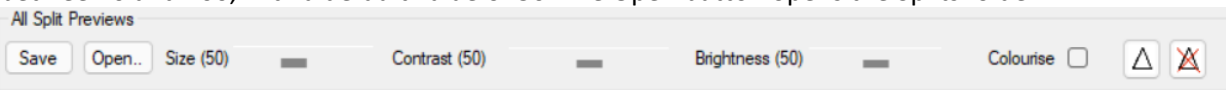


Figure 8 All Splits Preview Box

Individual split previews have additional buttons for rotation, flipping and full-size display in a new window. Splits can also be deleted via the button. The file name for the split can also be specified. This name may be descriptive and can be applied as a visible caption after ImageSplit is closed via the Caption Pro Auto-split option. If the split comes from a loaded file, the default name is the name of the loaded file with a numeric suffix added and is saved in a folder called Splits within the folder containing the loaded image. Where the image comes from a scanner, the scan time is used as the file name to which suffixes are added and the file is saved in the folder specified in Settings.

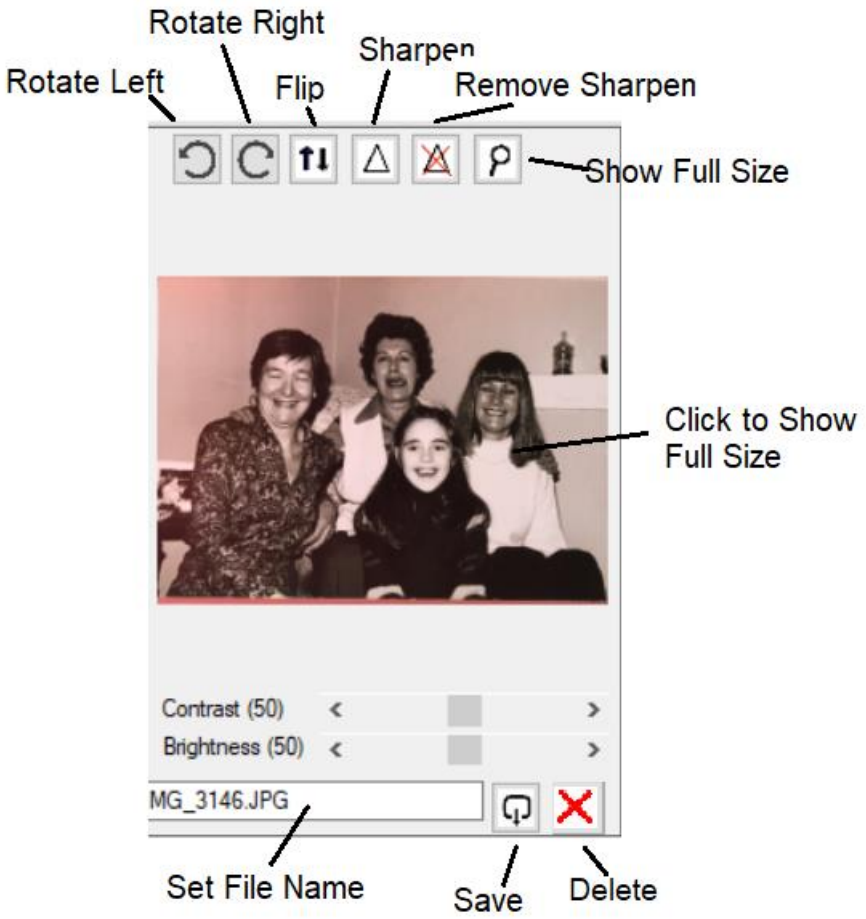


Figure 9 Individual Split Preview elements.

Splits

Adding Splits Manually

Where not all the photos present have been automatically detected, the Add Split(s) menu option can be used to add between 1 and 4 splits to the input image at fixed locations. If 2 or 3 splits are added, they can be aligned in portrait or landscape mode, as selected by radio buttons ion the image below. There is also an option to create a single split containing the whole loaded image. This may be useful for colourisation.

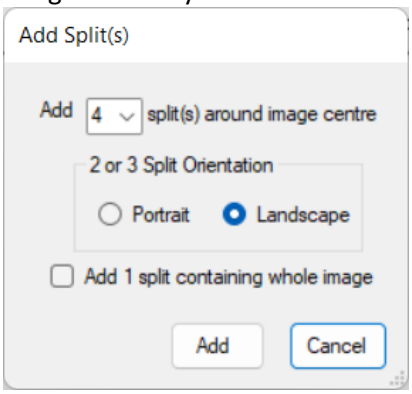
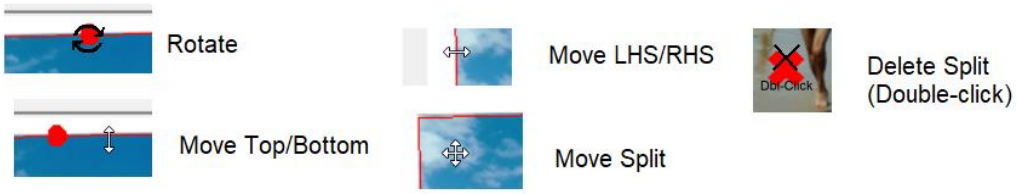


Figure 10 Add Splits Screen

Adjusting Splits

Individual splits can be resized by dragging the sides of the split rectangle, rotated by dragging the red dot at the top sideways, moved by clicking and dragging anywhere inside the split and deleted by double-clicking on the red X in the centre. The cursor changes for each of these actions as shown below:

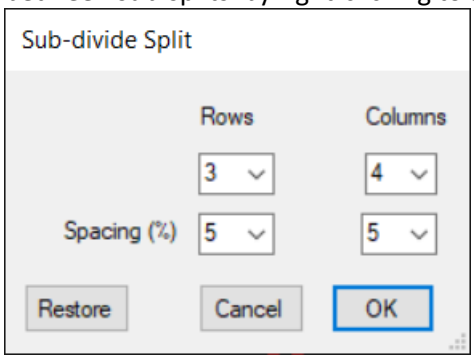


Changes in the splits are immediately reflected in the de-skewed previews in the right-hand panel.

All splits can be deleted by the Clear Splits top-level menu item.

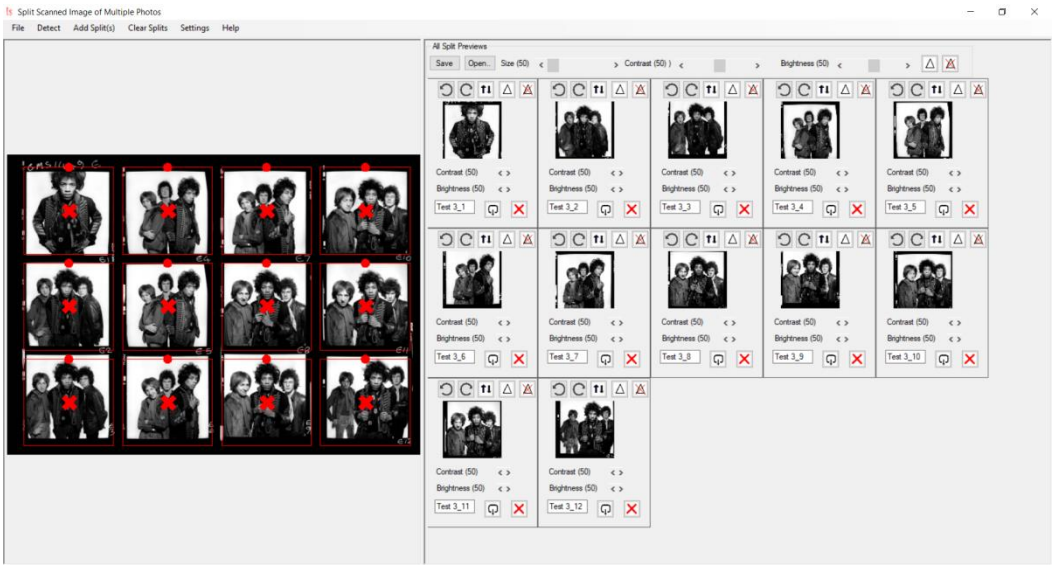
Sub-dividing Splits

Splits can be sub-divided into a specified number of rows and columns with variable spacing between sub-splits by right-clicking to show the following screen:



If OK is selected the selected split is replaced by a grid of splits with the specified number of rows and columns and spacing between the sub-splits. The sub-split spacing is a percentage of the sub-split width and height with spacing set to zero. Cancel closes the form without performing the subdivision. Restore replaces a set of subdivided splits with the split before before subdivision, if subdivision has occurred. Restore is useful where the split orientation, position, row or column count is incorrect and the subdivision process needs to be repeated.

If sub-dividing is used on an image containing multiple sub-images in a regular grid (such as a contact sheet as shown below), care must be taken to align the parent split so that the sub-splits align correctly with the images:


Split Scanned Image of Multiple Photos
File
Detect
Add Split(s)
Clear Splits
Settings
Help
All Split Previews
Save
Open..
Size (50)
Contrast (50)
Brightness (50)

Settings Screen

This screen is used to define the detection method, the save folder for splits, the Auto-split threshold, parameters for adding splits manually, whether detection is automatically applied on image loading and whether a sequential numeric prefix is added to split file names.

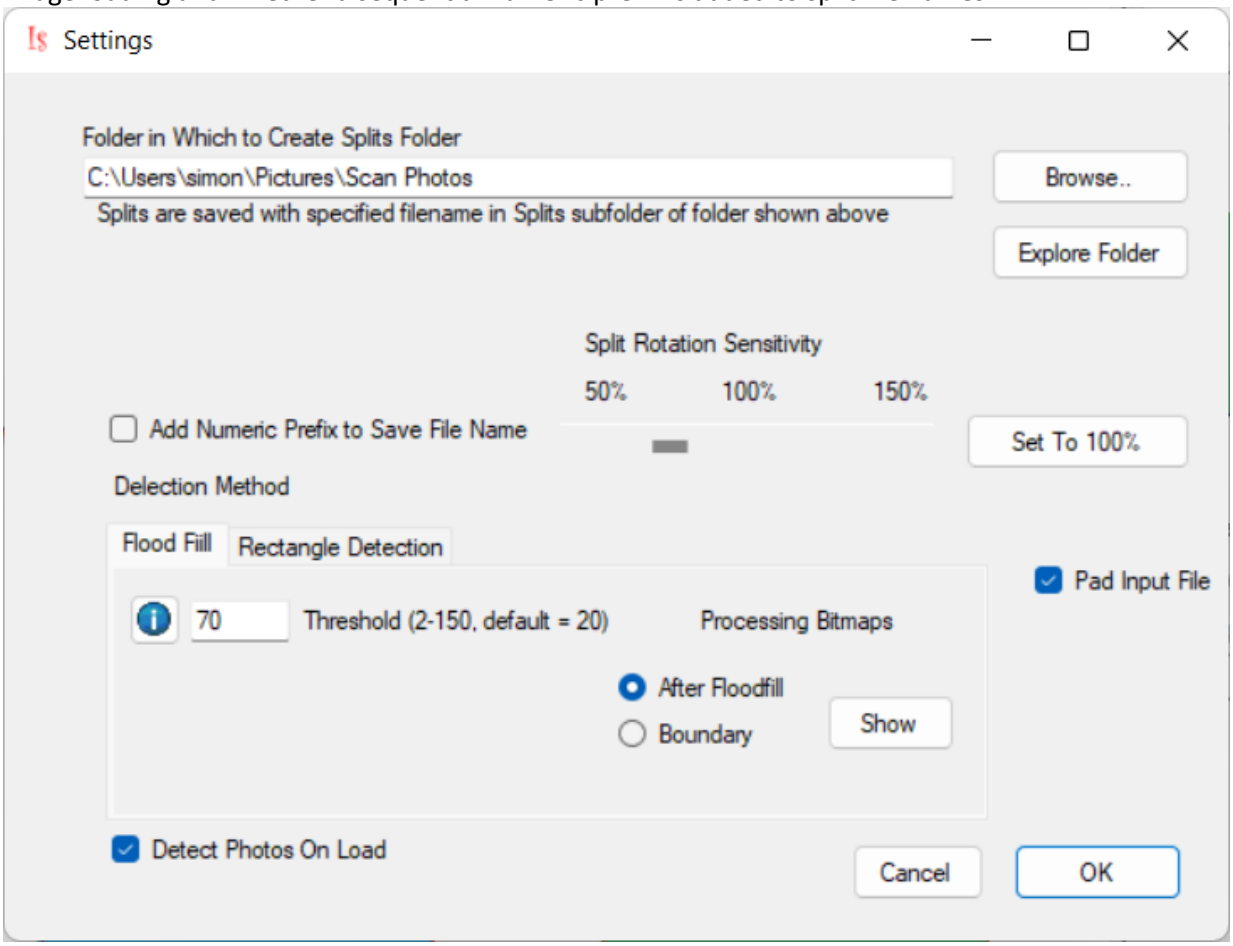


Figure 11 Settings Screen with default Flood Fill detection method

Add Numeric Prefix to Save File Name

If the Add Numeric Prefix to Save File Name is checked, a numeric prefix is added to the file name shown in. The prefix is the number of files saved before the current save operation padded with two leading zeros. Use of this prefix allows sorting of the saved files by name in the order in which they were scanned.

Split Rotation Sensitivity

This parameter changes how much the split is rotated in response to movement of the rotation icon left or right.

Pad Input File

If checked, a white border is added to the loaded image. This may improve detection of individual photos where the photos touch the edges of the scanned area.

Threshold (Flood-fill)

The extent of the flood-fill operation on the edge-detected image is controlled by the Threshold parameter. Any pixel values which differ by less than threshold from the value of the background pixel (as defined by the circle shown in the main image), which are connected to the background are filled. Allowed values are between 2 and 150 with a default value of 20. The results of this changing the threshold on the intermediate processing bitmaps can be seen by

selecting either the After Floodfill or the Boundary radio button and clicking the Show button. Tapping enter after changing the threshold value

Low threshold values may result in photos being merged, multiple splits created from the same photo, or non-rectangular splits. The figure below shows the results from different threshold values:

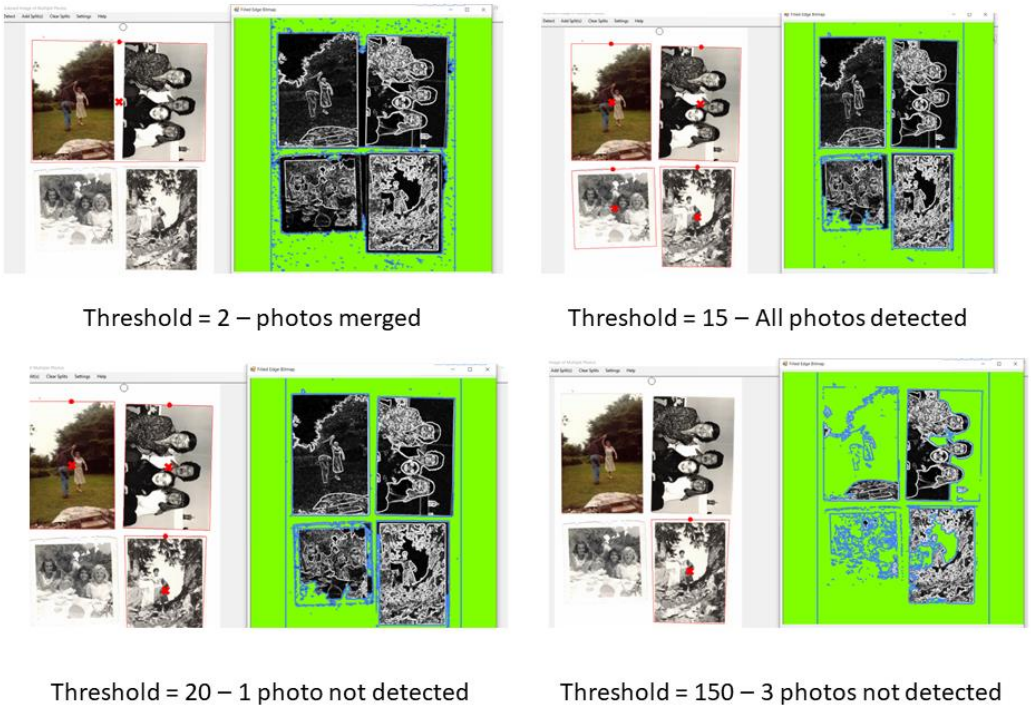
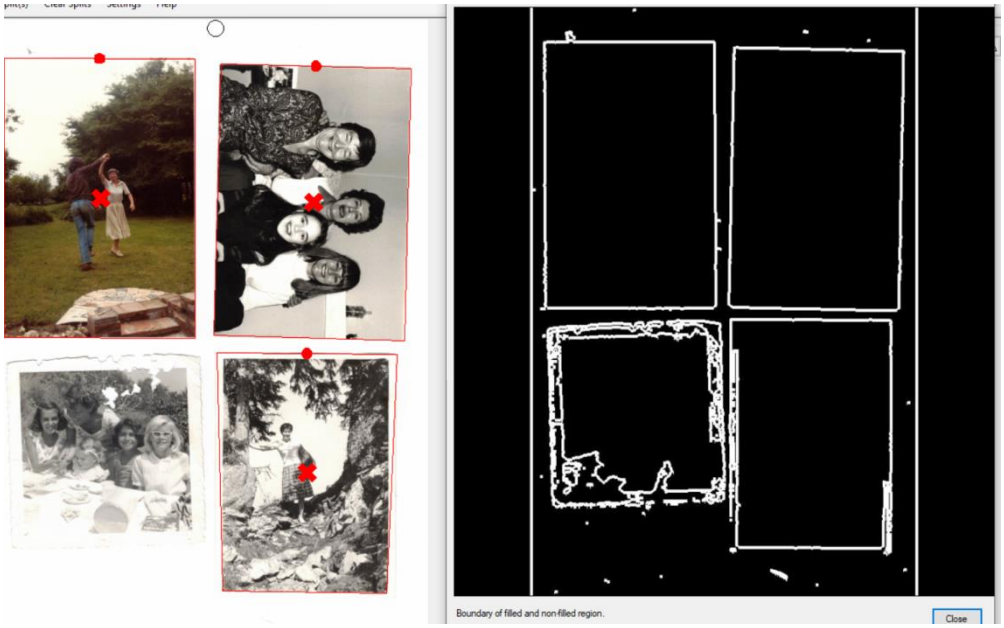


Figure 12 Results of detection using different threshold values. Filled regions are shown in green and the filled region boundary in light blue

If the threshold value is too low, there will be unfilled regions between the photos. If it is too high there will be large filled areas within the photo boundary, and the fill boundary will have large gaps in it. The threshold value acts to trade off detection ability and accuracy.

The Boundary option for the processing bitmap shows the filled region boundary in white and other points in black as shown below for a threshold value of 20:



Optimum values for the threshold value will vary somewhat according to the nature of the photos and the background pixel selection. This can be varied by dragging the circle visible by default at the centre of the top or right-hand side of the image to another location between photos. If photos are persistently missed in auto-detection, splits can be added manually via the Add Split(s) menu on the main screen.

Rectangle Detection

The Rectangle Detection parameters are shown below:

Figure 13 Rectangle detection parameters

If checked, Use Threshold replaces all edge image values which exceed the Edge Threshold by the maximum value (255), which appears as white. Min Width and Min Height specify the width and height of the smallest rectangle which will be detected as a percentage of the image width. If more than 4 equal size photos are to be detected, the value should be reduced from the default value of 15%. The processed image can be displayed by clicking the Show Edge Image button. The effect of changing the Edge Threshold value is shown below:

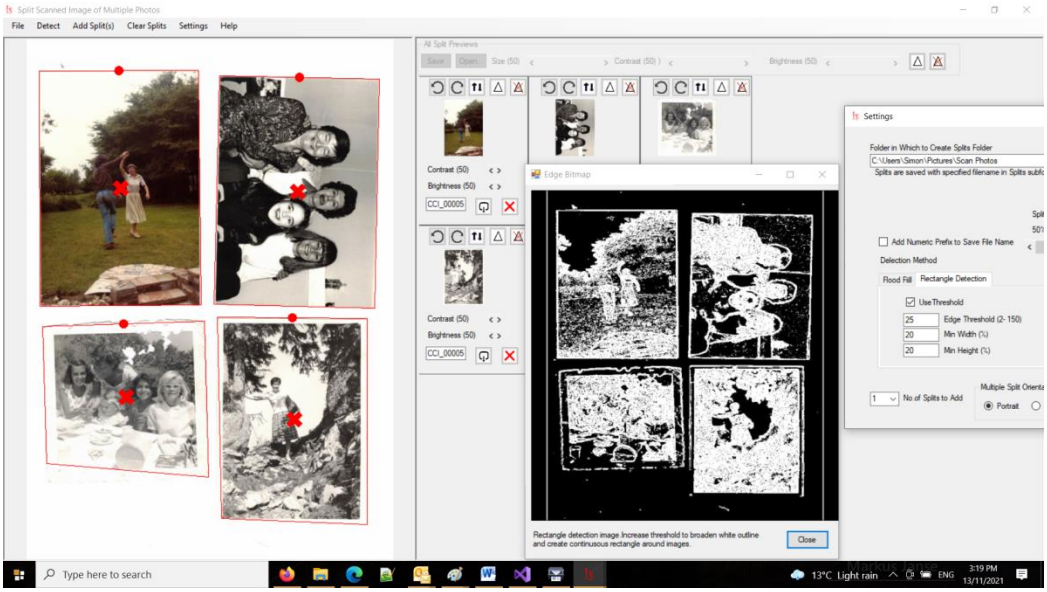


Figure 14 Rectangle detection with Threshold of 25

All photos have been detected using a threshold value of 25, but the boundary of the lower left photo is incorrect and the lower and upper right boundaries are not rectangular. Note that the splits are always rectangular and made fit within the split region.

The display using a threshold value of 50 is shown below:

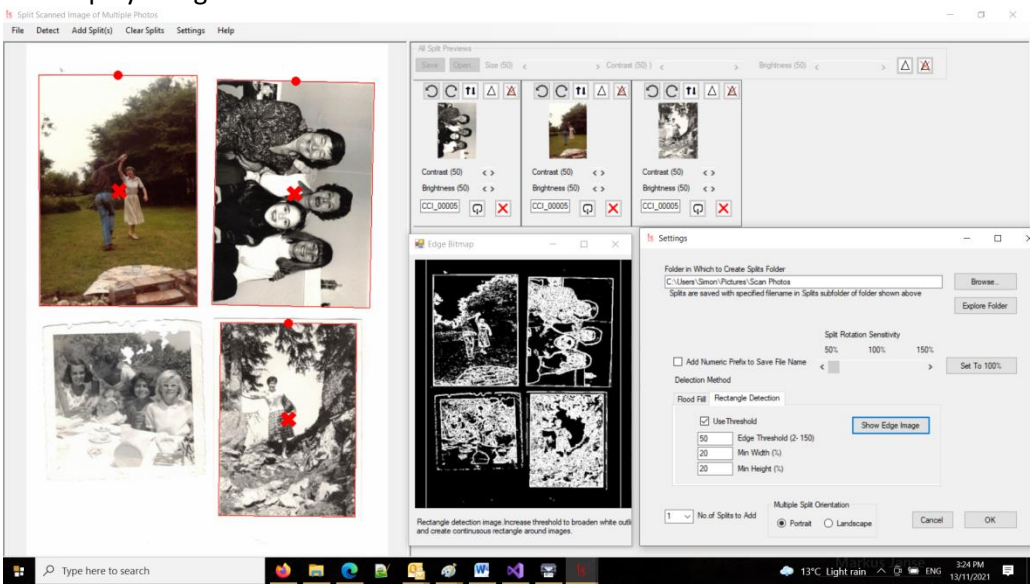


Figure 15 Rectangle detection with a threshold value of 50

Using a threshold value of 50, only 3 photos are detected but their boundaries are much more accurate.

If Use Threshold is unchecked, no photos are detected in the example shown and the edge image is as shown below:

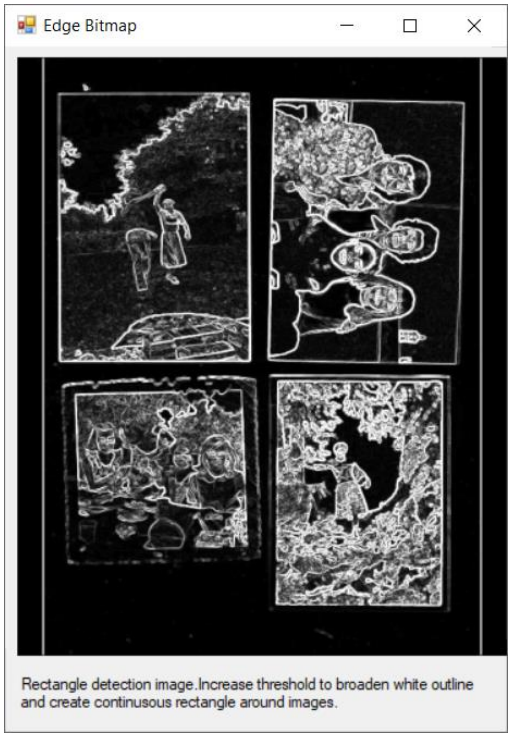


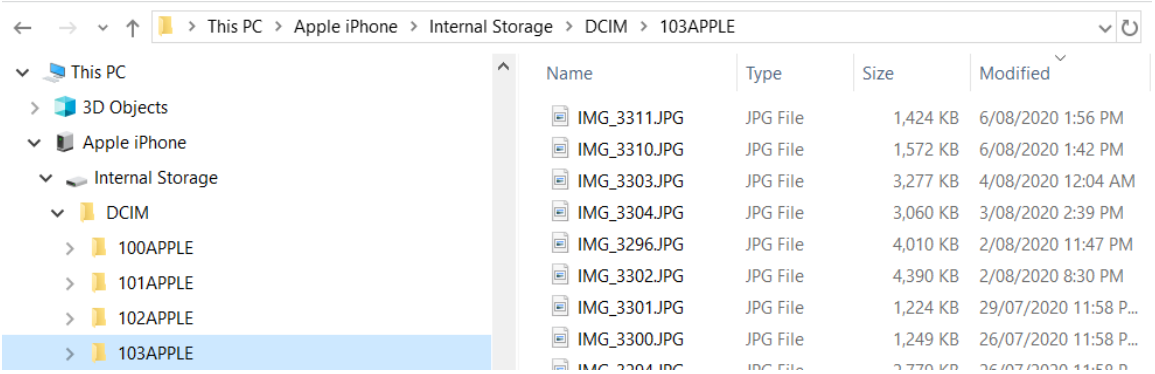
Figure 16 Edge Image with no threshold

Loading from a File

Files created by a scanner, or by a camera (such as are built into mobile phones) also be loaded via the File-> Open menu. Most bitmap formats are supported, including JPEG, BMP, PNG, TIFF and PNG.

Importing Mobile Phone Photos

Mobile phone photos can be imported via email or by connecting the phone to a PC USB socket with the lead normally used for charging. After entering a password to trust the computer (for an iPhone), the phone appears as a device in the This PC node. Opening this device and the contained DCIM folder eventually shows the photo storage folders. The most recent photos are contained in the highest numbered folder in DCIM and can be copied to any desired location.



Most mobile phones have an image resolution of 8-12 megapixels. This means that the resolution of extracted images where there are more than 2 or 3 photos will only have sufficient resolution for device display. However, phones with higher resolution cameras (such as Unihertz) can produce images of similar resolution to a 600 dpi A4 scan, from which high-resolution photos can be extracted.

Saving Splits

Once splits have been defined, and optionally rotated, flipped or adjusted for contrast, brightness or sharpness, they can be saved into the Save folder in JPEG format. The name of the file used for the split can also be changed and may be applied as a caption displayed in a bar beneath the original image within Caption Pro by using the file name as an auto-caption source. Any characters not allowed in Windows file names (such as ?, = or \) are changed to underscores (_). If the image has been obtained from a file, the default save folder is located in the folder containing the file, with the name 'Splits'. If the image is loaded from a scanner, the splits are saved in the specified folder rather than a Splits subfolder.

Adding Captions to Saved Splits

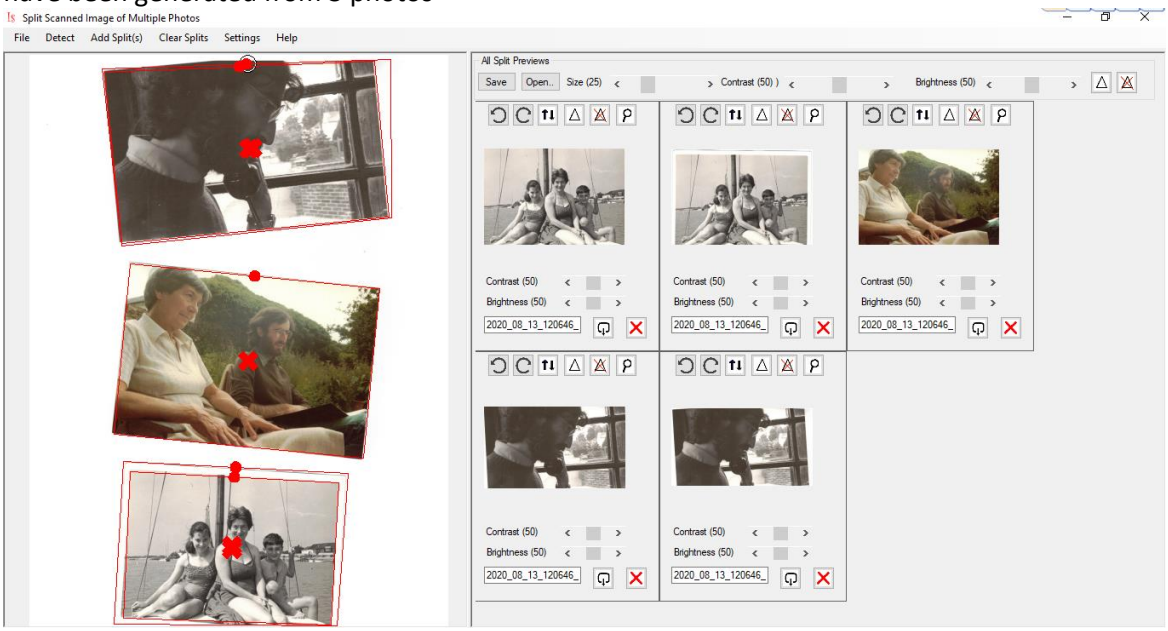
Once splits have been saved and ImageSplit has been closed, Caption Pro displays the files in the Save folder in Modified date order. Two-part captions can then be added to these files if desired, either overwriting the saved files or creating a new file as specified in the Options screen. The same caption can be applied to all saved files using the Batch options of Caption Pro. Descriptive file names can also be used an auto-caption source.

As all files in or below the save folder, are loaded into Caption Pro, it may be the case that files are present which have already been captioned. Files with captions can be moved to another folder via the Caption Pro Edit->Copy/Move Captioned option.

Frequently Asked Questions

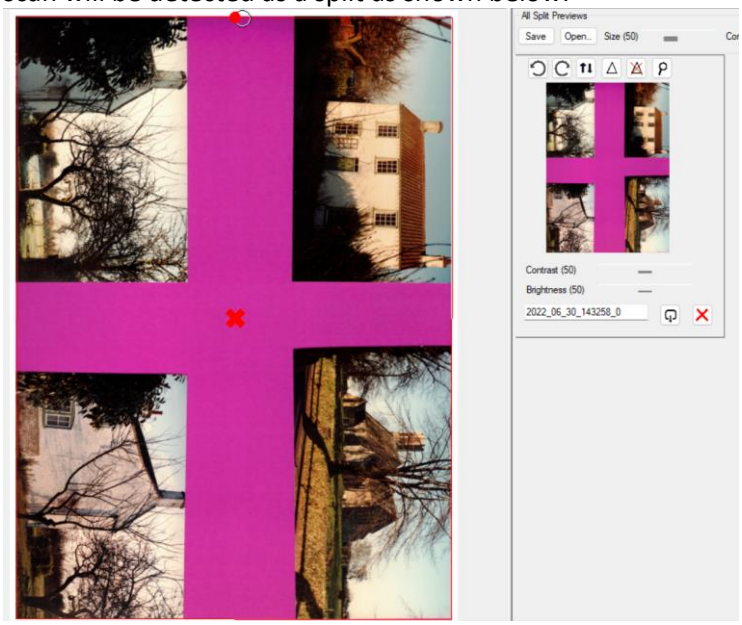
1. Automatically detected splits do not correspond to photo boundaries

This problem can manifest as either duplicated or skewed splits as shown below, where 5 splits have been generated from 3 photos

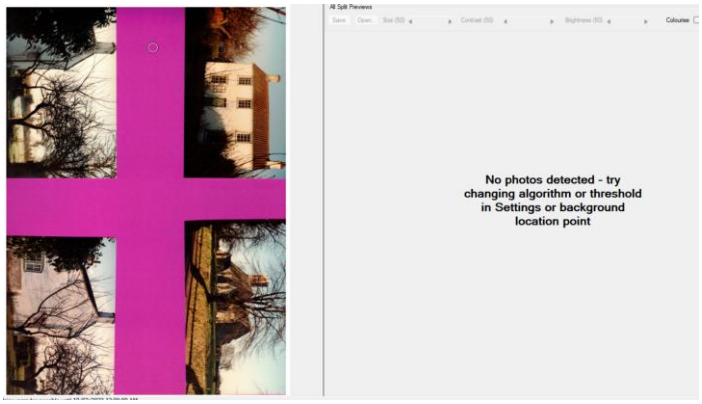


In this case the problem arises through incorrect detection of the background, caused by parts of a photo being outside the scanned area. The background location circle at the centre top is not outside the photo boundary. Dragging it to a position outside any of the photos gives the expected result. Duplicated splits can also be deleted.

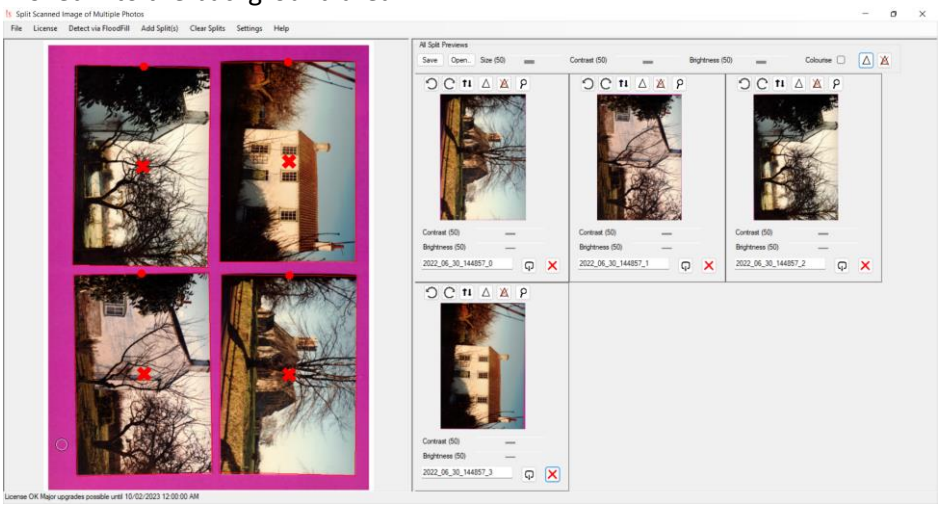
If a non-white background is used and photos are touching the edge of the scanner, the entire scan will be detected as a split as shown below:



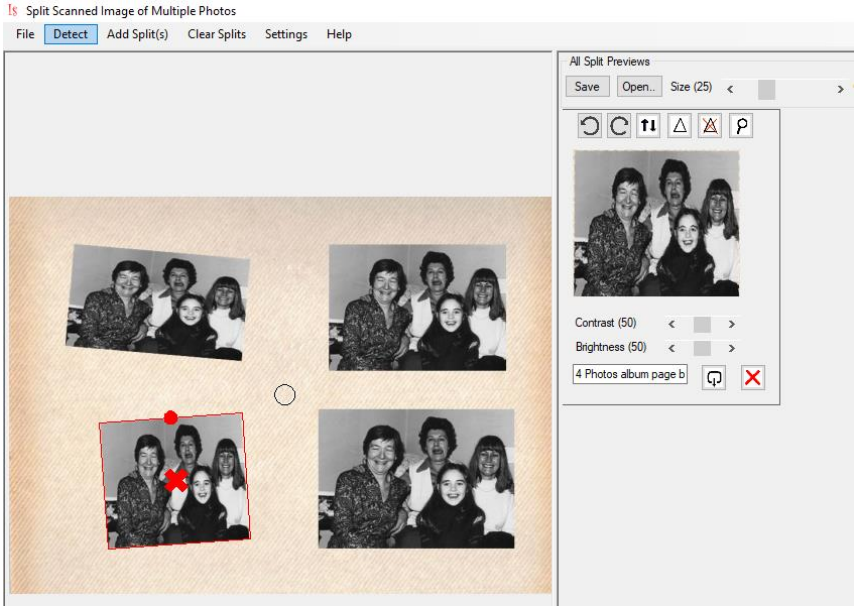
This happens because a small amount of white padding is often applied to the scanner output and the default background colour position is within the white padding, so the entire scan is detected as a single image. Moving the background location to within the non-white background results in no photos being detected:



To fix the problem, photos should be moved away from the scanner edges so a few mm of background completely surrounds each of them, and the background definition point should be moved into the background area:



Where photos have a patterned and non-uniform background, as shown below, none or only some photos may be detected. After moving the background pixel to the centre of the image, only one of the 4 photos is detected with the default threshold value of 20 as shown below. No threshold value successfully detects all of the photos. In this case, the rectangle detection algorithm should be tried, or splits should be added manually. If automatic detection is required, other products such as ScanSpeeder or AutoSplitter may be more successul.



Where photos are touching each other on the scanner (as shown below left), there are no rectangular boundaries of the filled region around the touching photos as shown below (right) . This will resukt in the touching photos not being detected.

2. Cannot connect to scanner

Ensure that the scanner is switched on and connected to the PC, either via a USB port or a wireless connection. Then check that the scanner works using existing scanner software. If the scanner works with existing scan software but not with ImageSplit, then use existing software to save a scan as a 24-or 48-bit colour file and load this into ImageSplit.

3. How I can I best use ImageSplit for a large number of photos?

If you wish to digitise a large number of paper photos and add visible captions to them, the easiest way to do this is to use the file name as the caption, and then use the Auto-caption facility of Caption Pro to insert the file name as text within the images as a single operation. However, the following characters are not allowed in file names, and thus cannot be used in captions applied in this way

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\/:*?"<>|
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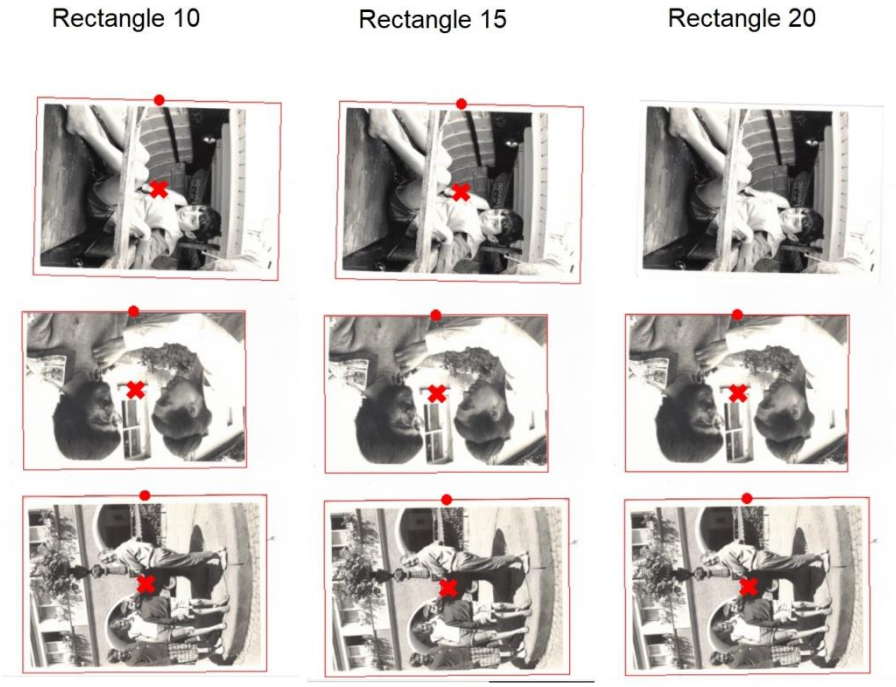
If captions are added manually in Caption Pro, any character can be used (including Asian languages).

4. ImageSplit crashes. How can I get support?

ImageSplit creates a log file and writes to it at various stages in its operation. The log file is stored in the user's My Documents folder with the name ImageSplitLog.txt. Email this file to support@alekaconsulting.com, if possible accompanied by a screenshot of the application before it crashed.

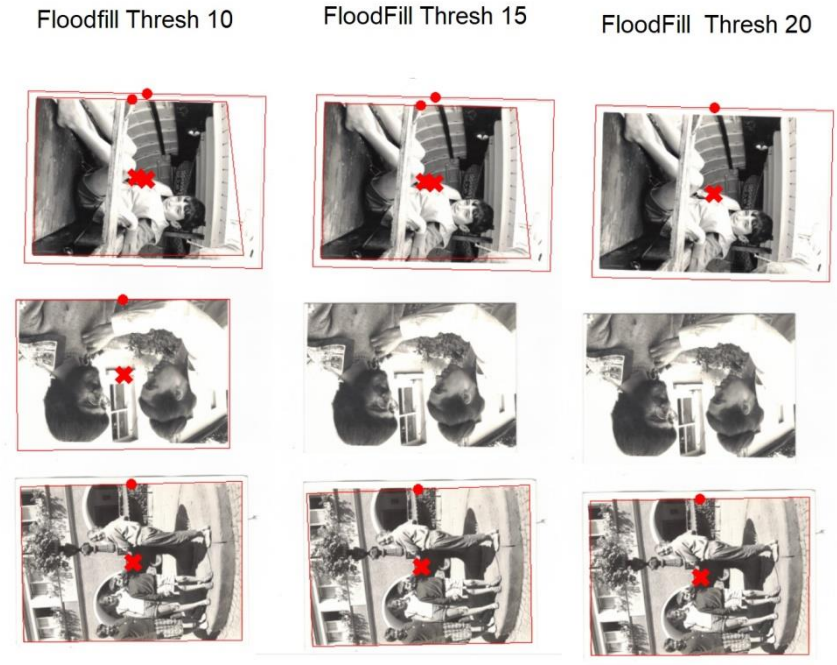
Examples of splitting with different algorithms and parameters

24 bit colour scan, 600 dpi, rectangle detection



No difference from changing threshold from 10 to 15, 1 image missed at 20.

24 bit colour scan, 600 dpi, floodfill detection



Threshold of 10 detects all photos but adds a non-boundary split to one. Other values miss one of the photos.