
ROLLINGSHUTTER
BY THE FOUNDRY

RollingShutter 1.1 User Guide

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Contents

INTRODUCTION

Welcome to this User Guide for RollingShutter 1.1 on After Effects. RollingShutter is a plug-in that estimates a corrected image from an image sequence captured with a CMOS camera.

The plug-in compensates for the skewing of objects caused by their relative motion to the camera. Adjustment is performed locally, so objects moving in different directions or at varying speeds can be individually corrected. The correction can help make a shot trackable and remove visual artifacts from the distortion of objects.

The RollingShutter plug-in integrates seamlessly into After Effects. It is applied to your clips as any other tool and animated using the standard After Effects animation tools.

About this User Guide

This user guide will tell you how to install and use the RollingShutter 1.1 plug-in. The usage of the plug-in is described in detail in the next chapter.

This guide assumes you are familiar with After Effects and the machine it is running on.

Note *For the most up to date information, please see the RollingShutter on After Effects product page and the latest RollingShutter 1.1 on After Effects User Guide on our web site at http://www.thefoundry.co.uk.*

What's New?

Have a look at the new features and improvements in Appendix A.

System Requirements

RollingShutter 1.1 plugs into Adobe After Effects CS5 running on Windows or Mac OS X.

Installation

On Windows

RollingShutter is distributed as a software download from our web site at http://www.thefoundry.co.uk/. To install RollingShutter on a computer running Windows follow these instructions:

1. Download one of the following files from our web site at www.thefoundry.co.uk:

   RollingShutter_1.1v2_AECS5-win-x86-release-64.exe
2. Double click on the exe file to launch the installer. Follow the on-screen instructions to install the plug-in.
3. RollingShutter will be installed but not licensed. It will render the effects with a watermark.

   Proceed to "Activating RollingShutter" on page 7 to get your license.

On Mac

RollingShutter is distributed as a software download from our web site at http://www.thefoundry.co.uk/. To install RollingShutter on a Mac, follow these instructions:

1. Download one of the following files from our web site at www.thefoundry.co.uk:

RollingShutter_1.1v2_AECS5-mac-universal-release-64.dmg

2. Double click on the downloaded dmg file.
3. Double click on the pkg file that is created.
4. Follow the on-screen instructions to install the plug-in.
5. RollingShutter will be installed but not licensed. It will render the effects with a watermark.

   Proceed to "Activating RollingShutter" on page 7 to get your license.

Install Directory

By default, the RollingShutter plug-in is installed in one of the following directories:

On Windows

- C:\Program Files\Adobe\Adobe After Effects CS5\Support Files\Plug-ins\
- C:\Program Files (x86)\Adobe\Adobe After Effects CS5\Support Files\Plug-ins\

On Mac OS X

- /Applications/Adobe After Effects CS5/Plug-ins/

Activating RollingShutter

Once you have installed RollingShutter, you will need to activate the product. Successful activation gives you a license key that unlocks the software.

If you have a serial number for RollingShutter, you can activate the plug-in via the Internet or by telephone.

If you don't have a serial number for RollingShutter, you can activate the plug-in by telephone.

Activation via Internet

1. Start After Effects.
2. Apply a RollingShutter plug-in to a layer in a composition.
3. Press the **About** button and make a note of your System ID (sometimes called lmhostid). This number is unique to your machine and your license key will be locked to it. Click the dialog that appears to make it go away.
4. Press the **Activation** button at the top of the plug-in.
5. This launches a web browser. Check that the System ID shown on the web page is correct. If it is not, or you wish to activate for a different computer, follow the on-screen instructions.
6. Type your serial number into the box provided. Make sure you type it in exactly as shown. Click **continue**.
7. If successful, you will be taken to a page that let's you download your license file and the Foundry License Installer (FLI). From the pulldown menu, select the installer for your operating system, and click **download license**.
8. Double-click on the downloaded file to extract the license key and the Foundry License Installer (your computer may do this automatically). The license will be in a plain text file called foundry.lic. The license will look a bit like this:

```
INCREMENT rollingshutter_ae_i foundry 1.1 permanent uncounted \
HOSTID=0022411f0759 ISSUED=7-jul-2009 SIGN="0118 0259 3106 \
D626 F32A 54BC EA70 EFC6 AC23 0575 BD01 67F6 0D9B 9176 36A7 \
128A C706 C495 C017 34B8 8125"
```

Once you have downloaded the license file, proceed to "Installing a License" on page 9.

Activation by Phone

Call our London office on 020 7434 0449 (country code 44) or phone our Los Angeles office on 310 399 4555. You will need your System ID ("System ID (lmhostid)" on page 9), an e-mail address for us to send the license key, and, if you have one, a serial number.

Installing a License

Once you have received your license file, you need to install the license. The Foundry License Installer (FLI) application helps you with this. You may have received this application in an e-mail or downloaded it from http://www.thefoundry.co.uk/licensing.

To install a license:

1. Open the directory where you have saved the license file and the Foundry License Installer.
2. Double-click on the Foundry License Installer application.
3. In the window that opens, click **Install**.

   This checks the license file and installs it into the correct directory.

If you installed a node-locked license key (a license that allows you to run the software on one machine only), you're good to go. Start After Effects and check your plug-in is licensed. If it is not, check that you have a foundry.lic license file in the correct directory. See "Where Does the License File Go?" on page 10.

If you are installing a floating license key, you will be asked whether you want to create a client license file. For more information on how to install floating licenses, see "Background Rendering" on page 12.

System ID (lmhostid)

The System ID (sometimes called lmhostid) is a unique number that identifies your computer. We use this number to generate a license key for that, and only that, computer.

The System ID is shown at the bottom of the help dialog. Click on the **About** button in the RollingShutter controls to

display this number.

Where Does the License File Go?

The license file should be called foundry.lic and saved in the following directory as a plain text file.

Mac

If you're on a Mac, this is where the license file should go:
/Library/Application Support/TheFoundry/FLEXlm/foundry.lic

Windows XP

If you're on Windows XP, this is where the license file should go:
C:\Program Files\The Foundry\FLEXlm\foundry.lic
C:\Program Files (x86)\The Foundry\FLEXlm\foundry.lic

Windows Vista

If you're on Windows Vista, this is where the license file should go:
C:\ProgramData\The Foundry\FLEXlm\foundry.lic

There are also other places where you can place the license file. See "Alternative License Directories" on page 10.

Alternative License Directories

If you like, you can also put the license file in an arbitrary directory and point to it with the environment variable: FOUNDRY_LICENSE_FILE

This can be useful for large post houses that have centrally managed license servers, but will not be necessary for most customers.

See "Further Reading" on page 14.

Can I Install RollingShutter on More Than One Computer?

You can install RollingShutter on as many machines as you like, but a watermark will be drawn over the image if there isn't a valid license key for that machine.

If you wish to render the RollingShutter plug-in on a network of render-only versions of After Effects you will need to purchase RollingShutter render licenses.

See "Background Rendering" on page 12.

Watermark

If you don't have a valid license key, a warning will be displayed and the finished render will have scattered coloured dots across it.

License Problems

If you can't get your licenses to work, you can download the Foundry License Diagnostics (FLD) utility from http://www.thefoundry.co.uk/licensing. Run the FLD and e-mail the resulting text file to support@thefoundry.co.uk with a clear description of the problem.

Error Log Files

If the plug-in fails to get a license, the incident is recorded in an error log file. The time, date and nature of the problem are appended to the end of the file. The error log file can then be found in the following location:

Mac

/Library/Application Support/TheFoundry/FLEXlm/log/license.log

Windows XP

C:\Program Files\The Foundry\FLEXlm\log\license.log
C:\Program Files (x86)\The Foundry\FLEXlm\log\license.log

Windows Vista

C:\ProgramData\The Foundry\FLEXlm\log\license.log

Background Rendering

In After Effects Pro, you can render on a network of computers using watch folders. If you want to do this for compositions that use RollingShutter, you will need:

- The RollingShutter plug-in installed on the networked computers.
- A valid RollingShutter license key for each networked computer.

You may need to purchase additional license keys from The Foundry. Without these, the After Effects Render Engine will render RollingShutter with dots scattered on the image.

There are several ways of licensing a network of machines, but the most common and flexible would be to purchase a number of floating render licenses and have a license server manage these licenses. Render license keys will allow you to process RollingShutter using After Effects Render Engine, but not the full After Effects program. Render licenses are much cheaper than full licenses.

Here is an overview of the processes needed to set up a

floating license network to render RollingShutter on up to five After Effects render engines using a Mac as the license server.

Buy a License Key

Contact The Foundry and buy a RollingShutter floating license for five machines that will run on a server with System ID = 000EA641D7A1.

Configure the Server

1. On the server (whose machine name is Red), take the license key you bought (foundry_float.lic) and install it using the Foundry License Installer (FLI), which you can download from http://www.thefoundry.co.uk/licensing. Here's that license key:

```
SERVER Red 000EA641D7A1 30001
VENDOR foundry
INCREMENT rollingshutter_ae_r foundry 1.1 permanent 5 \
START=8-aug-2009 SIGN="00FF 6A1B 735B A476 2069 \
0A10 6894 4903 E2CF A238 7A01 1A15 1808 7BCF 346C \
F59E 8899 F53C 2B13 E204 C7FD"
```

2. When you are asked whether you want to create a client license file, accept. This creates a client.lic file, which you need to save on your machine.
3. Download and install the Foundry FLEXlm Tools (FFT) from http://www.thefoundry.co.uk/licensing.
4. Having installed the Foundry FLEXlm Tools (FFT), do the following:

   On a Mac: Go to /Applications/TheFoundry/FLEXlmTools[version]/ and double-click on the Foundry Server Utility.

   On Windows: Select Start > All Programs > The Foundry > FFT[version] > Foundry Server Utility.
5. Press Start Server.

Configure the Clients

1. On each of the five render engines, install the RollingShutter plug-in.
2. Take the client license file (client.lic) that was created when you installed the floating license on the server and copy it to each of the render machines. Also copy over the Foundry License Installer.
3. Now install this license on each render machine using the Foundry License Installer.

Further information on setting up a machine to manage these licenses across a network, including how to set up a Windows render network, is beyond the scope of this user guide. See "Further Reading" on page 14. If you wish to discuss your particular requirements, please call us.

Further Reading

RollingShutter is licensed using FLEXlm. FLEXlm license keys can be locked to a particular machine (which is common for RollingShutter) or configured to manage licenses for multiple computers on a network. These floating licenses can be more cost effective if you have lots of machines which only need occasional access to RollingShutter.

Systems Administrators may wish to find out more about licensing RollingShutter with FLEXlm. We recommend reading the Foundry FLEXlm Tools (FFT) User Guide available to download from our web site (http://www.thefoundry.co.uk/licensing). In addition, there are general FLEXlm licensing guides on Macrovision's web site (http://www.macrovision.com).

Other Foundry Products

The Foundry is a leading developer of visual effects and image processing technologies for film and video post production. Its products include Nuke, Furnace, FurnaceCore, Keylight, and Ocula and run on a variety of compositing platforms including Adobe After Effects, Avid DS, and Apple Final Cut Pro. For the full list of products and supported platforms, see our web site at http://www.thefoundry.co.uk.

Nuke is an Academy Award® winning compositor. It has been used to create extraordinary images on scores of feature films including *Avatar, District 9, The Dark Knight*, *Iron Man*, *Quantum of Solace*, *The Curious Case of Benjamin Button*, *Transformers*, and *Pirates of the Caribbean: At World's End.*

Furnace and FurnaceCore are collections of film tools. Many of the algorithms utilise motion estimation technology to speed up common compositing tasks. Plug-ins include wire removal, rig removal, steadiness, deflicker, degrain and regrain, retiming, and texture tools.

Keylight is an industry-proven blue/green screen keyer, giving results that look photographed, not composited. The Keylight algorithm was developed by the Computer Film Company who were honoured with a technical achievement award for digital compositing from the Academy of Motion Picture Arts and Sciences.

Ocula is a collection of tools that solve common problems with stereoscopic imagery, improve productivity in post production, and ultimately help to deliver a more rewarding 3D-stereo viewing experience.

Visit The Foundry's web site at http://www.thefoundry.co.uk for further details.

ROLLINGSHUTTER

Description

Modern digital video cameras fall into two categories: cameras with CCD sensors and cameras with CMOS sensors. Many CMOS chip designs effectively have a rolling shutter. Unlike global shutters that expose the entire frame simultaneously, rolling shutters record each frame one scan line at a time, "rolling" through the frame.

Because there is a time lag between the first scan line and the last, not all parts of the image are recorded at exactly the same time. If the subject or the camera moves during the exposure, the recorded frame may exhibit one of the three rolling shutter artifacts: skew, wobble, or partial exposure.

The RollingShutter plug-in has been designed to correct for the skew and other distortions that are the result of relative motion between an object in the scene and the camera. These can arise from the camera itself moving, an object moving in the scene, or both. Using local motion estimation (LME) technology (see page 33), the plug-in calculates the motion of objects in the scene. Based on their speed and direction, it reconstructs a corrected frame with the objects in their natural place(see Figure 1 and Figure 2).

Figure 1. Before RollingShutter.

Figure 2. After RollingShutter.

Because local motion estimation is used, RollingShutter is able to compensate for the skew and distortion per object. Compared to global methods that distort the entire frame, this has some advantages. For example, you can remove skew from locked-off shots of moving objects and shots of multiple objects moving in different directions.

You can also use the plug-in to add distortions to a clean plate or CG render to match a live-action shot.

Note 1 *The correction process relies on motion estimation, and shares its limitations. For example, shots where there are large, flat areas of colour, or a lot of complicated and blurry motion, suffer from a difficulty in estimating the in-scene motion. Depending on the severity of the distortion and the complexity of motion, visual artifacts may result from the correction process. If this is the case, the plug-in may be more useful for making a shot suitable for tracking than for making it look right.*

Note 2 *If there are a lot of very high frequency vibrations caused by the camera (for example, caused by a hard helicopter mount or a hand-held camera on a bumpy ride), a global solution that distorts the whole frame may give you better results than RollingShutter. For example, F_Steadiness in The Foundry's Furnace plug-in set and the free Deshaker plug-in for VirtualDub offer a global correction. However, at the time of writing, neither of these correct for the distortion of individual objects within the scene, which occurs when there is any degree of parallax within the frame.*

Note 3 *RollingShutter does not correct for rolling flicker with unsynchronized lights, or flashes and other strobes cut off half way through the frame.*

Shutter Sync

To reconstruct a frame with the objects in their natural place, RollingShutter looks at where each pixel moves in the previous and the following frame. The following frame allows it to move objects forward in time, and the previous frame

allows it to move them back.

Using the **Shutter Sync** parameter, you can choose the reference point in time that the plug-in is aiming for with its correction. Because any correction has the potential to introduce visual artifacts, you want to minimise the distance any pixels are moved in the image.

Figure 3 shows a situation where an object is moving to the right in a locked-off shot. You can see that when **Shutter Sync** is 0 (the beginning of the scan), the bottom of the object has to move quite a large distance to the left to reach its correct position. Likewise, when **Shutter Sync** is 1 (the end of the scan), the top has to move a long way to the right.

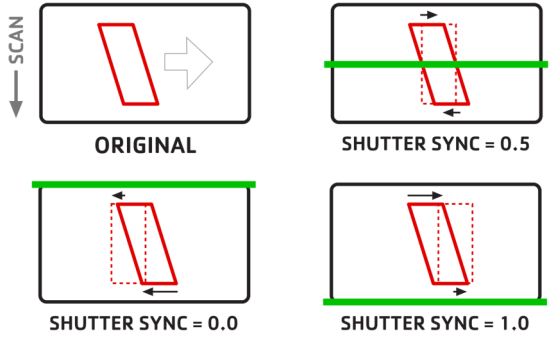

Figure 3. The effect of **Shutter Sync**.

With the default setting of 0.5 (the middle of the scan), the top and the bottom both move less, but in opposite directions. Generally, this works well and helps reduce any artifacts caused by the plug-in moving the objects around in the scene.

Problems can arise, however, if either the objects or the

camera are accelerating, which they often are. Because the top half will be corrected using motion vectors from the previous frame (backward vectors), and the bottom with those from the next (forward vectors), a "kink" can occur. The faster moving half would need more correction, so the image becomes bent.

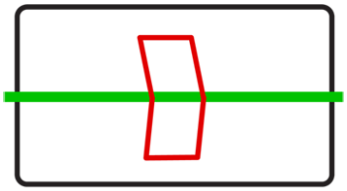

Figure 4. Setting **Shutter Sync** to 0.5 can bend the image if either the camera or the objects depicted in the shot are accelerating.

To avoid this, you can set **Shutter Sync** to 0 or 1. This tells RollingShutter to only use the forward or backward motion vectors, at the compromise of potentially introducing more artifacts due to the distance pixels have to move to be corrected. The **Show Vectors** parameter (see page 26) can be useful here, as it can help you see any significant differences between the vectors from each direction.

Quick Start

To correct for the skew caused by a CMOS camera, do the following:

1. Start After Effects and import the footage you want to unskew.
2. Select **Effect** > **The Foundry** > **RollingShutter (1.1)**.
3. If you know how much time lag (in frames) there was in the camera's sensor, set **Correction** to the appropriate value for that camera.

If you don't know the value, find a frame in your source clip, or one shot especially for the purpose, which features a vertical edge bent due to the rolling shutter. Set **Correction** to a positive value that makes the edge vertical again. This is the correction amount for that camera, assuming the camera doesn't ever vary its read-refresh cycle rate. You can also use the same correction value, but negative, to skew clean footage to match that created by your camera.

Note that if you have a camera that scans from the bottom to the top, you need to use negative values to remove skew, and positive values to distort any clean plates.

4. View the result.
5. If you're not happy with the results, adjust the motion vector generation parameters, such as **Vector Detail** and **Smoothness**, as necessary. To see the motion vectors, check **Show Vectors**.
6. If some objects in the image show "kinks", adjust **Shutter Sync** to set when in the scan cycle is used as the reference point in time that the plug-in is aiming for with its correction. When set to 0, objects will be moved to where they should be at the start of the scan. A value of 0.5 moves objects to where they are in the middle, and a value of 1 moves them to the end. For more information, see "Shutter Sync" on page 18.

Controls

Reset - Revert all parameters in the plug-in to their default values.

Activation - Launch a web browser to get a license key for the plug-ins. See "Activating RollingShutter" on page 7.

About - Show information about this plug-in. The information includes the plug-in's version number and help text as well as your System ID. To hide the help dialog, click on it after it has appeared.

Correction – Time offset in frames from the top scan line to the bottom. In most cases, you should use positive values to remove skew, and negative values to distort any clean footage. However, if you have a camera that scans from the bottom to the top, you need to use negative values to remove skew, and positive values to distort any clean plates. This value should be constant for any given camera setup.

Vector Detail – Adjust this to vary the density of the vector field. The larger **Vector Detail** is, the greater the processing time, but the more detailed the vectors should be. A value of 1.0 will generate a vector at each pixel. A value of 0.5 will generate a vector at every other pixel. For some sequences, a high vector detail near 1.0 generates too much unwanted local motion detail, and often a low value is more appropriate. For more information on vector fields, see "Local Motion Estimation" on page 33.

Smoothness – Vector fields usually have two important qualities: they should accurately match similar pixels in one image to another and they should be smooth rather than noisy. Often, it is necessary to trade one of these qualities off against the other. A high smoothness will miss lots of local detail, but is less likely to provide you with the odd spurious vector (think of it as if the vectors were combed until they are smooth with respect to their neighbours). A low smoothness will concentrate on detail matching, even if the resulting field is jagged. The default value of 0.5 should work well for most sequences. For more information on vector fields, see "Local Motion Estimation" on page 33.

Shutter Sync – When in the scan cycle to use as the positional reference for the correction. When set to 0, objects will be moved to where they should be at the start of the scan. The default value of 0.5 moves objects to where

they are in the middle, and a value of 1 moves them to the end. When **Shutter Sync** is set to values other than 0 or 1, visual artifacts arising from the correction should be reduced, but accelerating objects or cameras may show 'kinks'. For more information, see "Shutter Sync" on page 18.

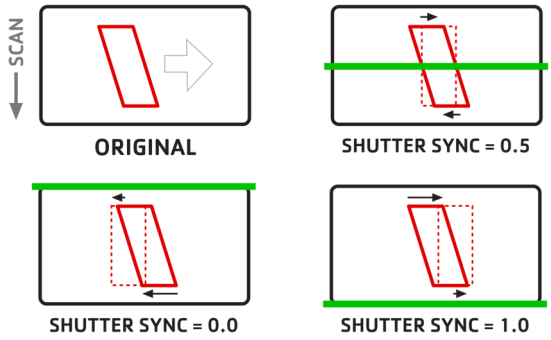

Figure 5. The effect of **Shutter Sync**.

Output - Sets the final output display for the image. Selecting anything other than **Result** is only useful when a **Matte** image is used.

- **Result** - displays the unskewed result.
- **Matte** - displays the **Matte** image.
- **Foreground** - displays the foreground - the background regions outside the **Matte** image may show garbage.
- **Background** - displays the background - the foreground regions inside the **Matte** image may show garbage.

The Matte controls help the plug-in distinguish what is foreground and background in the image. This can improve the motion estimation by reducing the dragging of pixels that can occur between foreground and background objects. White areas of the matte are considered to be foreground,

and black areas background. Grey areas are used to attenuate between foreground and background.

When a matte is used, it is important that the sequence has the same resolution and covers the same temporal range as the footage you are correcting.

Matte Source - This parameter controls how the pixel values in the matte are used to do the masking.

- **None** - no matte is used.
- **Src (Source) Alpha** - Use the alpha channel of the source clip as a matte.
- **Src (Source) Inverted Alpha** - Use the inverted alpha channel of the source clip as a matte.
- **Matte Layer Luminance** - use the luminance of the **Matte Layer** image.
- **Matte Layer Inverse Luminance** - use the inverted luminance of the **Matte Layer** image.
- **Matte Layer Alpha** - use the alpha of the **Matte Layer** image.
- **Matte Layer Inverse Alpha** - use the inverted alpha of the **Matte Layer** image.

Matte Layer - Use this to choose a sequence that you want to use as your matte. This control is disabled if you have selected **None**, **Src Alpha** or **Src Inverted Alpha** under **Matte Source**.

Advanced - The lesser used refinement controls.

Motion Source - If supplied, motion vectors will be calculated from this sequence and applied to the current layer. This allows you to apply some processing to the image before the plug-in analyses its motion. You may want to

do so, for example, if the current layer is very noisy, as too much noise interferes with the motion estimation.

Block Size - To find where a certain pixel is located in the analysis range, the vector generation algorithm looks for a block of pixels centered around that pixel. Block size defines the width and height of these blocks (in pixels). On rare occasions, a large block size can produce data that's lacking in detail. This is because a small feature can fit into a large block, causing the motion estimation to concentrate on the background motion and ignore the small feature. A small value, instead, can produce a noisy motion field, as there aren't enough constraints in a small block to fit the motion accurately. In most cases, however, the default value is small enough so that details aren't lost, and the smoothing step of the algorithm ensures the motion field isn't too noisy. Therefore, this value very rarely needs editing.

Over Smooth - This is a computationally intensive smoothing operation that performs a different vector-smoothing operation to normal. This generates highly smooth vector fields (as if the vectors were combed several times with a fine-toothed comb), but may also sacrifice a lot of required detail. In most cases, this level of smoothing isn't necessary. However, if you have a problem sequence that looks too "broken up" after the correction, you may want to toggle **Over Smooth** on.

Filtering - Sets the quality of filtering when producing in-between frames.

- **Normal** - use bilinear interpolation which gives good results and is a lot quicker than **Extreme**.

- **Extreme** - uses a sinc interpolation filter to give a sharper picture than **Normal**, but takes a lot longer to render.

Warp Mode - Select a method to use to reconstruct the corrected image.

- **Simple** - this is the quickest option, but may produce less than optimal results around moving objects and image edges.
- **Normal** - this is the standard option, with more optimal treatment of moving objects and image edges.
- **Occlusions** - this is an advanced option that can improve the results when not doing a separated picture build with multiple vector sequences and mattes. It attempts to reduce the level of background dragging that occurs between foreground and background objects.
- **Sharp Occlusions** - This option is similar to **Occlusions**, but produces fewer artifacts if the generated vector fields are extremely accurate.

Show Vectors - Switch this on to display the calculated motion vectors on the screen. This can be particularly useful when adjusting the **Shutter Sync** parameter (see page 18).

Luminance Correct - LME is highly dependent upon the idea that the brightness of objects doesn't vary through a sequence. Where brightness varies rapidly - for example a highlight moving across the bodywork of a car - the motion calculation will perform poorly. The luminance of a shot can come from other sources too - such as an over-

all flicker problem. In these cases where there is a global luminance shift, toggling this control on will allow the LME algorithm to take account of overall brightness changes between frames.

Tolerances - For efficiency, much of the LME is done on luminance only - that is, using monochrome images. The tolerances allow you to tune the weight of each colour channel when calculating the image luminance. These parameters rarely need tuning. However, you may, for example, wish to increase the red weighting **Weight Red** to allow the algorithm to concentrate on getting the motion of a primarily red object correct, at the cost of the rest of the items in a shot.

Weight Red

Weight Green

Weight Blue

Example

This example shows you how to calibrate a camera to find out the correct **Correction** value for any images shot with the same camera setup. You'll also learn how to get rid of any kinks that the correction process may introduce.

The image sequence used here was shot with a RED camera and is courtesy of FXphd.com. You can download from our web site at http://www.thefoundry.co.uk. From the RollingShutter product page, click on the **Tutorials & Example Images** link.

Step by Step

1. Start After Effects and import RollingShutter.mov.

2. Scrub through the frames. Notice how the windows and walls in the clip have become skewed as a result of the quick camera pan. This is particularly obvious on frame 5, as shown in Figure 6.

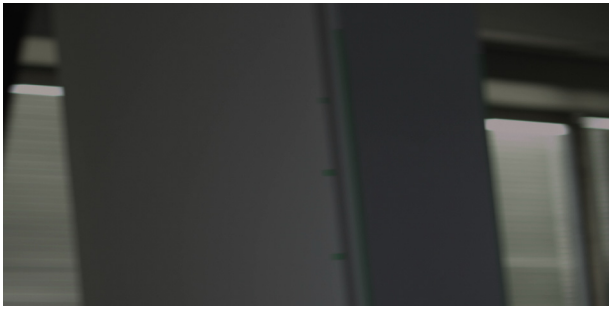

Figure 6. On frame 5, the wall appears to lean towards the left.

3. Select **Effect** > **RollingShutter** > **RollingShutter** (1.1).

   The plug-in estimates a corrected image from the input sequence.

4. Go to frame 5 and view the result. As you can see, RollingShutter in its default state is compensating for the skew

too much, making the wall look like it's leaning towards the right (see Figure 7).

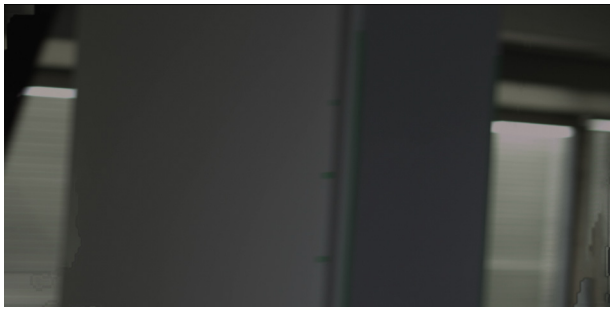

Figure 7. The default **Correction** value of 0.5.

5. In the RollingShutter controls, adjust the **Correction** value. This value should be constant for any given camera setup. However, as we do not know the correct value for the camera that was used to shoot our images, a bit of trial and error is required. Decrease the **Correction** value until the wall looks vertical. You should end up with a value of 0.32.

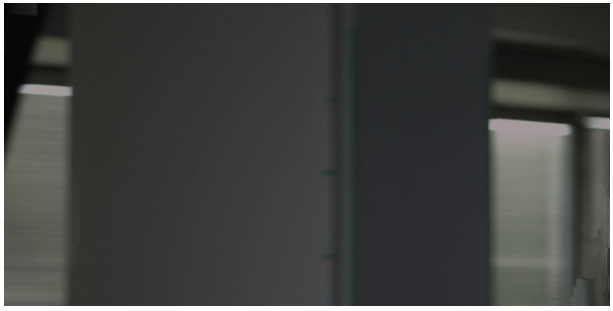

Figure 8. A **Correction** value of 0.32.

6. This footage was shot specifically for the purpose of finding out the correct **Correction** value for the camera in question, and that is now done. However, if you step through the frames to

see how the correction holds up, you should see a kink in the wall on frame 8 (see Figure 9). If you were to use this footage for any other purpose than calibrating the camera, the kink could be a problem.

Figure 9. The kink on frame 8.

The kink was created because by default **Shutter Sync** in the RollingShutter controls is set to 0.5 to reduce the apperance of artifacts. This means the plug-in uses the middle of the scan cycle as a positional reference for the correction. It uses motion vectors from the previous frame (backward vectors) to correct the top half of the image, and those from the next (forward vectors) to correct the bottom. Because the camera used to shoot the images was accelerating on frame 8, the correction for the top half does not match the correction for the bottom.

7. To get rid of the kink, you need to set **Shutter Sync** to either 0 or 1. This tells RollingShutter to either only use the backward motion vectors and move the objects to where they are in the beginning of the scan cycle, or use the forward motion vectors

and aim for the end of the scan. In the case of our example, set **Shutter Sync** to 0.

Figure 10. Setting **Shutter Sync** to 0 gets rid of the kink.

8. Play through the frames to evaluate the results. As you can see, the skewing of objects has been greatly reduced. However, setting **Shutter Sync** to 0 has also introduced some artifacts in the image. Depending on what you want to use the images for, the results may need further editing.

LOCAL MOTION ESTIMATION

Introduction

In this chapter, we look at Local Motion Estimation (or LME) technology, which is the per-pixel motion analysis used in RollingShutter.

Description

The easiest way to understand LME is to think in terms of vector fields. A vector field for an image in a sequence has the same dimensions as the image, but contains an (x,y) offset per pixel. These offsets show how to warp a neighbouring image onto the current image. Clearly, as most of the images in a sequence have two neighbours, each can have two vector fields. These are called the 'forward motion vectors' where they represent the warp of the image in front of the current one, and 'backward motion vectors' where they represent the warp of the image behind the current one.

This is an approximation to what is really going on in an image sequence. A single vector field can be thought of as representing a warp or a morph - sometimes referred to as a 'rubber sheet' warp and cannot truly represent multiple overlapping motions. This effect can be seen where moving foreground objects appear to drag the background. To help cope with this restriction, RollingShutter allows the use of two vector fields per frame, one representing foreground motion and one representing background motion, where a matte input is used to identify the separation. In addition, the **Occlusions** parameter attempts to improve the rubber-sheet effect when separate vector fields aren't being used.

The vector generation process has a number of tuning

parameters which can be used to adapt the vectors to suit particular sequences, as well as to trade off render time versus accuracy of vectors.

To see the motion vectors RollingShutter has calculated, check **Show Vectors** in the RollingShutter controls.

APPENDIX A

Release Notes

This section describes the requirements, new features, improvements, fixed bugs and known bugs & workarounds for each release of RollingShutter.

RollingShutter 1.1v2

This release adds 64-bit support for Adobe After Effects CS5.

Release Date

April 2010

Requirements

1. Windows 7 64-bit or Mac OS X 10.5.8 64-bit.
2. After Effects CS5 on Windows or Mac OS X.
3. Foundry FLEXlm Tools (FFT 5.0v1 or later) for floating licenses.

Improvements

- Added 64-bit support for Adobe After Effects CS5. Due to this update we changed some underlying parameter types which broke compatibility and thus required a minor version number update (that is, the change from 1.0v1 to 1.1v2). The underlying algorithm is the same, so no new build is required for CS3 or CS4. Due to this version number shift, when opening projects saved from CS3 or CS4 in CS5 you will need to reapply RollingShutter in the relevant places.
- The RollingShutter plug-in now appears under a menu item named **The Foundry** in the **Effects** and **Presets** panel.

Bug Fixes

There are no bug fixes in this release.

Known Bugs and Workarounds

There are no known bugs in this release.

RollingShutter 1.1v1

Internal release only.

RollingShutter 1.0v1

This is the first release of RollingShutter for After Effects.

Release Date

August 2009

Requirements

1. After Effects CS3 or later on Windows or Mac OS X.
2. Foundry FLEXlm Tools (FFT 5.0v1 or later) for floating licenses.

New Features

There is one plug-in in this release.

Improvements

This section will describe new features in later versions.

Bug Fixes

This section will describe fixed bugs in later versions.

Known Bugs and Workarounds

BUG ID 8356 - Memory Considerations : RollingShutter is a memory intensive plug-in and will use a lot of RAM during processing. This can raise issues on Windows 32-bit machines where memory management can get fragmented. If processing a 4K plate on a Windows 32-bit machine, you may find that RollingShutter easily runs out of memory. There is currently no solution to this.

APPENDIX B

Third Party Licenses

This appendix lists third party libraries used in RollingShutter, along with their licenses.

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