Making HDR Pano and Time-lapse Using MECHA

What is HDRI?

High Dynamic Range Imaging (HDRI) is a technology that improves the range of color and contrast in a digital image. A common way to create HDR image is by capturing multiple images with different exposures at the same time in a quick sequence. The images are combined by software to highlight the best parts of each image.

Shooting Tips

Basic Rules:

1. Lock aperture to fix depth of field.
2. Lock focus.
3. Lock white balance.
4. Lock ISO at low values for less noise. Avoid using "extended" ISO values which have lower dynamic range.
5. Bracket the exposure time (or shutter speeds) for different exposures.
6. Turn off any in camera automatic image enhancement such as contrast, saturation and sharpening.
7. Keep your lens clean, any dirt or dust will be accentuated in an HDR image.

Aperture and Exposure Time

1. Generally overall image is sharpest at F8 or F11, beyond which diffraction will soften it.
2. Recommended EV Exposure Settings:
    i. [EV0, EV+2, EV-2] for real estate interiors and other high contrast scenes.
    ii. [EV0, EV+2, EV-2, EV+4, EV-4] for something really contrasty, like when there is a sun in the frame along with some dark cliff.

    Note: One EV (Exposure Value) implies a change of one stop of exposure. So EV-1 halves the amount of light. EV+1 doubles the amount of light.
3. Determine the shutter speeds for highlights and shadows using Aperture Priority and spot metering.
4. Calculate the shutter speed of middle exposure.
5. Switch to manual mode. Dial in the shutter speed for middle exposure.

Shooting in JPEG or RAW

In JPEG, bracket in 1 EV increments with the right white balance.

In RAW, bracket in 2 EV increments because it has much larger exposure latitude and that means fewer photos to cover the same exposure range. You can also change color temperature in post processing. When shooting in mixed lighting conditions, e.g., interior lit with fluorescent lamps with windows in natural daylight, you can process each shot for two color temperatures and composite them in an image-editing application like Photoshop.

Mirror Shock in DSLR

Mirror flapping up and down causes the camera to move at the time of exposure, resulting in a small amount of blurring in the image. The blurring can be visible when shutter speed is slower than 1/125 seconds, especially when doing macro work or using long telephoto lenses. Use Mirror Lock-up, Exposure Delay or Live View features to avoid it.

Long Exposure Noise Reduction

If this feature is turned on in camera, exposure longer than 1s will be processed to reduce noise by method of Dark Frame Subtraction. The consequence is each shot longer than 1s will take double amount of time. This will aggravate exposure shift due to changes in lighting and add a lot of time to capture the whole pano or time-lapse. It is highly recommended to turn this feature off and do noise reduction in post processing instead. To reduce long exposure noise, you can use Manual Dark Frame Subtraction or other software tricks. See here http://bit.ly/LENR-1 and here http://bit.ly/LENR-2.

Using Higher ISO

Sometimes, you need to boost ISO for faster shutter speeds. You want the longest exposure in a bracket to be free of motion blur. You may want to shoot the entire bracket without any object moving at the time of capture. You may want to shoot sharp handheld HDR by using fast shutter speeds and high-speed continuous shooting.

Certain cameras today are "ISO invariant". They show little noise penalty to boost a low ISO RAW file in post-processing. With them, you can protect the highlights by using a lower ISO, but still have the ability to pull good detail out of the shadow areas as if you were using a higher ISO. You will meter for the highlights using spot metering. See here for a study on ISO invariance of Sony Alpha 7R II. http://bit.ly/ISO-inv

Other Considerations

1. Shoot fast - people, cars and clouds move, lighting can change quickly. Shoot in continuous mode whenever possible. Use a cable release.
2. Take your time to do it correctly. Many times, you cannot do a reshoot. If you rush too much, you may overlook something and only to realize you missed a few shots at the time of stitching. When shooting many HDRs or panoramas of various locations, be sure to keep your eye on the exposures or histogram on your camera. When you are moving around with your gear, it is very easy to accidentally turn a dial or knob. You may forget to turn on/off your auto-bracketing options.
3. Don't bump your tripod or you will have to start over.
4. If you shoot in sand or loose ground, then tripod spikes can help stabilize your tripod. You can also slice open three tennis balls and put them under the tripod legs. This will help to spread the weight of the camera and tripod. This also prevents scratching up hardwood and marble floors.
5. Position yourself to minimize your shadow. This will save you a lot of time in eliminating the shadow in post processing.

Camera Settings

Make sure to:

1. Lock aperture to fix depth of field.
2. Lock focus.
3. Lock white balance.

4. Lock ISO at low values.
5. Turn off automatic image enhancement.
6. Turn off Long Exposure Noise Reduction!

Auto Exposure Bracketing

Many cameras include an Auto Exposure Bracketing (AEB) mode, in which the camera automatically takes three or more shots, each at a different exposure.

Step by Step

1. Select how many shots in a bracket you need to take.
2. Set the amount of exposure compensation (EV steps) that should be used for each shot.
3. the shutter speeds for highlights and shadows using Aperture Priority and spot metering.
4. the shutter speed of middle exposure using this calculator. http://bit.ly/HDR-Cal
5. Switch to manual mode. Dial in the shutter speed for middle exposure, regardless of bracketing order.

Tutorial for finding shutter speeds for highlights and shadows. http://bit.ly/MeterDR

shooting mode

Single

Press the shutter button multiple times to complete the bracket.

Continuous

Hold down the shutter button completely, the bracketed shots will be taken consecutively and the camera will automatically stop shooting.

Self-timer

Bracketed shots will be taken consecutively after a delay.

Reducing Mirror Shock in DSLR

What is Mirror Shock

Mirror flapping up and down causes the camera to move at the time of exposure, resulting in a small amount of blurring in the image. The blurring can be visible when shutter speed is slower than 1/125 seconds, especially when doing macro work or using long telephoto lenses.

Mirror Lock-up

The first time you press the shutter release it will lock up the mirror, the second time it will fire the shutter. Typically, the camera will return the mirror to the down position at the end of every exposure and wait for you to lock the mirror up again for it to proceed, regardless of shooting modes.

Exposure Delay

This mode is only available in some advanced cameras. It allows you to set a timer between mirror up and shutter release. Once the shutter button is released, the mirror will be raised and the camera will wait until the timer expires, after which the image will be captured. Below are some examples.

Canon 5DS, 5DS R, 5D Mark IV can set up a timer from 1/8 to 1 second. Nikon DSLRs with "Exposure Delay Mode" can set up a timer from 0.2 to 3 seconds. Phase One XF can set up a timer from 0.5 to 8 seconds.

Live View

In this mode, camera is effectively operating in mirror lock-up mode all the time, only the camera won't put the mirror down between frames when used in combination with continuous and timer release drive modes.

Bracketing Limitation Workaround

Extensive bracketing options are usually reserved for high-end cameras. If your camera is limited in the number of bracketed images and the EV steps, you can take two or more brackets with exposure offsets and combine them to get a larger exposure range and/or more closely spaced EV steps. This HDR Exposures Calculator will work out the combinations automatically for you. http://bit.ly/HDR-Cal

MECHA Settings for HDR Pano

Continuous Shooting Mode

1. Use continuous shooting mode in camera whenever possible. Treat the whole bracket as one image. In the number of images to shoot for each position, enter **[1]**.

2. Many cameras require holding down the shutter button completely till all bracketed shots are taken. Sum of exposure time is about 2x of the longest exposure for 1 EV steps and 1.33x of that for 2 EV steps. Enter the time it takes to complete the bracket in **[E:x sec.]** (Exposure Timer) dropdown, where x is the last saved value. When shooting a large bracket in RAW, buffer memory can be filled up quickly and shooting will be slowed down. Allow more time accordingly.

3. When camera buffer memory is full, it will not respond to further shutter button signals, resulting in missed shots. For best reliability, allow time to write ALL images to memory card before MECHA moves to next position. Use **[A:x sec.]** (After Exposure Timer) dropdown for this purpose.

Single Shooting Mode

1. Use single shooting mode in camera when mirror lock-up is needed or when the longest exposure in a bracket is longer than manual exposure mode allows, typically 30s. Switch to Bulb mode to extend the range.
   In the number of images to shoot for each position, input the number of images in a bracket, e.g., **[3]** or **[5]**. MECHA will press the shutter button multiple times to complete the bracket.

Short Exposure

2a. For exposures less than 1second, you can enter the longest exposure time in **[E:x sec.]** (Exposure Timer) dropdown, where x is the last saved value. You can use a slightly longer time for ease of input and as extra safety.

3a. When camera buffer memory is full, it will not respond to further shutter button signals, resulting in missed shots. For best reliability, allow time to write ALL images to memory card before MECHA moves to next position. Use **[A:x sec.]** (After Exposure Timer) dropdown for this purpose. This delay is added after the whole bracket is complete.

4a. For camera with small buffer memory shooting in RAW, use a negative value for x, e.g., **[A:-3 sec.],** to allow more time between shots for the buffer to clear after EACH exposure.

Long Exposure

2b. For longer exposure, time wastage will be significant if all exposure time is treated the same as the longest. MECHA supports varying Exposure Timer in a bracket. The order can be either increasing (under > normal > over) or decreasing (over > normal > under). You will need to change the bracketing order in your camera to match that of MECHA.
For bracketing in increasing order, enter custom value **[E:2*m sec.]** in **[E:x sec.]** dropdown for +1 EV steps, or **[E:4*m sec.]** for +2 EV steps, where m is the shortest exposure time in the bracket. The duration of shutter button signal will be progressively doubled or quadrupled. For bracketing in decreasing order, enter custom value **[E:0.5*n sec.]** for -1 EV steps, or custom value **[E:0.25*n sec.]** for -2 EV steps, where n is the longest exposure time in the bracket. The

duration of shutter button signal will be progressively halved or quartered. Except in Bulb mode, use a slightly longer exposure time for safety. Always do a test before the real capture. You can always cancel a test sequence.

3b. When camera buffer memory is full, it will not respond to further shutter button signals, resulting in missed shots. For best reliability, allow time to write ALL images to memory card before MECHA moves to next position. Use **[A:x sec.]** (After Exposure Timer) dropdown for this purpose. This delay is added after the whole bracket is complete.

4b. For camera with small buffer memory shooting in RAW, use a negative value for x, e.g., **[A:-3 sec.]**, to allow more time between shots for the buffer to clear after EACH exposure.

Mirror Lock-up

5b. When a negative value is entered for **[B:x sec.]** (Before Exposure Timer) dropdown, e.g., **[B:-5 sec.]**, up to 2 seconds from it will be used for Mirror Lock-up. The first exposure in a bracket will be made 5 seconds after MECHA moves to a new position. For each exposure, mirror will be locked up 2 seconds before shutter is fired.

On Top of Pole

Due to large leverage and flexibility in long pole and support base, there can be big vibration after MECHA moves to a new position. Time must be allowed to damp the vibration before first exposure is made. Use **[B:x sec.]** (Before Exposure Timer) dropdown for this purpose. It also allows more time for camera to write images to memory card. When this delay is used, the After Exposure Timer can be reduced accordingly.

MECHA Setting for Time-lapse

Repeat

Use Repeat Timer for a time-lapse. Enter custom value in the **[no repeat]** dropdown. Enter number of repeats to make and the in-between delay in seconds, with * as a separator. To repeat once, just enter the time.

e.g., **[300]** for one-time repeat in 300 seconds, **[4*300]** for 4 repeats, 300 seconds apart.

Rewind

Select **[rewind]** from the dropout to return rotator to initial position. Useful for partial panoramic time-lapse. And vital to prevent cable entanglement when cables attached are stationary at one end.

Wake Up

When a camera has been idle for a long time, it may enter sleep mode to save battery. Use the Wake-up feature in MECHA to reactivate the camera by sending an AF signal to camera. Select from **[W:x sec.]** (Wake-up Timer) dropdown or enter a custom value to wake up the camera x seconds before the sequence begins. To avoid unnecessary delays, wake-up signal will only be sent if AF or shutter button signal has not been sent in past 50 seconds. A negative value entered will force a camera wake-up signal and delay before each sequence begins.

Hide Yourself

Wake-up Timer is also saved with the button presets. Entering and saving a negative value long enough, you can have time to move out of camera's view after you execute a preset by buttons.