

## Long Exposures

Usually the photographs we take have very short shutter speeds - fractions of a second. And there are a lot of articles about such photographs. However when you step into the realm of long exposures, you find many interesting things and effects. In this article I will try to explain several known to me techniques that relate to usage of long exposures.

The Idea

Panning

Zooming

Curtain Synchronization

Dragging with Flash

Moving Objects

### **The Idea**



The term "long exposure" used here is quite simple; it's when the shutter is open for long time (more than a half of second could be already considered a long exposure). Because of such long exposure the photographer could introduce various effects into the photograph. Some of the effects are intentional, some are not. For example, unsteady hands will produce blurry images and weird lines of bright lights in the picture. Examples of intentional application are panning, zooming and freezing the moment with flash. More about specifics of these applications is in next sections of this article. Some of the effects actually allow the photographer to "remove" moving objects from the picture. How? Read on.

So, let's get back on track - back to the idea of "long exposures".

The idea is to capture the movement and express this movement in the photograph. There are two ends of this stick. First is that the camera stays still and the subject is moving. Or that the subject stays still and the camera moves. And in the middle is all kind of combinations of it. Such that you follow the moving subject with the camera; and the background is blurred (expression of the movement).

The greater the difference in speed of the subject and the background the more dramatic effect you get. As I explain below, in some of the effects the speed of the subject (relatively to the frame) is controlled only by you. And if you are able to hold the subject in focus and in the same position within the frame for longer time, then you will get a more blurred background and a greater contrast (impact) between the sharp subject and the blurred background.



## Panning

Panning is the techniques that I just described. Let me repeat. Your subject (i.e. a car) is moving, you keep the subject in focus and move (pan) the camera, so the subject stays in the same place of the frame all the time. What photograph does it produce? Look at the example below.



Let's spend a minute and analyze the image. What can we digest here? Those multiple lines (streaks of light) tell us that I was panning the image. The police car is slightly out of focus and looks like a ghost (double vision kind of thing). That tells us that while I was moving the camera to follow the car, my movement was not perfect and some portion of the movement the car has moved within the moving frame (horizontally mostly). There is one more thing, the lines of light are slightly bent; it says that there was some vertical movement as well.

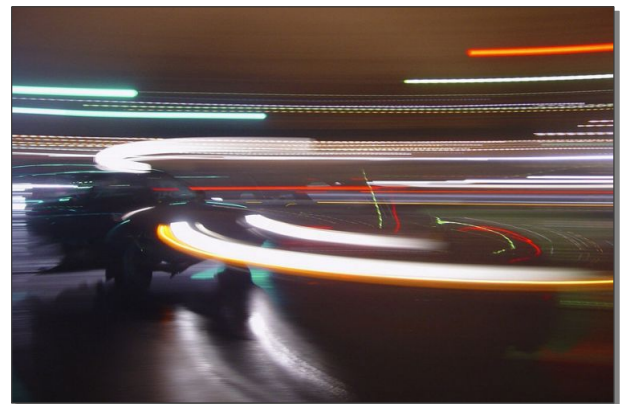
Such image degradations are common, especially if you don't use a tripod (or at least monopod). In this case the photograph was taken handheld; there was no any other support except my shaky hands. It took me many attempts to get a decent shot like this one.

However, even when a tripod is used and some direction of movement is limited or even eliminated there are a few problems left. First one is that when you press the shutter you cannot any longer see what is going on in your camera - the viewfinder goes dark, because the mirror goes up and the light shines at the sensor. It applies to SLR cameras, but not to rangefinder ones. To achieve the perfect shot (or close to one) you have to practice for some time before your movement, movement of the camera and the moving object all coincide.

The second one is not so obvious. Supposedly you locked the vertical movement and you do the shot as I've done with the police car. The plane you are moving the camera and lens is not the plane the car is moving (in my case the camera was slightly higher than the car). And here lies the problem - the difference in the planes creates a slight curve in the movement. So the movement of the camera could be locked in only one plane - horizontal, but the car will move slightly in the vertical plane. And sometimes it's not such a big problem (for short exposures the curve could be unnoticeable), but it's something you may want to know. In order to cope with this problem, you have to ensure that the plane, in which the camera moves, is parallel with the plane of the moving object. In my example, I would have to point my camera slightly higher to make the planes parallel.

And to conclude this section, I want to add a few things. During a day to achieve long exposure you usually have to use smaller aperture and ISO. Though even then it could be not enough. Then try to put a polarizer on the lens, if you have one, it will add you a stop or two to you shutter time. The best solution is to use neutral density filters. They would not change the scene (as polarizers do), but simply decrease the light coming through the lens.

To make the best out of the panning (and most of the other long exposure techniques described in this article) I would recommend to choose a bright/shiny subject (or highly reflective), darker background with many bright spots. By doing so, you will achieve a greater contrast between the background and the subject, and the background lights will create those interesting patterns.



Application? The most frequently seen application of panning is racing cars. The cars move quite fast and with a shutter speed about half a second or longer the photographers are able to draw the eye to the car. The background is almost completely smudged.

## Zooming

This technique is not that different from the one I described in the previous section - panning. The difference here is that the motion is applied to the lens instead of the camera, and the movement of the subject is achieved only by the movement of the lens zoom. And I would not say that the movement of the subject helps here. Probably, if the subject moves directly from or to the camera it would not deteriorate the desired effect.

And again it would help if the camera is on a tripod. The motion applied to the zoom ring should be smooth and consistent. You have to practice a lot before you can do it right, at least it took me many attempts to get something worth. The other thing that you should know is that the subject (or important part of it) should be in the center of the image (where the focus is as well). The area farther from the center will be blurred stronger than in the center. And it will be hard to distinguish details in areas around the center.



There is one little trick that you can use for your benefit. Leave some exposure time for a still shot. So, the zooming motion is preceded or succeeded by a short period of time when the camera and lens are completely still. Such stillness will make this delayed scene more prominent in the whole shot. For example, you have a bright display sign as the subject; and you are closing in on it during this long exposure. If you stay on the sign for 20% of the exposure time and then start zooming in, the final photograph will have a bright sign (may be even overexposed slightly) in the middle and a blurred motion around, which leads the eye to the sign.

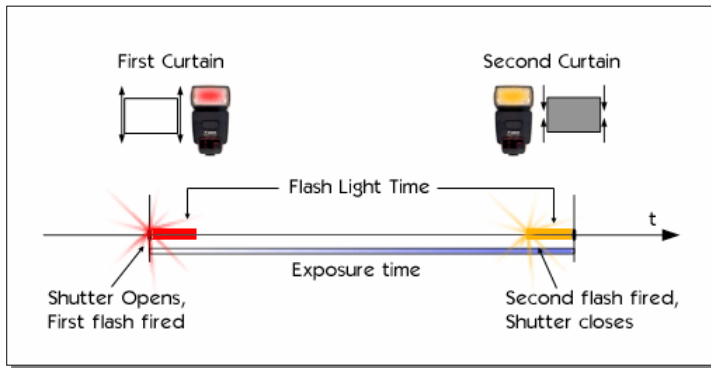
## Curtain Synchronization

Before we proceed to the next section (Dragging with Flash) I have explaining to do. There is one technical aspect of using flash with long exposures that you should know - Curtain Synchronization. Many people use flash without thinking much about it; and it's fine. But when you dig into technicalities and want to get more out of the equipment you have, then you have to know some basics at least. Here is a simple question, which I will try to answer in this section: "When does the flash fire during long exposure?"

The answer is simple - the camera/flash manufacturers usually provide us with only two choices - first curtain and second curtain. If your camera doesn't have such settings then it's most probably the first curtain. Wait a minute, what is he talking about? What first or second curtains? Is it a shower curtain?

Of course, it's not a shower curtain. We are talking about the shutter curtains. Here is a nice explanation:

*"Focal plane shutters (common on SLR cameras) consist of two "curtains", usually made of rubberized cloth (in old film cameras) or very thin metal. The first curtain (which I will call the "leading" curtain) normally covers the film or sensor, hiding it from the light coming through the lens. When you take a photo, the leading curtain moves across the film/sensor to expose it to the light. After the leading curtain has moved, another curtain (which I will call the "trailing" curtain) starts to move, again covering the film/sensor to hide the light from it."* - Skip Douglas ([http://www.photo.net/bboard/q-and-a-fetch-msg?msg\\_id=00FZNZ](http://www.photo.net/bboard/q-and-a-fetch-msg?msg_id=00FZNZ))



The figure on the left shows the mechanics that I want to explain. The diagram depicts the actions, which happen in time. There are two choices that we have with firing flash: first curtain (red color) and second shutter (orange). The white-blue gradient shows the exposure time, which starts when the shutter opens and ends when it is closed.

#### First Curtain

When you camera is set to synchronize the flash and shutter at first curtain, shutter opens and at the same time the flash fires. Because the flash fires only for a short time, the flash light time doesn't coincide with

the exposure time - it's much shorter. Only the first few fractions of a second the scene is lit by the flash. This is depicted by the thick red line in the beginning of the exposure time.

#### Second Curtain

The situation with synchronization to the second curtain happens at the end of the exposure time. Flash fires; the scene is lit for a few fractions of a second, shutter closes. And this is shown by the thick orange line.

Well, this concludes this section about concepts of shutter and flash synchronization. Now, I hope, you understand and can answer the question I asked you earlier - "When does the flash fire during long exposure?" And we can proceed to the next section.

## **Dragging with Flash**

So, stop for a moment and think of the following statement - "Long exposure and Flash". What kind of thoughts and ideas it evokes in your mind? In light of the previous section about curtain synchronization, we know when and how the flash will fire. But what effect will it bring to the picture? This is what we are going to look into in this section. There are several ways to use flash: first curtain, second curtain and stroboscopic.

The effect of the first two is very similar to the image on the right. I was zooming while the shutter was open (the shutter speed was 1/25 of a second) and the flash allowed me to freeze the motion. Though the streaks of light are not that long; the shutter speed was too short for that. But I wasn't using a tripod or even a monopod; and the camera was handheld. And only because of the flash the subject in the picture is sharp.



The difference between **first and second curtain synchronization** is obvious in shots with moving cars. Currently I don't have pictures to show as an example. So, I will try to use words to describe the example. When you use the synchronization by first curtain, the moving car first will be visible (frozen) with the flash, and the all bright spots in the car (such as the headlights) will drag through the frame. The photograph would show the car with two (or more) light streaks going from the headlights (and other places) and crossing the frame in the direction of the car's movement.

With the other setting (second curtain) the car will be frozen and visible at the end of the exposure time. The car has moved for some time in the frame leaving the light marks (streaks) along its movement, which lead to the visible car.

I had to add that the scenario described above is for night time. And the car is of a dark color, which reflects insignificant amount of light. This insignificant amount of light won't be registered by the camera (or there will be a slight ghosting of the car).

With **stroboscopic** the effect is drastically different. The flash produces a series of pulses that freeze increments of the movement. Such effect sometimes is used in scientific work, to show the track of a moving object. To see

examples look at <http://www.albertvisage.com/?l=fr&m=medium&mp=MAM-SQU-012>. There is an interesting article written by Andrew Davidhazy about Digital Stroboscopic Motion photography (<http://www.rit.edu/~andpph/text-digital-stroboscopy.html>), which could help you learn more about this topic.

## ***Moving Objects***

The last topic to cover is how long exposure affects appearance of moving objects in the photograph. The main effect you probably can tell right away - it blurs them. In the previous section I briefly touched this effect when I explained about the moving car and flash synchronization.

When the object moves within the frame, each fragment of the sensor receives only a fraction of the light from the object. The faster the object moves; the less light sensor receives. And if we consider the proportion of the light received from the moving object and the scene, the scene light will be several time more. The longer the exposure, the bigger is the difference in light from the moving object and the rest of the scene. And here we can make a conclusion that the moving object could almost disappear if the exposure time is long enough.

This could be used to our advantage. One photographer was tasked to take a photograph of the Golden Gate Bridge in San Francisco. But the busy traffic would not allow taking a bridge without the cars and people. So he used the technique I just explained. He put several neutral density filters on the lens to make the exposure time very long (probably about an hour or even more) and during a day took the picture. The cars were gone.