

Chapter

7

Compare with SimulCam

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1 Compare with SimulCam

The SimulCam technology provides you with a unique analysis capability for comparing two athletes' performances blended onto a single background. This enables you to view and analyze often imperceptible differences between these performances, and discover precisely what made one performance stronger than the other.



SimulCam



SimulCam Fixed

In essence, SimulCam has a similar purpose to using the Analyzer module's *Basic blend* view, however the end result is vastly superior: Basic blend is unable to track the relative movements of the background features, making comparison near impossible if the camera zooms or pans during filming. Basic blend results in ghostly, semi-transparent figures whereas SimulCam creates a more realistic picture.

Required to use SimulCam:

- Camera on tripod
- Pan, tilt and zoom allowed during filming.
- Video clips can be recorded at different times but must be taken by a camera in exactly the same position.

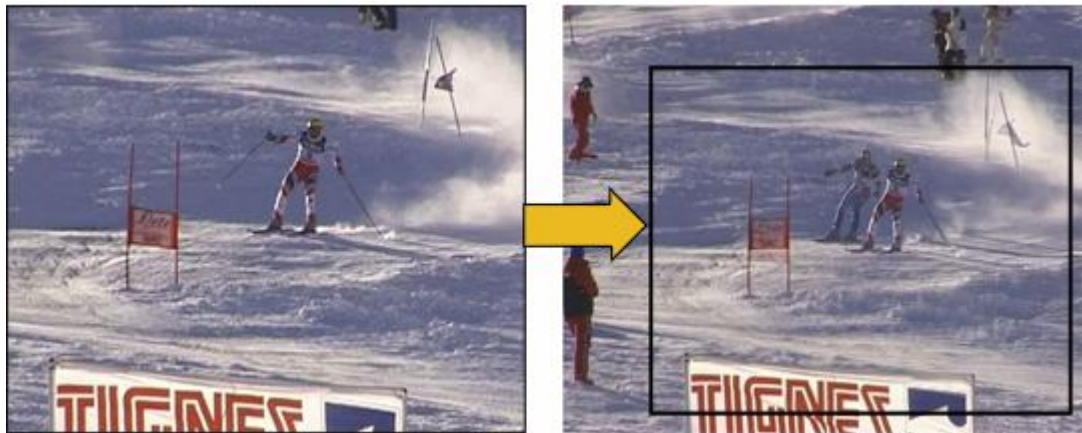
Required to use SimulCam Fixed:

- Camera on tripod,
- No change in pan, tilt or zoom allowed during filming.
- Video clips can be recorded at different times and different places but must be taken by a totally fixed camera.

1.1 Simulcam

SimulCam compares two video clips filmed from the same view point at different times and is used when the camera pans or zooms during filming. If the camera does not pan or zoom use the *SimulCam fixed* module (see [SimulCam fixed](#)).

To compare performances, SimulCam estimates the camera movement (pan, zoom and tilt) by matching and tracking the background features in the two video clips. Using this information, the two backgrounds can be aligned and blended into a single one.



The steps in using it are to:

1. Step 1 - clip selection and synchronization. Two video clips are loaded. To be comparable the two clips should then be synchronized.
2. Step 2 - camera movement calculation. Background features are matched and the amount of camera pan and zoom is calculated.
3. Step 3 - blending, preview and saving the clips. You can also save the SimulCam project if you wish to make changes to any of these steps later.

1.1.1 Getting good SimulCam results

Remember, the SimulCam technology matches backgrounds of two video clips; it will have difficulty doing this under the following conditions:

Insufficient number of background objects

For example; snow. Imagine trying to identify the same point on a white background from frame to frame. Your brain is still better than a computer's so "what the eyes cannot see, the computer cannot!".

- Avoid this by not zooming too closely on the subject. Even on snow, shadows, rocks, slalom gates etc can still be used but only if enough of these distinguishable objects appear in each frame of video.

Background is blurred

Its the same problem, if background objects become blurred or out of focus, SimulCam is unable to calculate where they have moved to.

- Use a tripod or another solid object to mount the camera.
- Zoom and pan smoothly and slowly.

Backgrounds are different

SimulCam can only compare if the content of the background is similar in each video clip.

- Always film from the same position. If it helps you remember, mark the spot!
- It does not matter if a different zoom has been used for each clip - the backgrounds only have to contain similar objects filmed from the same direction. SimulCam will calculate the difference in zoom.

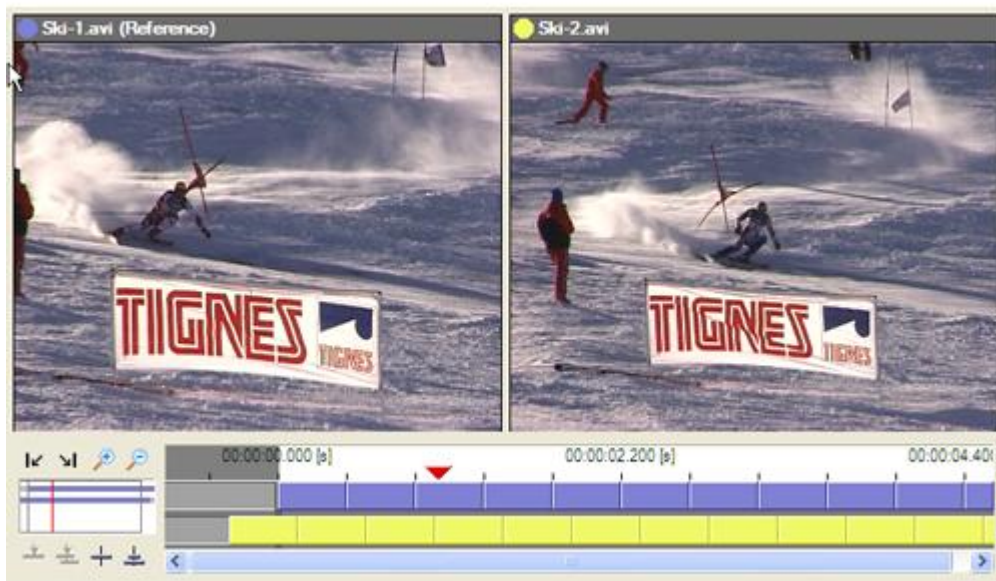
1.1.2 Step 1 - clip selection and synchronization

Step 1 of the SimulCam clip creation process consists of:

- Loading two video clips containing the performances to analyze.
- Synchronizing the clips for optimum comparison.
- Trimming the video by selecting appropriate cue in & out points.

1.1.2.1 Loading video clips

SimulCam compares two clips. Drag & drop each clip you wish to compare from the items list on to SimulCam's left and right video display windows.




! At this point, you can exchange either clip for another clip by simply dragging and dropping a different clip from the *Items list* or *Tray*.


! The video format must be DV (.avi), for example it is not possible to create SimulCam images from Windows media (.wmv) video or MPEG (.mpg). Also, the two clips cannot be of different formats (for example, NTSC and PAL).

1.1.2.2 Synchronizing video clips

SimulCam has a set of easy-to-use tools to help you synchronize the two video clips. These tools are located at the bottom of the SimulCam window.

To synchronize the video clips:

1. Click and drag the timeline cursor  until you see an easily identifiable moment in the first video clip. For example, find the instant where a long jumper's foot hits the board, when a skier passes a gate, when a golfer hits the ball etc.
2. Click and drag the yellow timeline (this represents the second clip) left or right until you see the same image in the second video clip.

 Fine-tune the video frame selected using the left and right cursor movement keys of your keyboard

! It is important that you choose a starting frame with clear static elements that appear in both backgrounds. This will help you align the backgrounds in the next step.



! A "perfect" synchronization does not always yield a perfect analysis. The overlap between both performers may be too high, hiding important details. In this case, try to add one or two frame shift between both video clips.

! If the video clips contain synchronization points, they are automatically synchronized when loaded.

1.1.2.3 Trimming the clips

This means selecting the portion of the video clips you want to analyze. This is done by setting cue in and cue out points.

To set cue in & out points

1. Position the red cursor at the beginning of the portion and click on the *Set In* button ().
2. Position the cursor at the end of the portion and click on the *Set Out* button ().

 It is worth taking time to trim the clip to the section of the video you wish to compare as this considerably reduces the time taken to produce the final result clip. Also, experienced SimulCam users will be able to avoid sections of video where SimulCam is not able to make comparisons.

1.1.3 Step 2 - camera movement calculation

In this step, calculation of the camera movements is initiated. This is required by SimulCam to blend the two performances onto a single background.

In this process, similar features in the backgrounds of the two video clips are manually aligned by one of two methods:

1. *Drag & zoom alignment* - Backgrounds are aligned by blending the first frame of each clip then zooming and dragging one frame above the other until backgrounds match.
2. *Matched alignment points* - Several matching static background features are marked with alignment points on the first frame of each clip.

Which method is best?

We recommend that you try both methods to decide which one is most comfortable for you. By default, your software uses the *Drag & zoom alignment* method. Use the following notes as a guide.

- In general, manual alignment by the *Drag & zoom alignment* method is quicker.
- *Drag & zoom alignment* requires you to zoom using scroll function of your mouse or the [+] and [-] keys of your numeric keypad (refer to your laptop documentation). If neither of these are convenient for you then *Matched alignment points* might be a better choice.
- The *Matched alignment points* method is sometimes a better choice when the video images do not match well.

To select the calculation method

The calculation method can be changed at any time before or during SimulCam.

1. Select *Tools>Options* from the menu bar (or press F3).
2. Select the *SimulCam* topic from the list on the left.



3. Select the mode. Note that you can *Set as default* your choice of calculation method.

1.1.3.1 Drag & zoom alignment method

The *Drag & zoom alignment* method consists of dragging and resizing the image of the first video clip on top of the other clip until the two backgrounds match perfectly. Step 2 using Drag & zoom alignment looks like this:




Images from both videos are blended but the backgrounds still have to be aligned for each of the 3 pairs of images displayed on the left hand side of the module.

Adjusting Zoom

If the camera used different zoom while filming the two video images this can be compensated for by resizing the top video image.

1. Click the blended video images.
2. Adjust the size by using the mouse scroll function.

 If your mouse has no scroll function or it does not operate zoom then use the [+] and [-] keys on the numeric key pad of your keyboard. Different laptops use different methods of activating and operating the numeric keypad; refer to your laptop's manual to find out.

Aligning backgrounds

When images are a similar size, they can be aligned - although you may have to align then zoom again to get a perfect match.

1. Click & drag anywhere on the blended video images, the top image will move over the image below it.
2. Focus on one or more objects in the background; the stands, objects on the field, posts, equipment, etc. and align those objects.

Repeat Alignment for the other pairs of images

The first pair of images show the background of the two different video clips. The alignment process needs to be repeated for the two remaining pairs of images. These pairs are used to calculate movement from one frame to the next in each clip so if movement is slight this will be much quicker than aligning the different video clips.

1. Click the second pair of images listed on the left hand side of the SimulCam module.
2. Align them.
3. Click the second pair of images listed on the left hand side of the SimulCam module.
4. Align them.

The end result of step two is illustrated below. Click the *Next* button to proceed.



1.1.3.2 Checking alignment

Check the alignment quality using the transparency cursor.



Drag the cursor to the left and to the right. If you feel that the background is moving, it means you need to keep aligning the two backgrounds.

! If you still cannot align the background, after repeated zooming and alignment, this could

mean that the camcorder tripod moved during your recording session. In this case, it is not possible to create SimulCam video clips. You still can compare performances but you will need to use the split screen functionality of the *Analyzer* module.

1.1.3.3 Matched alignment points method

The *Matched alignment points* method is a process of placing markers on similar features in the background of both video clips. The alignment point window is illustrated below:



Selecting background alignment points.

In this method, at least two points are set on objects in the background of the first image and then set on the same objects on the second background. This is repeated for all three pairs of images listed on the left hand side of the SimulCam module. It is best to use obvious points of high contrast as illustrated in the following pictures:



Also it is essential that these background points are fixed objects: People or the top of the slalom gate in the above clip would not be good choices because they move!

To define alignment points.

1. Click on the first clip's title above the video display. A frame of the first clip is displayed in the main screen. (Ski 1 in the illustration below)



2. Click the left mouse button on a static background feature. The feature is marked as shown below.



3. Now click a second and perhaps a third object. They will be labeled similarly; you must set a minimum of two alignment points but defining more may improve the background alignment.
4. Click on the second clip's title above the video display. A frame of the second clip is displayed.
5. On the second clip, click the same background objects that you selected on the first clip *in the same order so that the numbers match*; the thumbnail on the left displays the previous selections and can act as a guide.
6. Click on *Visual Check* on the process bar. A combined image of both frames is displayed. The backgrounds should appear aligned.

If you need to delete a numbered mark because the elements are not in the second image or are not positioned correctly, right-click on the mark you wish to delete. Then left-click in the correct position and a marker with the same number appears again.

If the backgrounds do not match in the *Visual Check*, make sure that the alignment points are placed correctly and that point 1 matches point 1 in each image etc. If backgrounds still do not match then adding further points will improve accuracy.

7. Select the second pair of images from the thumbnails on the left of the SimulCam module. These images compare camera movement from one frame to the next in the same video clip.
8. This time feature points are already set but you need to check they are positioned correctly. Use the techniques described in step 6 to remove and reposition feature points as required.
9. Repeat for the third pair of images.
10. When complete proceed to the next step by clicking on the *Next* button.

1.1.3.4 Adding new alignment frames

Both methods to complete step 2 require that you match the backgrounds in the starting frame of your clips. However, if the backgrounds in this frame are too different, they do not include clear common background elements or the objects are blurred you will need to set a different start frame.

To set a new start frame.


1. Go back to step 1 by clicking the *back* button.
2. Set a new cue in at a start frame that is more appropriate.
3. Repeat step 2.

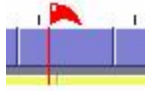
Setting new alignment frames.

It is essential that the start frames match but additional frames can be set where backgrounds can be realigned. This might be necessary for clips that "jump" because of a change of camera angle, or because the images have become blurred during panning or the clip does not include part of the action in a particular frame.

New alignment frames are represented by flags in the timeline. Once you add a flag, you will be able to realign the backgrounds in that particular frame as described previously.

To add a flag.

1. Go back to step 1 by clicking the *back button*.
2. Drag the current position indicator  along the timeline to the new alignment frame.
3. Click on the *Add flag button* . A new flag is added to the timeline. A red flag indicates that the background alignment still needs to be performed for this particular moment



4. Other icons allow you to jump to the next or previous flag and to delete a flag.



5. Repeat step 2 for each flag added.

1.1.4 Step 3 - blending, preview and saving

Step 3 enables you to:

- Select the blending mode
- Start the calculation of the SimulCam clip and watch a preview
- Save the SimulCam video clip

1.1.4.1 Blending mode

The SimulCam image quality may vary depending on the blending mode. You can choose from three modes and use the preview to experiment with what works best for your sport.

1. *Motion-based*: In most cases, this is the best mode to use for generating a blend. It is based on the camera movement.
2. *Color-based*: Use this mode when your clip features a lighter colored background than the performer. For example, snow, sand, concrete. Light colors are "pushed" into the background.
3. *Constant*: This is the fastest blend calculation mode, however, the resulting quality is poorer than the other modes. Use this mode when you want to get a rapid result.

Use the drop-down list to select the blending mode



1.1.4.2 Previewing your clip

It is not necessary to use the preview function but it will help you decide the best blending mode and whether additional alignment is needed.

To preview, click on the *Start preview* button. The SimulCam clip will be displayed in the main screen as the calculation progresses. At any moment, you can decide to stop the calculation by pressing the *Stop preview* button. You can now experiment with different blend modes to compare which gives the best result.

If the SimulCam can be improved, go *Back* to the previous steps and redo cue in, alignment, blend mode etc.

This done, it may be that there is still a progressive misalignment of the backgrounds. If this happens, stop the preview and try one of the following.

1. Add an alignment flag to the frame where the background misalignment begins (see [Adding new alignment frames](#)).
2. Select a different first frame - as described in [Step 1](#).



It is much quicker to preview using *Constant Blending mode*. When satisfied that alignment is correct switch blending mode to *Motion-based* or *color-based* for a better quality result.

1.1.4.3 Saving SimulCam results

There are two potential end results of a SimulCam project:

- the creation of a new video clip using the [Publish](#) process
- the SimulCam project itself.

Saving the SimulCam project

To do this select the *Save...* option from the *File* menu. Saving the project is not always necessary but may be useful if you wish to return to the project to make changes in the future. SimulCam projects appear in the *Items List* represented by the following icon:



Starting a new SimulCam project

To initiate a new project select the *New* option from the *File* menu.

1.1.5 Publishing new video clips

The publish process uses a wizard to guide you through creating new video clips resulting from SimulCam, SimulCam Fixed, Stomotion and Stomotion fixed. It is used to:

- Save and name the video clip.
- Categorize the new clip using categories.

Initiate the *Publish* process by clicking the Publish button at the bottom right of each module.

1.1.5.1 Choosing video settings

The first step is to select which encoding profile you wish to use for the clip. A range of encoding profiles exist to allow you to select an appropriate format for the eventual use and location for the video. For example, if the video clip is lengthy or needs to be sent by email, you may decide to use an encoding profile which compresses the result into a file of smaller size (see [Converting video](#) in the Getting Familiar chapter to learn more about video settings).

After selecting a profile, click the *Next* button to continue.

1.1.5.2 Assigning file name, destination and categories

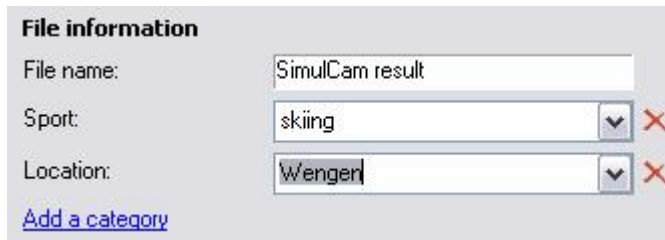
File name

Type a name for the video clip in the *File Name* text box. If this box is left blank the generic filename of "Untitled" will be applied.

Categorize clips while saving

If you use Dartfish's category/value video management system (see [Organizing your library](#) in the Video Library chapter) then you can benefit from categorizing new video clips as they are saved. The method for doing this is to create a form listing a box each category that you wish

to use then selecting existing values from these categories or entering new ones. An example is shown below. The same method is used for [categorizing captured video](#).



File information

File name: SimulCam result

Sport: skiing

Location: Wengen

[Add a category](#)

Destination folder

This is the physical location on the computer (drive and folder) where the new clip will be stored. Type the location or click the *Browse* button to search and select a folder.

Conflicting file options

If the file name matches that of another file in the destination folder the *conflicting file options* setting allows a choice of overwriting the original file or renaming the saved file. If the latter option is chosen, the new video file will be suffixed with a number. For example, if "World cup" already exists a new file would be called "World cup(1)".

1.1.5.3 Video creation

The final step automatically initiates the creation of the new video file according to the settings chosen in the wizard's previous steps. The time taken to render the new video will depend on the power of the computer and the size of the new file; progress of creation is indicated.

You will be notified when the publishing process is complete and, by default, the new video clip will be added to the *Tray*, allowing convenient access to replaying it in the *Player* or *Analyzer* modules.

1.2 SimulCam Fixed

SimulCam Fixed compares two video clips filmed at different times and/or different locations using a fixed camera. If the camera pans or zooms during filming use the SimulCam module instead (see SimulCam).

In SimulCam Fixed, the performer in the first video clip is extracted from its background and projected onto the second video.



To do this, the background needs first to be identified by using frames of video where no performer is present; these frames may be part of the current clip or may be a separate clip of the background alone. If the two clips are filmed on different backgrounds it is possible to

select which background to use allowing you to transport one athlete through time and space to perform next to another.

The steps in using it are to:

1. Step 1 - Background identification - Identify which pixels of the image belong to the background
2. Step 2 - Performer(s) extraction - Synchronize and extract the performers which are to be compared
3. Step 3 - Blend & save - Adjust the blending. You can also save the SimulCam Fixed project if you wish to make changes to any of the steps later.

1.2.1 Getting good SimulCam Fixed results

Here are some tips for getting good SimulCam fixed results.

Remember to film the background!

In order to extract the performer from its background, you should have at least one frame of video showing the background but WITHOUT the performer present. This can be done in two ways:

1. Record a separate clip of the background before you start to film the action.
2. The background shot may be the first few frames of video before the performer enters the field of view.

Fixed means fixed!

The camera cannot move or zoom during filming and it can't move or zoom between filming the background and filming the performer. Using a tripod is therefore essential.

If comparing performers at the same location on different occasions it will help comparison if you use the same position and zoom each time. Mark the position and take note of the zoom used.

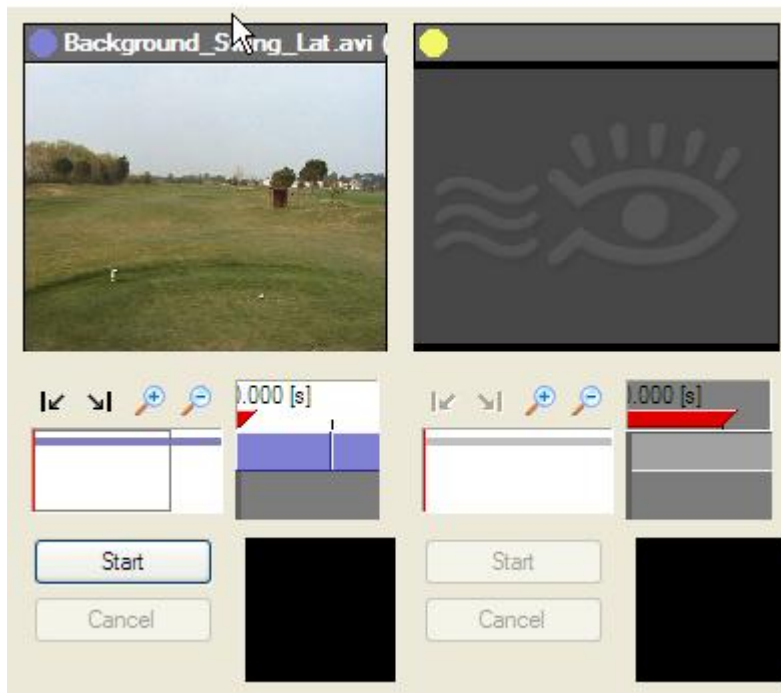
1.2.2 Step 1 - Background identification

This step consists of:

- Loading clip(s) showing the background for the video clip from which you wish to extract the performer.
- Trimming the background clip(s)
- Starting the background identification for each clip

Loading background clip(s)



1. Select the SimulCam Fixed icon on the icon bar. The Step 1 window appears and prompts you to select the background clips.
2. Drag and drop background clips from the *Items List* onto one or both of two video display areas.



! It is only necessary to load the background for the clip from which the performer will be extracted. If both backgrounds are loaded you can choose which background you wish to use in either step 2 or step 3

When the backgrounds are the same in both video clips, it is only necessary to load one background clip.

Trimming the background clip(s)

1. Position the red cursor at the beginning of the portion and click on the *Set In* button .
2. Position the cursor at the end of the portion and click on the *Set Out* button .

! Trimming the background clip means it will take less time to compute but trimming is essential if only a few frames of the clip contain the background without the performer.

Start the background identification

When the background(s) have been prepared click the *Start* button for each one. Shading on the timeline indicates progress. When complete, click the *Next* button to proceed to step 2.

1.2.3 Step 2 - Performer(s) extraction

This step consists of:

- Loading the clips containing the performers
- Synchronizing and trimming the clips
- Extracting the performer(s) from their background

1.2.3.1 Load, synchronize & trim action clips

When the Step 2 window is displayed, it shows the two processed background clips in small windows below two new blank windows (see illustration below).


Load clips containing action.

1. Drag and drop clip containing the action into each of the two video display windows. Ensure that you match each clip with the background shown in the thumbnail below. The screen will appear as follows.



! in our example, we will extract the left performer from its background and project it onto the background on the right.

Synchronize the video clips.

1. Click and drag the timeline position indicator  until you see an easily identifiable moment in the first video clip. For example, find the instant when a golfer hits the ball etc.
2. Click and drag the yellow timeline (this represents the second clip) left or right until you see the same image in the second video clip.



Fine-tune the video frame selected using the left and right cursor movement keys of your keyboard.

Trim the clips

The action clips should also be trimmed in the same way as the backgrounds were in step 1. The aim here is to show only relevant detail. It will take your computer less long to create the SimulCam Fixed video clip.

1.2.3.2 Extracting performers

The extraction process "subtracts" the background identified in step 1, from the corresponding video of the performer. Choose which performer(s) to extract from their background by selecting the extract option found under each image.



The choice you make depends on which background you wish to remove. If only one background clip was loaded in step 1, this must be the background extracted here in step 3. Your three choices are:

1. Extract left - the extracted performers will be blended on the background of the right hand clip.
2. Extract right - the performers will be blended on the background of the left hand clip.
3. Extract both - if both performers are extracted it is possible to make a choice of which background to use in the next step.

1.2.4 Step 3 - Blend & save

This step allows you to:

- Blend the clips and make final adjustments
- Save the clip and project for future work

1.2.4.1 Blend & adjust images

The aim here is to position, size and blend the two clips to achieve as clear an output as possible.

Select video A or video B

To adjust clips it is first necessary to choose which clip is to be adjusted. To do this, click the headings above either video A or video B:



! It is not necessary to select either heading; if a selection is not made, video B will be adjusted. The currently selected video is indicated by a thin white border around the heading.

To adjust alignment

Realigning the video images can be useful if one performer is obscuring the actions of the

other. To do this, point at the video image and move it by click & drag. The *Align videos* must be "On" for this to work:



To resize (adjust zoom) images

If, because of camera position or zoom, the performer in video A is a different size from the performer in video B, the zoom can be adjusted for the selected video clip. To do this:

1. Click on the image
2. Use the scroll wheel on your mouse to zoom in and out.

OR

Holding down the [ctrl] key, use [+] or [-] keys on the numeric keypad to zoom in or out.

! The method for activating and using the numeric key pad varies from laptop to laptop, refer to your laptop's documentation.

Flip images

Using the *flip* buttons, you can still compare video images even if they contain left and right handed players or one has been filmed from the left side and the other from the right.



To use these buttons simply click them to switch them "on" and "off".

Adjusting transparency



Adjusting the dominance of one image over the other can often produce a more natural looking result. Experiment with adjusting the transparency by using the transparency slider.

If two backgrounds were extracted, the transparency slider is used to select which background you wish to use.



1.2.4.2 Saving results

Saving the SimulCam fixed project and publishing the resulting video clip is identical to SimulCam without a fixed camera.

See [Saving results](#) and [Publishing new video clips](#) in the SimulCam topic.

1.3 Next steps

SimulCam & SimulCam Fixed are unique analysis capabilities for comparing two athletes' performances blended onto a single background. You may also be interested in the following topics:

- Read the topic [StroMotion & StroMotion Fixed](#) for another Dartfish special effect enabling you to dissect motion of a performer in a panoramic still image or a video clip.
- The Analyzer module offers another way of highlighting key frames and uses them to bookmark these moments and turn them into still images (read the chapter about the Analyzer to learn more).
- Having created these unique images, you may want to share them by CD, email or internet (see [Sharing video files](#) in the Video Library chapter).

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