DE:Flicker

WHEN Should You Use DE:Flicker?

You shot some slow motion video at 240 FPS, a time lapse at 1 FPS, or you shot at a venue where you had no control over lighting. Or, and we won't tell anyone, you used the automatic button because you thought it would be simpler. Whatever the reason, your video shows fluctuations and color variations that make it hard to watch when viewed at a normal frame rate.

DE:Flicker, a suite of three plugins, was created to reduce those unwanted variations.

Please visit our website gallery to see examples of this flickering artifact, as print makes it difficult to demonstrate:

http://www.revisionfx.com/products/deflicker/gallery/

This document provides an overview of flickering problems followed by a control by control description of the parameters.

Flickering Is Not All the Same

Because flickering results from different production situations, the solutions and workflows for eliminating the artifact also differ. Rather than pack all possible controls into one plugin, we felt that the production situation should inform the plugin's UI.

Before diving into the nuts and bolts of the plugins, it is useful to explain how different production scenarios generate flickering in video. Figure 1 contains three successive frames shot at 300 FPS. At that rate the frames appear similar, and the motion is very coherent across time. Still, notice that the light reflects differently in the middle frame on the top left edge of the frame on the wall. Such variations are often impossible to avoid when you shoot at high frame rate in a setting with many light sources.
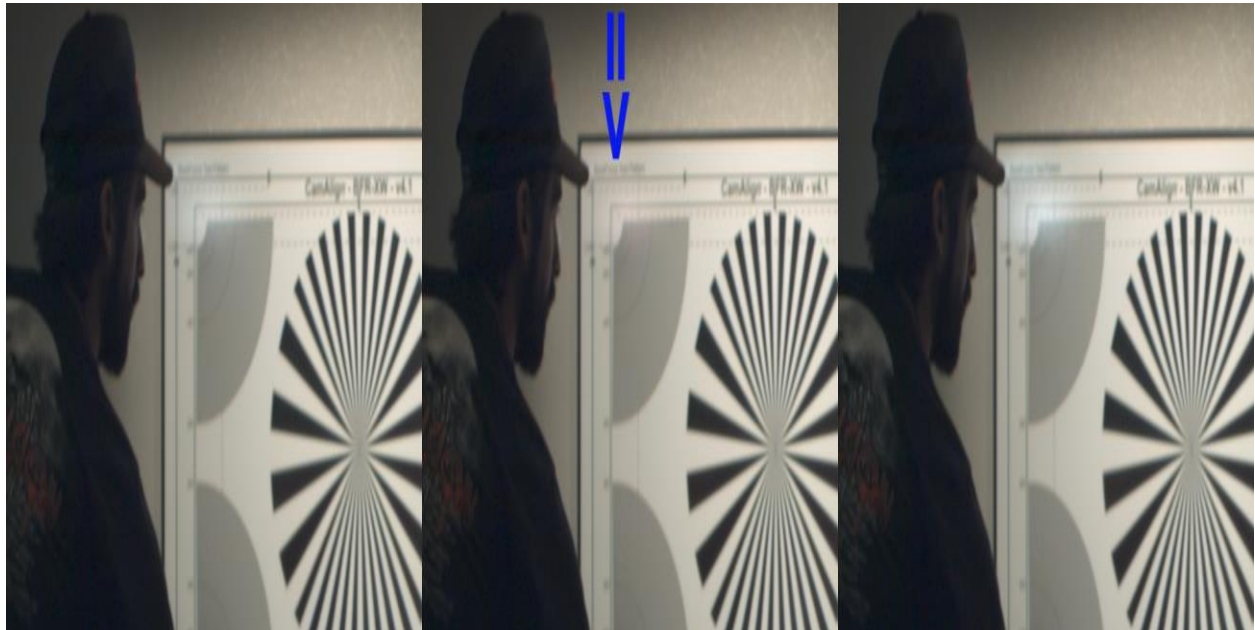

Figure 1: Flickering at 300 FPS

Figure 2: Flickering at 240 FPS

Figure 2 shows successive frames shot at 240 FPS with indoor fluorescent lighting. Notice the dramatic color shift between the first two frames and the last two frames. This color shift cycles on a 60 FPS basis while shooting at 240 FPS. You may have noticed ambient flickering of large light panels in super markets or large box stores. With high speed video capture, this ambient flickering becomes a dramatic annoyance at standard playback rate.

Figure 3: Flickering in Time Lapse

Figure 3 presents frames from a time lapse. Note areas of the image coming in and out the cloud shadow. Cars and buses also appear and disappear from frame to frame resulting in motion noise. In this example, you might want to reduce the strobe effect caused by large masses of shadows randomly popping up across the sequence while partially preserving the shadow.

WHY DOES THE CAMERA DO THAT?

It's not your camera; it's the principles of optics at work. Flickering is essentially caused by a lack of synchronization between the camera capture read rate—or shutter open-close for global shutters—and lighting technology. At very high capture rate (short exposures) depending on the light source flickering

can vary from almost no light on a frame to a small but perceivable modulation every four frames. The process is further complicated by multiple light sources, which are common in outdoor night locations and indoor setups. In addition, at large venues electricity typically flows to lighting setups over different electrical phases, resulting in luminance that can vary per frame. For example, while shooting high-speed video on a set with three point lighting, an object might be lit from the left on one frame and then lit from the right on the next frame. This might not be an issue if we watched movies at the rate we captured them (much like in reality), however the point of shooting at a non-standard frame rate is to see things differently at standard display rate.

Flickering is not a new problem. In the days when sports photographers shot with film, flickering would occur when shooting photo bursts in an arena illuminated by arc lamps. Today this is a much more common problem as cheaper and more sensitive sensors allow capture at flexible frame rates.

The artificial lights around you—aside from special-purpose studio lights—are designed to satisfy human persistence of vision and are not designed for camera capture. Artificial light might appear continuous to our eyes but it pulses at a higher frequency. These artificial lights have their frequency tied to their electrical power. For example, each LED light within a panel can have a slightly different luminance relative to the others in the same panel. This issue is more pronounced with consumer LED lighting. More precisely, the net effect is that all pixels are not equally exposed over time even if the camera is locked off and nothing in the scene moves.

Time lapse capture also results in a different form of flickering. As the frame rate reduces in capturing time lapse, you have to account for the presence of clouds or other objects that might cause moving shadows. Illumination varies across areas of the image on a per frame basis. On a partially sunny day portions of successive frames appear differently in multiple areas of the image as clouds move under the sun. Global color correction cannot address this issue, as only parts of the image vary in illumination.

Figure 4: Consecutive Frames of a Time Lapse

Notice the effect of the clouds in the consecutive frames of a time lapse in Figure 4. When played back at a normal frame rate the images look similar to boiling emulsions of poorly conserved film.

In controlled production settings, with a particular light system and a particular frame rate, flickering can be reduced. Lighting and camera capture, in certain configurations, can be synchronized and even time-

clocked synched (e.g. so-called flicker-free HMI ballasts). While you can control flickering with specialized light ballasts, they are expensive and often impractical. Commercial productions budgets rarely allow for a proper lighting setup needed for flicker-free capture.

DE:Flicker is three plug-ins in one suite

To address the different situations from which flickering arises, RE:Vision Effects has developed a suite of plugins, each addressing a specific flickering issue: (1) high speed capture, (2) time lapse, and (3) auto leveling. We named one plugin *DE:Flicker High Speed* and the other *DE:Flicker Time Lapse* to help you remember which one to use for the type of capture you intend to process.

DE:Flicker High-Speed

The DE:Flicker High-Speed plugin addresses flickering that occurs when a high frame rate (HFR) camera, particularly 240 FPS or faster, shoots under artificial lighting. This common issue arises all the time in sports stadiums or facilities like a school gymnasium, where lights are on three-phase power. A light source can appear to be on in one frame but off in the next, while another light panel in the same frame can do just the opposite. When the video is broadcast at a standard frame rate the images produce an annoying strobe effect.

The DE:Flicker High-Speed plugin helps with a range of flickering situations including video captured at very high-speed in low lighting—resulting in visual noise. Additionally, using DE:Flicker will better prepare your video for adding slow motion with Twixtor. Other uses for the DE:Flicker plugin are for standard rate video shot under particular lighting or under frenetic lighting during a live music performance. (See Figure 5.)

Figure 5: Flickering as a result of frenetic lighting during a music performance

Note that the second curtain on the right is more pink in the second frame than in first frame. While not so dramatic in print, check our gallery of examples to see how distracting it can be in video.

DE:Flicker Time Lapse

The DE:Flicker Time Lapse plugin implements a new technique developed by RE:Vision Effects that stabilizes color across a sequence even when there is a lot of random movement, for example a car passing by in one frame but not on the next. The plugin lessens the effect of motion noise typically

observed in time lapse video. If you have used a product like Twixtor, you may be aware that its motion estimation algorithms will not work on such material.

DE:Flicker Auto-Levels

The DE:Flicker Auto-Levels plugin addresses unstable exposure, whether caused by operator choice or by mechanical camera issues. During time lapse capture, photo bursts, or frozen time photography—"bullet time"—a camera's physical shutter might wear out and may not operate at its intended speed. This makes perfect synching harder and creates variation in the exposure. A similar outcome arises when enabling Automatic Exposure or Automatic White Balance and panning the camera inside a building on a sunny day. As the camera pans over a window, the exposure peaks quickly before it stabilizes, thereby creating a flicker or flash effect. DE:Flicker Auto-Levels addresses unstable exposure that is global in nature by providing methods to visualize and stabilize camera induced variations over time.
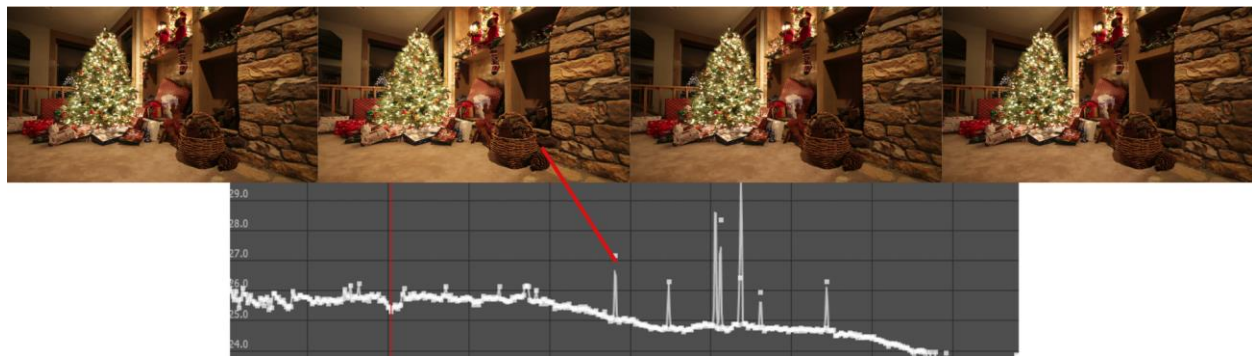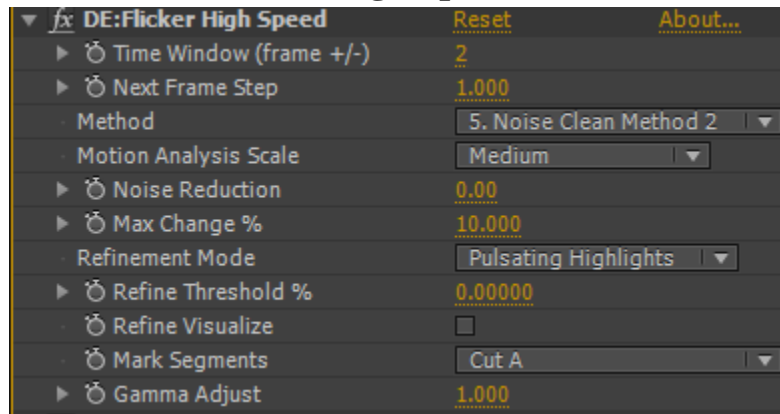

Fig: The temporal level analysis allows you to locate flash frames and longer flickings in your sequence

DE:FLICKER HIGH SPEED CONTROLS

DE:Flicker High Speed Controls

APPLY THE PLUGIN

1. Apply the plugin to your footage.

2. Turn the effect off. Do you see a difference?

3. Render or Modify Controls (see below).

   Note: We recommend you playback previews at the intended display rate because flickering artifacts are more noticeable at low display rate.

WORKFLOW FOR MODIFYING CONTROLS

You can address each type of problematic footage by going through the steps in the workflow outlined below.

1. Advance a frame forward then step back two frames. If there are color fluctuations from frame to frame, apply the **DE:Flicker High Speed** effect. Advance two frames forward to assess whether the color is more stable and whether flickering is reduced.

2. Advance a frame forward then step back two frames. If there is too much noise in the image, use the **Noise Clean Method**. Render a short preview and decide whether the noise is reduced to your satisfaction.

3. If you continue to see visual artifacts, set **<u>Max Change</u>** to a low value like 20% or lower. If you continue to see flickering, set **Time Window** to 3 instead of default 2. When you increase the Time Window control, ensure no ghosting artifacts appear before increasing it further. You will experience longer render times as you increase the Time Window parameter, but the plugin will analyze more frames, which will attenuate flickering.

DESCRIPTION OF CONTROLS

Time Window (frames +/-):

Time Window controls how many frames are analyzed before and after the current frame.It adjusts the "time radius" meaning the number of frames on each side of current frame. Setting Time Window to 0 turns off all frame analysis and temporal processing which is useful if only a specific segment of footage shows flickering. Consider creating keyframes with a hold interpolation for this control when you want to process only parts of your footage.

Next Frame Step:

Next Frame Step controls the amount of frames skipped between each sampled one when creating a new frame. Setting it to 1.0 ensures there are no skipped frames and each frame within the time window is used. Setting this to a different number than 1.0 defines which frames will be used. For example if you have a time window of 3, and a frame step of 2, than instead of reading the 3 frames before and after, it will jump 2 frames between each sampled one but still read only 3. When setting Next Frame Step to a fraction, as opposed to a whole number, no frame interpolation is performed. If the "Next Frame" falls between two actual footage frames, then the nearest frame to the current time is used. The exception is in tools with field-based rendering options, such as Adobe After Effects. If you set Next Frame Step to 0.5 in After Effects, the plugin will compare adjacent fields.

> HINT: If you shoot at high speed, for example 2000 FPS, you will notice fluctuations are spread over many frames. If you playback this type of footage at a standard frame rate, flickering will not appear as dramatic. However, you might intend to speed ramp the footage, which will introduce dramatic flickering. When applying DE:Flicker to footage captured at a high frame rate, it is advisable to skip frames using this control rather than increasing the Time Window to 20. Of course, you can increase the Time Window to a high value, but render time will increase significantly. It will take some practice to discover the best "skip beat" when working with this control. See the Auto-Levels tool section below to learn how to use the <u>Auto-Levels</u> tool to analyze the variation over time.

Method:

Out of the six options list in the Method popup menu, the last two are designed to address more noisy sequences. The "Noise Clean" options average the frames within the Time Window to the current frame. Use the "Noise Clean" options over the "Color Transfer" options if your footage contains a lot of noise in many frames without extreme action.

Color Transfer : This is the default setting and normally works well with very high frame rates.
Color Transfer, Coarse Color Match : This helps with less coherent lighting as found in footage of a rock concert's light show shot at standard frame rates. It also helps with footage containing large motion (objects that cover large areas of the frame as opposed to motion caused by tiny particles).Color Transfer, Abrupt Change : With this method the transfer of color values remains local (Local Color Transfer just like RE:Match Stereo), it will not affect parts of the image without flicker.

Noise Clean Method 1 & Noise Clean Method 2: Use these Methods when your footage contains a good deal of noise. To select the appropriate one for your footage, try applying each in a place where there is motion at the frame edge, and see which one looks best.

Alternate (period 2): Use this method if you have footage where the flicker vary on a period of two frames (on-off-on-off,…).

Motion Analysis

The Motion Analysis setting controls the amount of analysis needed to process the footage imagery. Use a low setting for smooth motion when it is uniform across the image, such as panning over a landscape. A lower analysis scale setting may be faster to process. If the initial default setting creates ghosting artifacts of fast moving objects, reduce Max Change %. If the artifacts remain, then select a different setting. We also allow you to turn off motion estimation for the special cases where warping artifacts are difficult to reduce or remove with the other settings.

Noise Reduction:

The DE:Flicker plugin provides an additional noise reducer. This internal noise reducer does not consider information from other frames. To adjust this parameter, you can temporarily set the Time Window to 0, then adjust Noise Reduction slightly, though not too much so as to avoid a resulting blurry image. After you do this, reset Time Window to its original setting. If you need more de-noising, consider applying another RE:Vision Effects plugin, such as DE:Noise, first.

HINT: Noise Clean methods can sometimes result in blob-like clusterin of the noise itself. This tends to happen in footage shot with a short shutter time in a low-lit setting. In this case Noise Reduction will help.

Max Change %:

This control limits the maximum contribution of a particular frame. The default setting is 10%. In practice it's often best to use a low value (between 10% and 20%) for noise smoothing methods (Noise Clean), and a high value like 100% for noise preserving methods (Color Transfer).

Refinement Mode:

The options for this control are Off, Refine, and Pulsating Highlights. It is set to Off by default. The Refine option is only useful in the presence of visual artifacts like ghosting, similar to how it's done in RE:Match Stereo. Typically this additional processing is needed when fast motion appears in footage with

lower frame rates. A manifestation of this with high-speed video is with small objects that still have motion blur at 300 FPS (for example a ping pong ball).

Refine Threshold %:

Like Max Change, Refine Threshold % lowers the maximum possible deviation a pixel can have relative to the original source. The threshold refinement defines which areas of the image will be refined. Essentially, this control allows you to gain more latitude for Max Change parameter (e.g. 100%) and fix it if needed. If you enter a really small value for Max Change, you may not see much difference in your processed footage.

Refine Visualize:

The Visualize option helps you to set an appropriate Refine Threshold % value. Areas included in the threshold, and where pixels will be affected, are displayed with a red, semi-transparent overlay.

Mark Segments:

Use Mark Segments to mark cut points, or scene changes, in your footage. Create key frames for this parameter at those cut points, ensuring that the option A, B or C is different for each of those key frames. Dissolve mode is used to turn off the de-flickering process when you have a transition instead of a cut.
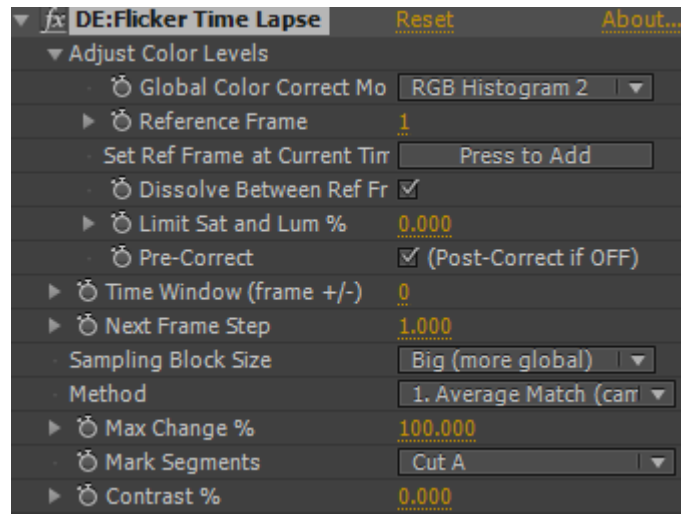
Fig.: With Mark Segments:

Fig.: Without Mark Segments -- Now the frames from tbe adjacent cut contaminates the other one.

Gamma Adjust:

Gamma Adjust provides basic color correction. RE:Vision Effects included this control to account for the range of color profiles available in high-speed cameras. Note, however, that your video editing application has more color correction tools if additional correction is needed.

DE:Flicker Time Lapse Controls

Processing time lapse footage—captured at a low frame rate—requires a different workflow from processing footage captured at high frame rate. RE:Vision Effects created DE:Flicker Time Lapse to address flicking in footage captured at low frame rates. DE:Flicker Time Lapse is tremendously helpful for a sequence in which night becomes day over a short playback. It is also very useful for fixing time lapse footage showing rolling shadows from a partially cloudy day. However, not all time lapse footage is better handled with this tool. For example, in time lapse footage of large water waves applying the noise smoothing methods of the DE:Flicker High Speed plugin might be more appropriate.

TIME LAPSE PLUGIN WORKFLOW

1. Assess the time lapse footage. Are global fluctuations in the footage, such as a shifting ambient light level, apparent? If such global fluctuations are the primary issue, consider using DE:Flicker Auto-Levels on its own or in preparation for using the DE:Flicker Time Lapse plugin.If fluctuations are local to specific areas of the image, for example in shadows cast from rolling clouds, use DE:Flicker Time Lapse. Use <u>Adjust Color Levels</u> controls to globally match a frame from one footage segment to another.

Figure 6: Two frames from a time lapse with variant lighting.

2. Figure 6 displays two frames from the same time lapse footage. Using either an all sunny or all cloudy frame as a reference, you can adjust the entire time lapse footage to a specific lighting level. If appropriate, you can also target reference frames with specific levels to progressively shift from bright to dark while still reducing the frame-to-frame flicker effect. Use this technique to handle footage that exhibits lighting fluctuations due to shading, for example, as found in a clip showing a building's dome roof in bright sun. In addition, processing footage with objects illuminated with only ambient lighting might look very different than a frame where those objects have defined shadows.

3. Set the temporal matching method. You can set the Temporal Matching mode from a working resolution (or proxy) to a quarter resolution or perhaps even less if your footage was captured at a high frame rate. Render with defaults. Render again with Time Window set to 5. Analyze progress by rendering 50 frames or so frames to view results. If you do RAM playback ensure the display rate is the same that your final render will be. Render once and watch it at a normal display rate. Is flickering reduced? With time lapse footage it often happens on the first pass that there is like 5 frames sequence not properly set over the whole sequence. It is sometimes difficult to set this looking only at particula frames. You might miss something obvious. To avoid this, render a first pass and then judge from that what would be useful to do next.

DESCRIPTION OF DE:FLICKER TIMELAPSE CONTROLS

Adjust Color Levels:

The following controls are available under the Adjust Color Levels section of DE:Flicker Time Lapse.

Global Color Correct Mode:

In Global Color Correct Mode, you can try different color matching algorithms. The default mode for the correction algorithm is Post-Correct, which first addresses local flickering artifacts and then corrects color globally. You can swap the order by ensuring the Pre-Correct is unchecked. Enabling Pre-Correct essentially corrects frames globally before local de-flickering.

Reference Frame:

Insert a value in this field to set a Reference Frame. With two reference frames, global correction is interpolated between them when Dissolve Between Ref Frm is checked. If there are dramatic light changes in your time lapse footage, try setting various reference frames along its timeline. When you set one reference to a dark frame, and another reference to a light frame, global correction will smoothly transition between those reference frames in the final footage.

Set Reference Frame at Current Time:

Push the Press to Add button to add a key frame at the current time for the Set Ref Frame at Current Frame parameter. Pressing that button will set the Reference Frame value to the current time.

> HINT: You can use the data generated from a **DE:Flicker Auto-Levels** analysis pass to locate good points in your timeline to create such key frames. As mentioned earlier, consider the three plugins as a kit that work well together rather than plugins that work in isolation.

Limit Sat and Lum %:

Sometimes DE:Flicker's global correction can create oversaturated regions or dots (bad spots of color). Sometimes turning off Pre-Correct (which will enable Post-Correct) will fix these issues. However if not, you can slide the Saturation and Luminance limiter to cut off the extreme color correction errors.

If you get false coloring as in the image on the left, this slider is for you

Time Window (frame +/-):

Time Window defines a radius of frames around the current time for analyzing and processing footage. It can be thought of as a "neighborhood" of frames. An ideal time window is often harder to set for time lapse footage in contrast to setting one for high speed footage—time lapse footage usually does not have a regular beat. For time lapse footage, you may need to animate the value of the Time Window parameter over time.

Next Frame Step:

A Next Frame Step setting of 1.0 will use all frames. Use Next Frame in a time lapse when you have a very long deployment timelapse that by itself causes no major flicker issues at playback rate, but decimating that timeline (making it shorter by skipping frames) might reintroduce unstable variations (that were not perceivable played from more FPS footage). Also it's not unusual in time lapses that an event "breaks" your setup for 5 frames. Although it's not recommended for visual continuity to animate this value, in this case it might make sense to say from a step of 15 (that would be a real slow timelapse) to animate towards 1 in a particular section so the adjacent frames (time window) becomes the nearest neighbor frames for a short section.

Sampling Block Size:

Due to the nature of the analysis methods used here, the Sampling Block Size control does not respond in the same way that Motion Analysis Scale does in DE:Flicker Highspeed does. With time lapse, there may be motion noise—like a car showing up on a single frame—whereby optical flow will not respond as well as with footage shot at high frame rates. Optical flow is a motion estimation method used by tools like Twixtor. In fact, optical flow might fail miserably on time lapse footage. As such, DE:Flicker Time Lapse implements a completely different motion estimation method and tracks groups—or blocks—of pixels and it matches the local color values of these over time. The drop down setting for this parameter essentially translates to how many "trackers" are used during analysis. Naturally, there is a performance cost in setting this parameter to a smaller size (smaller block equals more trackers). Notice the Block Size option "BIG," which you might find useful for time lapse footage with a very high spatial resolution.

Method:

The first three options on the Method menu may show only subtle differences. Use the default value to set up everything, and then check the other modes to see if your footage turns out better. Avoid adjusting things like Contrast % before you try this.

> Note: Blurry backgrounds, as found in footage shot with a depth of field, do not work well with this sort of block matching along a time window. The extra method, Coarse Color Transfer, is provided because of that issue. The difference between Average Match and Cumulate Match is that Cumulate Match will advance frame by frame within the time window while Average Match compares each frame within the time window to the current frame and averages the results.

Average Match might be better for a static or very slow moving camera. Sometimes you will not see much difference between the settings.

A last mode (Frame Average) is provided as a fallback solution, and this mode does not use any motion tracking. In this mode, pixels in successive frames are simply averaged together, and the resulting pixel color is controlled exclusively by the Max Change% control which limits how much each pixel can change in color.

Max Change %:

As in the DE:Flicker Highspeed controls, Max Change % limits the maximum contribution of a particular frame. Note that Max Change % will behave differently with the different methods.

Constant Color Fix:

Sometimes with flat color areas you might get blocky artifacts. When this happens press this button..
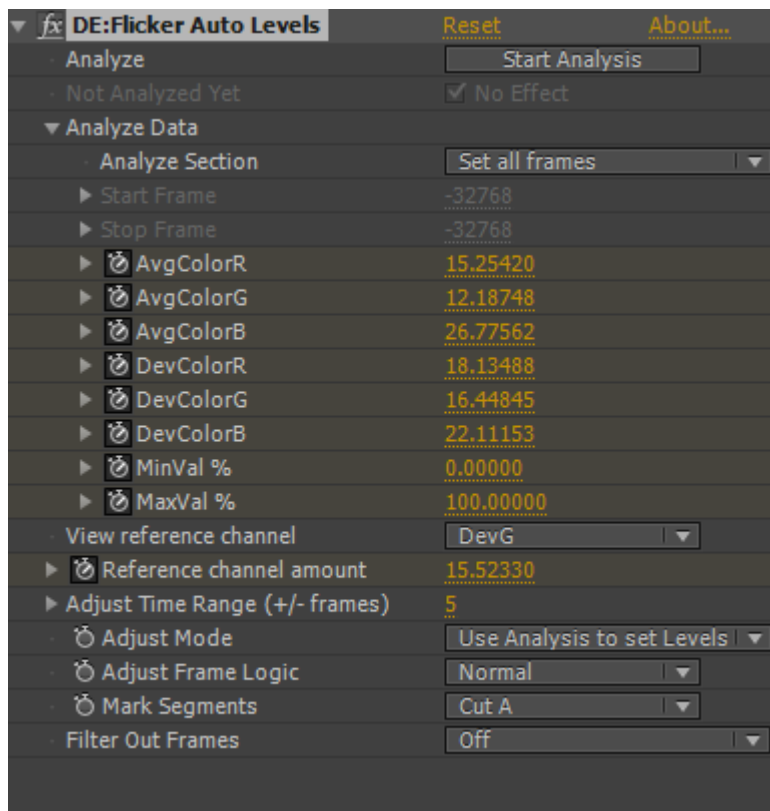
Mark Segment:

Use Mark Segments to mark cut points, or scene changes, in your footage. Create key frames for this parameter at those cut points, ensuring that the option A, B or C is different for each of those key frames. Dissolve mode is used to turn off the de-flickering process when you have a transition instead of a cut.

Contrast %:

Analyzing a large amount of accumulated frames can reduce the overall contrast of your footage. The Contrast % control allows you more control over contrast for a better quality or desired image. Of course it might be appropriate to color correct the result after deflickering.

DE:Flicker Auto-Levels

When you first apply the DE:Flicker Auto-Levels effect, your footage will not be effected. You have to press the Start Analysis button for the plugin to function. As explained in the DE:Flicker Time Lapse section, you might want to use this plugin not only to stabilize color/levels over time but to help you locate good frames for DE:Flicker Time Lapse or simply visualize what is happening.

AUTO LEVELS PLUGIN WORKFLOW

1. Analyze your footage. Analysis simply stores eight values at each frame that can be referenced for recovering significant global color changes. Notice that upon starting the analysis, key framing for the parameters becomes enabled and a new value is keyed at every frame. To really see what is going on, switch time line to its graph mode (see figure 7). Of course, if you are not working with 32-bit color depth, MinVal % and MaxVal % will never be under 0% or over 100%. If they are then you might have analyzed while in 32-bit color bit depth, but are now using a lower bit depth.
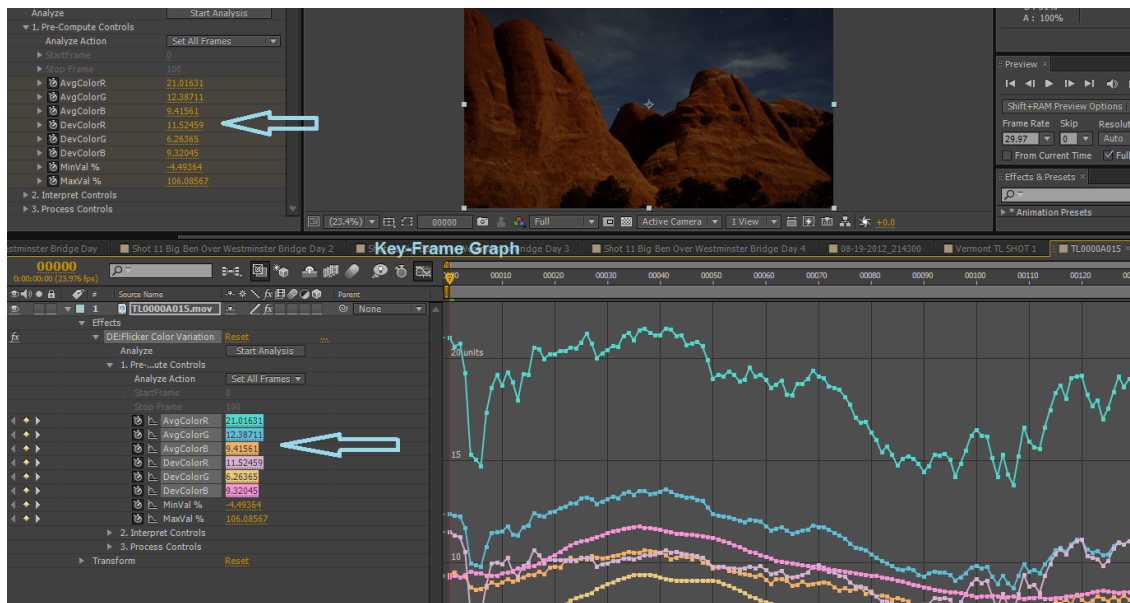
Figure 7 Graph view of DE:Flicker Auto Levels analysis parameters

2. NOTE: In Adobe After Effects use multiple selections to evaluate which is the best data channel to use.Interpret values stored by Analysis. Usually what we want is to smooth these curves to remove global color variations.

3. First set the channel you want to reference by setting <u>View Reference Channel</u>—it defaults to <u>DevG</u> or "Deviation Green". Use <u>Adjust Time Range</u> to smooth the reference channel's curve, it defaults to 5 frames on each side of the current time. In Figure 8 below we smoothed with a radius of 20 frames. Adjusting the time range will automatically re-compute a new curve for you, and does not affect the initial analysis step, so changing this value does not force you to reanalyze.
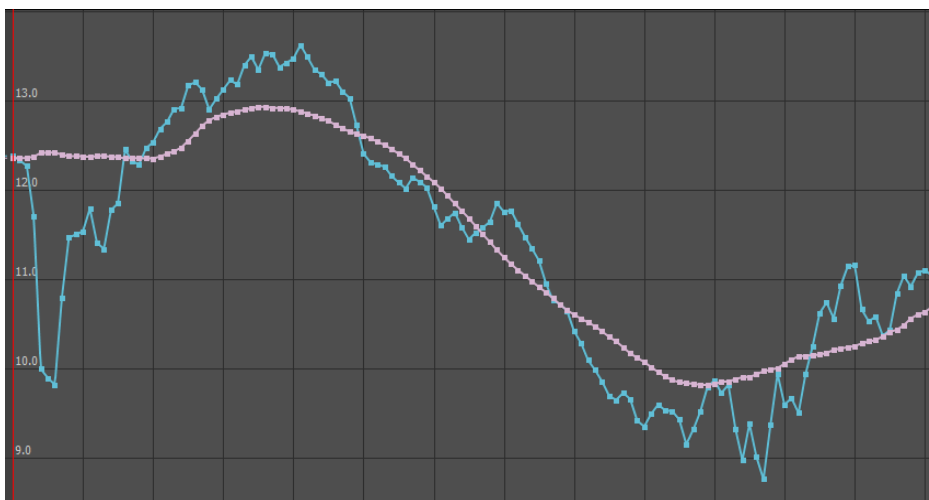

Figure 8 Smoothed curve using a Time Range value of 20 frames.

4. Usually we are interested in making this smooth over time as opposed to a flat line. Removing some wiggles in the curve over time is our objective here.

5. This parameter group also has the Scene Cut menu allowing you to **Mark Segments** (Cut points). The smoothing process will respect the cut points, and will not use values from other so defined segments.

DESCRIPTION OF CONTROLS

Analysis Data:

After pressing the "Start Analysis" button, results of the analysis are stored in the parameters found in this group of controls. You do not necessarily need to examine the values, but the tool needs to store them.

Analyze Section:

By default Analyze Section is set to "Analyze all frames". Change this to analyze only a range of frames when you have a long footage sequence with only a short segment to fix. When selecting any option other than "Analyze all frames", the Start Frame and Stop Frame controls become active.

Adjust Mode

This controls defines the technique used for adjusting the flickering. The default "Use Analysis to set Levels" smooths out all curves and will apply the variation to all color channels. As an example, imagine we have a red sequence that cuts to a blue sequence,

setting the time window to 20 will create a color dissolve 20 frames long. This processin happens very quickly as we avoid needing to fetch images by reading just pre-calculated values.

Adjust Frame Logic:

This sets a logical operator used during color correction algorithm. The "Normal" option has no effect. The "Only Lighter Than" and "Only Darker Than" options allow you to correct only lighter or darker frames, respectively, than what is determined as average. The idea with this control is that you might want to only correct too dark or too bright images in a first pass.

HINT: This control often makes more sense when you have a wide Adjust Time Range window.

Filter Out Frames:

This control examines adjacent frames and tries to reduce possible artifacts. For example some compressed videos might exhibit block-like artifacts when a dark image is brightened too much. The first two modes, "Use only even frame number" and "Use only odd frame number", are hard coded to filter out every even or odd frame respectively. You might want to do this if every other dark frame (or lighter frames) looks unacceptable when their levels are increased. Naturally, you would probably want to apply DE:Flicker High Speed after doing so. Alternatively if you have a light or dark frame every 4 frames for example you use modes "Use only darker than" or "Use only lighter than". This option only look at neighbor frames so is not necessarily appropriate for all cases.

Additional Notes and Known Issues

Large burnt out regions on some frames is a very common problem with LDR (Low Dynamic Range) capture. In cameras with a wide field of view and no zoom, it is easy to end up with clamped areas in your imagery, and it is often hard to avoid ending up with a bright light source in your imagery—like the sun. In such cases you might need extra help from RE:Match Color. Something that might lessen the clamped areas is to use the "Highlight Compress" mode in RE:Match Color to attenuate these large spots of flatness in skies for example or simply around light sources in the image. Note you can "sandwich" DE:Flicker between two applications of RE:Match Color as the control "Highlight Compress" supports the reverse operation when you slide the value under 0, thus allowing you to restore the highlights levels after deflickering. Alternatively if this makes the Auto-Exposure unpredictable, you can also, with RE:Match Color (before DE:Flicker), find a frame without big sun burn and match color to that using the Window Controls (if you are not familiar, you can set a window within a frame and select Invert Windows to ignore an area like the sun somewhere in frame).

Some modes do not work well with non-full alpha channel.

DE:Flicker Time Lapse does not preserve over range very well.

DE:Flicker Auto-Levels: You might want to analyze in floating point and then revert to 8-bit or 16-bit if you want to work with a lower bit depth. If you analyze at 8-bit then move immediately to 32-bit, your source footage then it might not produce the same average color. Material encoded in YUV (YcbCr) for example will often have values above 1.0 and under 0.0.