Removing a Moving Object with the Motion Key Filter

One of the more exciting new features of Boris Continuum Complete version 4.0 is the new BCC Motion Key filter. The Motion Key filter isolates and removes moving foreground images based on motion vector fields the source image. This filter continues the Optical Flow development first introduced in the version 3.0 Optical Flow and Motion Bur filters.

In this tutorial, you use the new BCC Motion Key filter to successfully remove a moving foreground object from a clip. In this example, the object you remove is a silver car.

Whenever possible, Boris Continuum Complete includes custom integration that benefits each host application. In Adobe After Effects, you can use a custom AE mask instead of the preset shapes to define the region or shape to remove. Because of this, a separate tutorial has been provided for After Effects users.

1. Create a new sequence or composition and edit a clip into the sequence.
The clip used in this tutorial, DSF110.mov, is provided courtesy of Artbeats (www.artbeats.com), although you may use any media that you wish.

2. Select the track and use the appropriate method to apply the BCC Motion Key effect.
   - Adobe Premiere Pro users should choose Effect > BCC4 Keys & Matte > BCC Motion Key.
   - Apple Final Cut Pro users should choose Effects > Video Filters > BCC4 Keys & Matte > BCC Motion Key. Double-click the clip to display the filter parameters in the Filters tab.
   - Apple Motion users should choose Window > Library and click the 3rd party Filters category on the left side of the Library window. Click the BCC4 Keys & Matte category and drag the BCC Motion Key thumbnail to the Canvas or the Layers Pane.
   - Autodesk Combustion users should click the Operators tab, choose BCC4 Effects from the menu then click the BCC Motion Key filter. Press F8 to display the filter parameters.
   - Eyeon Fusion users should select the loader and choose Tools > AE > BCC4 Keys & Matte > BCC Motion Key.
The Motion Key filter parameter controls appear.

3. Play the clip. It is a locked down shot with a silver car passing through an intersection. You will remove the silver car from this clip.

4. The Mode menu defaults to Setup Region, which allows you to define a region or shape that contains the moving object. Since the object is moving, you need to keyframe the region.

5. Press the Area Selection menu and choose Rectangle. By default, the Oval shape is used, so a while oval initially appears over the image.

The Area Selection menu sets the shape of the area to replace. When Rectangle is chosen, a rectangular area is used.

6. At the first frame in the clip add a keyframe (or multiple keyframes for those hosts that keyframe per parameter).

Now you will position the rectangle so that it encompasses the car. This is the area that will be replaced. Ideally the background outside your replacement area should include good contrast as well as vertical and horizontal edge definition. Repeating or uniform patterns such as grass or sky can be difficult to replace.

7. The Area Position/Offset, Area Scale and Area Aspect parameters let you animate the position and scale of the area to replace to increase the accuracy of the results.

   • Area Position/Offset sets the X and Y position of the Setup Region. In general it is easier to use the onscreen point controls to set up your area. Then use the position controls for finetuning.

   • Area Scale sets the size of the Setup Region.
• **Area Aspect** sets the aspect ratio of the Setup Region. Increasing positive values stretch the rectangle horizontally; decreasing negative values stretch the rectangle vertically.

8. Move a few frames forward, add a new keyframe and reposition the rectangle so that it surrounds the car.

9. Continue to follow this method of moving forward a few frames, adding a keyframe and repositioning the rectangle until you have completed the entire clip.

Your results should appear similar to the following examples.

10. Set the **Mode menu** to Show Mask. The colors displayed in the mask region indicate the filter’s confidence of removing the object. A clear area means that the filter cannot remove the object. Red areas will be successfully removed. Blue areas indicate a good chance of removing most pixels.

    Now you may want to adjust some additional parameters to finetune your results.
11. Increase the **Replacement Range**. Replacement Range limits the frames that are used as source material relative to the current frame. This can provide a better result depending on the speed of the moving object and the number of frames in the clip. With the example clip, the default range of 30 uses half of the frames in the movie. Increasing this to a value of **60** will use almost all the frames.

12. Increase **Feathering** slightly to soften the edges of the masked area.

13. **Luma Compensation** helps to compensate for luminance changes in the image. Increase this parameter to a value of **100**, to alter the luminance of the areas taken from alternate frames to match the luminance of the current frame. This helps to correct small changes in lighting.

14. Set the **Tracking Mode menu** lets you choose how to calculate the tracker data. The tracking data is calculated for the area outside the selection area. Since this is a locked down shot, choose **Translation** to tracks the motion on the X and Y axis only. If you are using your own media, you may want to use one of the following options.
   - **+Rotation** takes motion and rotation into account when tracking the background.
   - **+Zoom** takes motion, rotation and scaling into account when tracking the background.

15. To view the final result, set the **Mode menu** to **Remove Area**.

   The Motion Key filter is very render intensive. There can be a considerable delay when switching between the Mode menu settings.

16. When the filter finishes processing the image, check to ensure that the foreground object has been removed to your satisfaction. If you are happy with the results, render your image.

17. If there are problems, you can adjust the **Optical Flow parameters** to try to correct them. To do this, set the **Mode menu** to **Show Vectors**. This option displays onscreen motion vectors. The array of vector lines indicate the direction of motion of the pixels in the image in the current frame.

   The Optical Flow parameters analyze the frames before and after the current frame to determine the pixels that need to be replaced. Pixels from adjacent frames cover the replacement area in the current frame.
18. Increase the Tracking Samples value. This sets the number of samples that the filter takes. The filter breaks the images into a matrix; this parameter controls the number of cells in that matrix. Higher values produce more accurate analysis but increase rendering times.

19. Span sets the percent of the frame’s pixels that are used to determine the frame’s dominant motion. Increasing values can improve the tracking accuracy, but only to a point. This parameter is image-dependent. The default value works with a wide variety of images, but if you are having problems, experiment with this setting.

20. Edge Contrast sets a threshold for the minimum amount of detail in a region. Regions containing less detail than the threshold are treated as having no detail. If your image includes a lot of motion in areas that are very detailed or small objects, decrease this value. Min. Edge Contrast does not depend on the motion, only the texture and detail of the image.

21. The Resolution menu adjusts the quality of the output. The optical flow estimation algorithm has sub-pixel accuracy, so the default of Draft generally produces good results. However, if the motion estimation appears incorrect, set the Resolution menu to Full.

If the Optical Flow does not look correct at a particular frame, move to that frame and reduce the resolution. Adjust the Velocity parameters until you see a better output. Then increase the Resolution menu setting and finetune as necessary.

22. Velocity Limit constrains the magnitude of motion estimation. Decrease this value if the motion estimation appears incorrect. This value corresponds to a percentage of the size and resolution of the Source Layer. For example, when working with a D1 image, the value of 100 corresponds to approximately 100 pixels.

23. Low Velocity Correction sets a threshold for detecting motion in a region. If the Optical Flow moves an area that should not move, adjust the Low Velocity Correction value.

24. Once you have finished finetuning any problems, set the Mode menu to Remove Area.

The Motion Key filter is very render intensive. There can be a considerable delay when switching between the Mode menu settings.

25. Render as you would any other effect.