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Interactive Tutorials in the Marketing of Digital Cameras:
How Tutorials Benefit Consumers & Retailers

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Abstract

Interactive Tutorials in the Marketing of Digital Cameras: How Tutorials Benefit Consumers & Retailers.

There is a growing market for digital single-lens reflex cameras (SLRs) that is driven by their ease of use, accessibility, and falling price points. Marketing these cameras with an interactive tutorial not only allows photo enthusiasts to improve as photographers, but also gives the retailer a profitable add-on and selling incentive. This work explores how interactive multimedia can be utilized as a source for instruction in camera mechanics. The proposed model is an interface using a virtual camera with which the user interacts. From this starting point the user can choose tutorials from corresponding elements on the camera. The topics covered include the shutter, aperture, image sensor, lens, and metering system. The interface allows for multiple paths through the tutorials. The tutorials are also interconnected so the user can transfer between topics when necessary. Tutorial information is layered from basic to detailed so the user can determine the amount of information they will access on a particular topic. By providing information in this way the users can customize the tutorial to fit their needs and interests.

Keywords: Photography, photo education, art education, camera, camera mechanics, shutter, aperture, image sensor, lens, metering system, interactive, and instructional multimedia

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Introduction

The digital single-lens reflex camera (SLR) offers ease of use, accessibility, and instant results, making it ideal for the photo enthusiast who wants to learn photography but perhaps lacks the time and resources required to master the film SLR camera. Given the benefits of digital photography and its capabilities for home printing, a tutorial on the proper use of the camera would be invaluable to the motivated consumer. Marketing SLR cameras with an interactive tutorial not only provides the photo enthusiast with a way to improve as a photographer, but also gives the retailer a profitable add-on and "up-selling" incentive.

My goal is to explore how interactive multimedia can be utilized as a source for instruction in camera mechanics. The user is presented with a camera in cross-section that illustrates the relationship between the five elements. From this starting point the user can choose tutorials from corresponding elements on the camera. The topics covered include the shutter, aperture, image sensor, lens, and metering system. The interface allows for multiple paths through the tutorials. The tutorials are also interconnected so the user can transfer between topics when necessary. Tutorial information is layered from basic to detailed

so the user can determine the amount of information they will view on a particular topic. By providing information in this way the users can customize the tutorial to fit their needs and interests. The tutorial will be Flash-based and presented on a CD-ROM.

The interactive tutorial as sales tool is not a new idea but tends to be brand specific and is often a thinly veiled advertisement. The usual "How to Take Better Pictures" type presentation is little more than a slide show with one liners like "get closer to your subject". These offerings assume the user has little interest in photographing anything beyond children and birthday parties.

My goal is to build a tutorial for the enthusiastic photographer who is not as interested in content ideas as in learning how to use the camera skillfully in difficult situations and in how choices in shutter, aperture, meter and focal length will affect the final image.

Review of Literature

The majority of the content in the tutorials is based on my previous education and experience in photography, work experience in photo retail, and 3 years as an photography teacher at Susquehanna University.

While I did not need to do any heavy research on the topics presented in the tutorial I did find the book "Photography," by Barbara London, useful in checking that my knowledge on the topics is accurate and that I was using the proper terminology. The "Photography" book and "Dictionary of Photography and Digital Imaging," by Tom Ang, were also used as references in writing the definitions for the interactive glossary.

In preparation for this project I looked at several CD-ROM and web site presentations on photography. The CD-ROM based tutorials were the "Kodak Photo University" and "Canon Photography Workshop," which had definite branding as they often referenced

their own cameras. The web sites were mainly companions to books or as part of a professional photographer's web site.

The two web sites that I felt related most to what I hoped to achieve were the companion web site for London's "Photography" book and a site called Short Courses. These are the most relatable as they both include interactive illustrations within the content. Interestingly, both of these sites are companion sites for a photo textbook. Short Courses prints "books on demand" and is companion to multiple books but the section I was most interested in related to "Using Your Digital Camera" by Dennis P. Curtin. Of the sites I looked at these two followed the strictest chapter format. The other sites did tend to group topics together but beyond the basics, like shutter and aperture, tended to include random tutorials

that weren't necessarily tied together in the same way they might be if they were incorporated into a structured lesson plan.

For this reason I wanted to design my tutorial so it adhered to a strict lesson plan. What this means is that I began by limiting what my primary topics were going to be: lens, meter, aperture, shutter, and sensor. These are the 5 elements of the photo process that are necessary to understand when learning photography. Other photo tutorials will go on to include a tutorial on close-ups, portraits, composition, etc. While I do touch on these in my tutorial it was

important that they are explained in a way that directly relates them to the 5 main topics. This in turn reinforces the importance of, and relationship between, the main topics.

Other issues I found with the web sites I looked had a lot to do with design. They tended to have larger blocks of text, uncohesive typography, and inconsistent treatment of illustrations and interactions. This is likely because most photographers have little or no training in graphic design. As a designer/photographer I hope that my tutorial design is an improvement over that of these predecessors.

Process

Overview

The decision to create an interactive tutorial on camera mechanics as a sales tool for camera retailers was based on my previous experience and education in photography. I have an MFA in Photography from Savannah College of Art and Design, three years of experience as a photo instructor at Susquehanna University, and eight years in retail camera sales. As a graduate student in Computer Graphics Design at RIT, I saw how interactive tutorials could be utilized in both photo education and camera sales.

During my time in camera sales I learned that cameras have a very small profit margin. More money is made in selling accessories and photo finishing. The single-lens reflex camera offers more opportunities for accessories or "add-on" sales. This is because customers are more likely to buy additional lenses, lens filters, tripods, external flash units, and memory cards. Customers tend to see SLRs as an investment, and therefore they are more likely to buy add-ons. Thus, a common goal in camera sales is "up-selling," or getting the point-and-shoot purchaser to move up to the SLR camera.

The type of consumer who is likely to buy an SLR is someone who has an interest in photography, who realizes an SLR will produce a superior image to a point-and-shoot camera, and who would like to improve as a photographer. The three reasons I recall most customers giving for not purchasing an SLR were cost, size of the camera, and a fear that they would never be able to use any of the features. It has always been my feeling that the issue of cost and size would not be a factor if customers understood why the SLR produces better photographs and felt confident that they could learn how to use the camera. Offering the consumer a tutorial on the camera's mechanics would allow them to learn how the camera works, how it produces better images than smaller cameras, and how it offers creativity through custom controls and its range of optimization (i.e. its range of f-stops and shutter speeds).

Content Structure

The tutorial is separated into five sections to simplify comprehension. These sections are the lens, meter, aperture, shutter, and sensor. My goal was to create

a tutorial that contained a great deal of information but presented it in a layered manner. A photography textbook may have a plethora of information, but the content is very linear and requires the reader to search through example images and superfluous information to find the core content. For this reason I designed the tutorial so that the main text on each page covers the fundamentals of the topic. I then added additional information in a manner that allows the user to decide how much information they need to comprehend the topic, or if they would like more information to enhance their knowledge. This additional information is included in several ways.

First, I reduced the number of definitions within the text by adding a rollover glossary of terms. The user can move the mouse over any word highlighted in blue to view its definition in the lower right corner of the screen. This was very useful in defining photographic terms that are essential to understanding the topic being covered. For example, it is necessary to know the term “focal plane” in order to understand several aspects of the lens and aperture. Given the non-linear design of the tutorial I would have had to define the term in several places in case the user skipped the first section of the lens tutorial in which it was defined. By defining all other instances of the term in the rollover glossary I was able to use the word when necessary without needing to restate the definition within the main text.

Second, I presented additional information through interactive illustrations. Most of these illustrations allow the user to click through images that clarify the information in the main text. The user can switch between images that show how different camera settings affect an identical scene. I was also able to provide additional information in the captions included with the images. For example, on the page about white balance I was able to explain the topic in general terms while giving more specifics on individual settings within the captions of the illustration.

Third, I added example images as thumbnails in the lower left corner. The user can click on the thumbnails to view additional images that further illustrate the current section topic. Each of these images includes text about the image, advanced topics, or helpful tips.

Finally, each section has a five question quiz that I use as an opportunity to summarize key points. The quiz is also an opportunity to add a few more notes. In the shutter tutorial I explain the “bulb” setting, but I wait until the answer portion of the shutter quiz to give details on why it’s called bulb.

Basic SLR Camera Mechanics

Introduction

Whether you shoot film or digital, the single-lens reflex camera (SLR) is essential for any photographer who wants high-quality images and control of camera functions including shutter, aperture, focus, and exposure. These functions have an effect on image quality, composition, aesthetics, and editability.

The single-lens reflex camera derives its name from the fact that it uses a mirror and prism to direct the light coming through the lens to the viewfinder. When the picture is taken the mirror flips out of the way to allow the light to pass to the focal plane where the image is captured on film or digital sensor. This feature allows the user to see the composed scene exactly as the camera will record it.

In this tutorial you will learn about the basic mechanics of the SLR camera, how they work together to produce a photograph, and what effect their settings have on the final image.

[Begin Tutorial](#)



figure 1:

Introduction Screen

When the user opens the tutorial they will arrive on the introduction page (*fig. 1*). The purpose of this page is to define the single-lens reflex camera and how it differs from point-and-shoot cameras.

I created a 3D modeled of an SLR camera that will transition into the camera in cross-section on the main navigation screen. In my original design this camera was a photograph of my actual camera, which is a Canon 10D. I decided to use 3D model for several reasons:

- The generic 3D model makes the tutorial non-specific to any brand of camera
- The cross-section was better at illustrating the placement and relationship between the five camera elements
- The photographed camera showed signs of wear, and given the age of the model would have given the tutorial a dated feel

This page also designates the placement of the tutorial title and the white box in which the main content will be presented. The title of the tutorial was originally "The Digital SLR Camera." While the text certainly speaks to the digital camera the majority of the topics covered apply to film SLR cameras as well. Given the lack of film cameras on the market today it seemed unnecessary to specify "digital."

Main Navigation

As mentioned before, the original navigation page had a photograph of an actual camera (*fig. 2*). Six icons, one for each section, encircled the camera. As the cursor moved over one of the icons the camera spun so the lens pointed towards the selected icon. The spinning camera was created by making a movie in Flash that contained images of the camera turning 360 degrees on a pivot point. To do this I placed the camera on a tripod with a piece of white mat board between the camera and the tripod shoe. I then set another camera so it looked down at the model camera at a 45-degree angle. Once my lighting was set I photographed the camera, then turned the tripod head connected to the model camera 15 degrees. This process was repeated until I had turned the camera 360 degrees. The tripod used to do this played an important part in this process, as it had degree marks for accurate increments and a pivot point centered above the tripod's panning axis.

The original tutorial had six sections: lens, meter, aperture, shutter, sensor, and focus. I decided to remove the "focus" section when I changed the title

to "Basic SLR Camera Mechanics." I determined that focus was more of an aspect of the lens, and that it did not need its own section.

In the first two drafts of the tutorial I had created icons (*fig. 2 and 3*) that illustrated the purpose of each section. These were also removed from the final design. While they may have been useful design elements, testing showed that some icons were less successful in illustrating their related section than others. For example, several people noted they didn't understand the icon for the meter, which is a set of scales. I saw this as symbolic of the balancing of the exposure. But this may not be evident to someone who is just learning about the meter.

The final version of the main navigation (*fig. 5*) screen has an illustration of the camera in cross-section. When the user moves the mouse over either the section tabs at the top or section names to the left a description of that camera element appears under the illustration with a line pointing to its location in the camera.

Evolution of the Main Navigation Screen



figure 2:

The original tutorial included a section on focus and a revolving camera that pointed to the tutorial icon when the mouse rolled over it.



figure 3:
The second draft of the tutorial still included the icons as a graphic element. The sublinks, like “credits” and “help” were too prominently placed underneath the title.

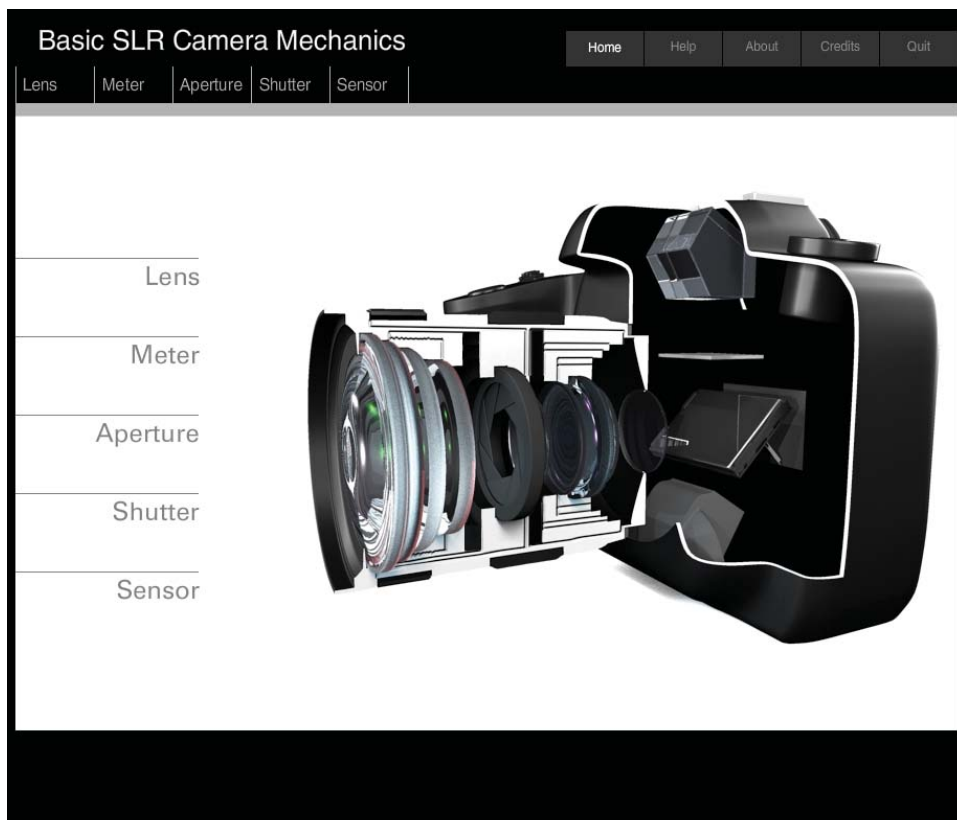


figure 4:
In the third navigation draft I removed the icons, moved the sublinks to the less prominent upper right and tutorial links now under title

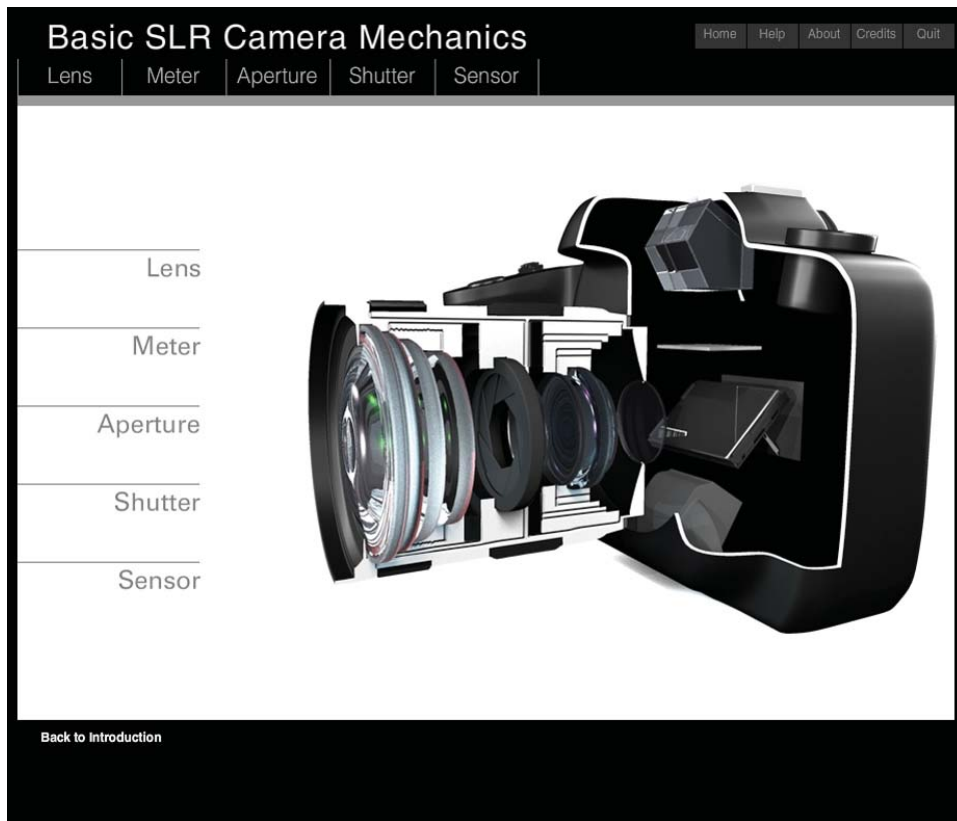


figure 5:
The final navigation has smaller sublinks, larger tutorial tabs, and a link back to the new introduction page.

Evolution of the Tutorials

The tab design for the interactive illustrations was influenced by the overall design of the application and the main navigation elements. Initially I tried laying out everything in a strict grid system with 75 pixel columns. Then all tabs, text columns, and images spanned was a pixel width of 75, 150, 225, etc. This carried over into my illustrations as I tried to make

each button 75 pixels across (*fig. 6*). This became difficult give the varied content and number of buttons necessary to accomplish what I wanted in each illustration. I decided to discard my strict grid system and make my illustrations more like simple buttons than tabs. This also made the tabs used in the top level navigation stand out more.



figure 6: First version of interactive illustration design

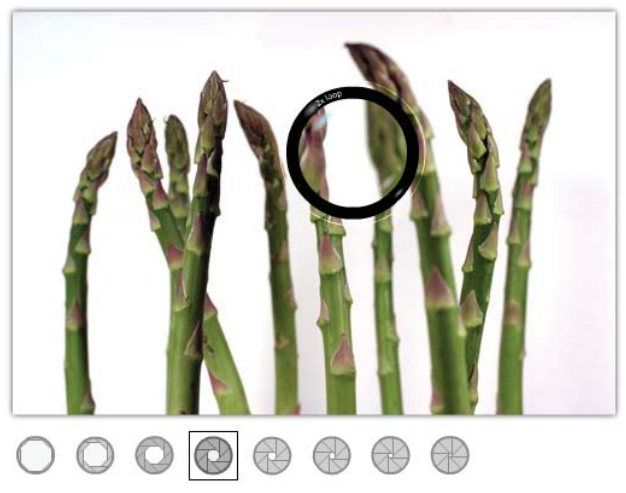


figure 7: Final interactive illustration design

Lens Tutorial

The lens section begins with an explanation of the lens structure, how it gathers light and projects the image on the focal plane. I then go into the key points on:

- Lens quality
- Focal length
- The difference between wide, normal, and telephoto lenses
- Macro photography

To introduce the lens I created a short animation (*fig. 8*) that illustrates how the modern camera lens is in fact made up of several optical elements. When I taught photography one demonstration I used was to take a magnifying glass and hold it parallel to a white wall that faces a window. I then moved the glass towards

or away from the wall until I got a relatively sharp image on the wall of the window. I explained this was considered a simple lens, and that while the lens in a camera is more complicated, it is performing the same task by projecting the image of the composed scene on the camera's focal plane. I would then expound on the camera lens and how it is actually a series of lenses that fix for differences in the refraction of light waves, contrast, sharpness, etc. This animation is basically the same demonstration. I begin with the simple lens and show how moving it in and out affects the image. I then show how the camera lens is a series of optical elements and how the image gets a little sharper when viewed through the multiple elements.

Basic SLR Camera Mechanics Home Help About Credits Quit

Lens Meter Aperture Shutter Sensor

Introduction to the Lens 1 2 3 4 5 Quiz ▶

The camera lens is vital to the quality of a photograph. Its primary function is to gather the light emitted from the composed scene and project it onto the camera's **focal plane** as a sharp and undistorted image that accurately represents what is seen through the viewfinder. This projected image is then recorded at the focal plane on film or by a digital sensor.

While the original lenses were a single glass element, the SLR camera lens is a series of optical elements. The elements are a variety of concave and convex shapes that fix for aberrations, distortions and sharpness. The elements may also be coated in different salts like **halide** and **magnesium fluoride** to improve contrast, decrease reflection, and reduce UV haze.

Lens quality is one reason the SLR camera produces a better image than any smaller point & shoot camera. This is due to:

- Quality of optic material, which can range from high quality glass to clear plastic.
- The size of optics, which gather more light. More light means more detail as the scene is brighter when captured.
- The number of corrective optical elements.

SLR camera
the single-lens reflex camera allows the user to compose through the lens by using a mirror that reflects the image to the viewfinder for composing.

Photo Examples Rollover blue words for definition

figure 8: Page one of the "Lens" tutorial

The second screen and illustration expands on how these elements affect the image by explaining issues with low quality lenses. The user can view the same image (*fig. 9*) as it would appear if the lens in use were to cause:

- Chromatic aberration
- Vignetting
- Low contrast
- Blurriness
- Distortion

Given the limited space in the tutorial, the illustration has an interactive loupe (magnifying glass) on it that can be used to see portions of the image magnified. This interaction appears several times. I felt the loupe was a good match given the photographic content of the tutorial.

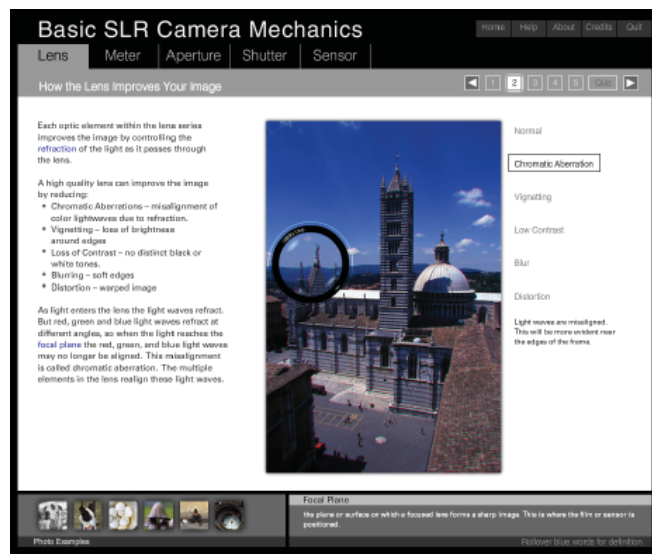


figure 9: Page two of the “Lens” tutorial

The portions on focal length and choosing the right lens are basically part of the same topic since the lens is defined mainly by its focal length. This is why they share the same illustration. I explain focal length and how the focal length categorizes lenses as wide-angle, normal, or telephoto. To demonstrate how a change in focal length affects both magnification and spatial relations within the image I shot two series of images using different focal lengths ranging from 17mm to 200mm. In one series I kept the main subject the same size in the viewfinder as I increased the focal length (*fig. 10*) to illustrate how focal length affects the spatial relationship between the main subject and the background. In the other series I kept the camera stationary and increased the focal length to show how the focal length magnifies the scene. For the first series I chose a subject that had a distant backdrop.

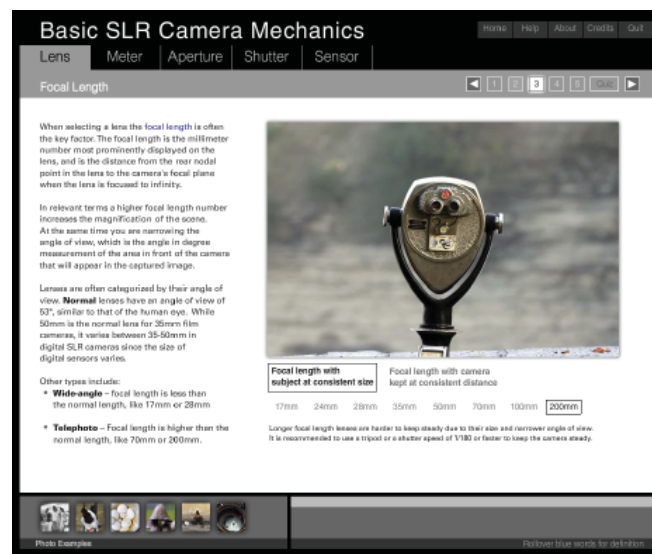


figure 10: Page three of the “Lens” tutorial

For the stationary camera series (*fig. 11*) I selected a scene in which an architectural structure is visible at the wider-angle focal lengths. The straight lines of the structure had the added benefit of showing how objects appear distorted near the edges of an image shot with a wide-angle lens.

The inclusion of a section on macro photography (*fig. 12*) was based on the fact that some lenses the user may come across will tout the fact that they are “macro”. An explanation of macro will help the user understand that there are varying degrees of macro. A discussion of macro is also an opportunity to point

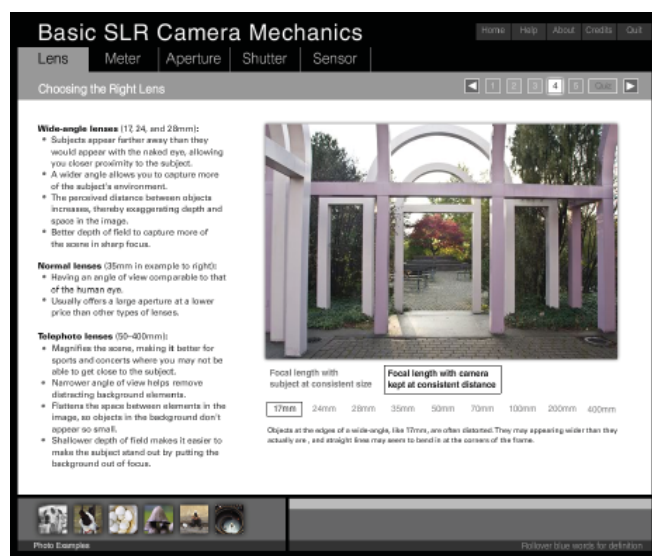


figure 11: Page four of the “Lens” tutorial

out how depth of field will be quite shallow at very close proximity to the subject.

A section on the range of acceptable sharpness was removed from the lens tutorial. I had created an interactive illustration that showed how a change in focal length or aperture affects the relative sharpness of the area in front and behind the plane of focus. This was removed for two reasons. From a design standpoint the illustrative quality of the interaction was inconsistent with the other illustrations in the project. Secondly, explaining the concept would require a lot of technical jargon and mathematics to do it justice. To help maintain the user's enthusiasm for photography it seemed important stay away from unnecessary technical concepts. It also seemed unnecessary since I do write about the more common "depth of field".

The lens has the greatest affect on composition decisions since it is what the photographer views the scene through. For this reason the example photos in the lens section deal at length with composition. Topics covered by the example photos are the rule of thirds, alignment, macro lenses, high and low perspectives, and the utilization of simple shapes in compositions.

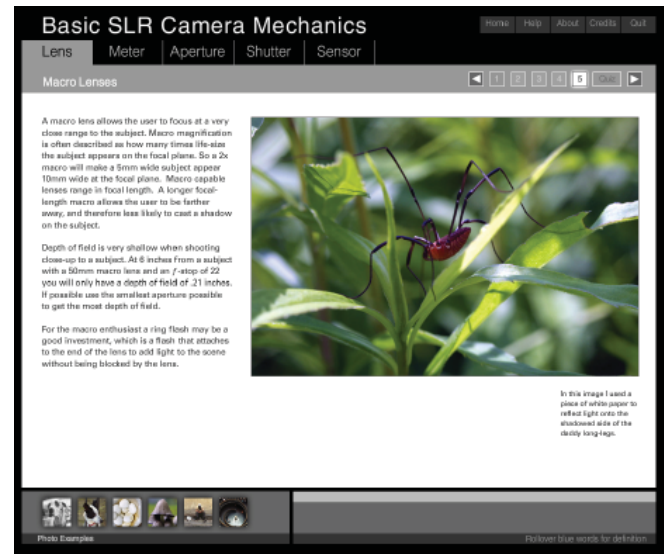


figure 12: Page five of the "Lens" tutorial

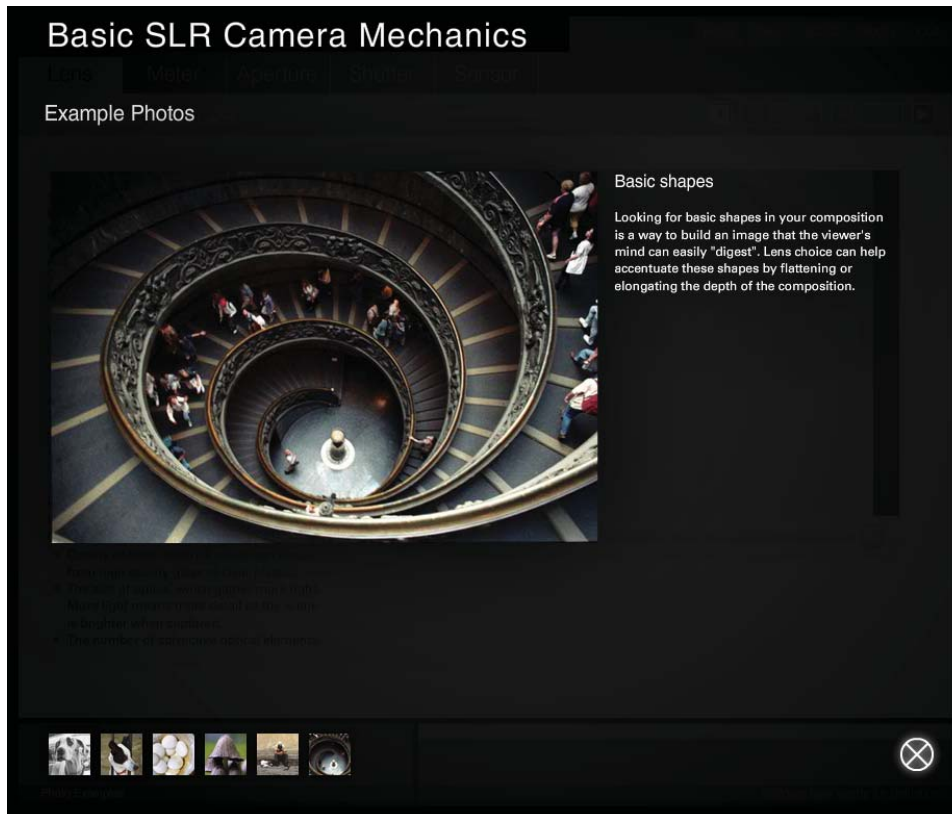


figure 13: Example image from "Lens" tutorial

Meter Tutorial

Instead of only teaching the function of the exposure meter it is important to teach how it works. That way the user will have a better understanding of what the meter “sees;” circumstances in which it may give an inaccurate reading, and when it may be prudent to second guess the meter.

In this tutorial I explain how the meter averages the light in the scene as a shade of gray, and then based on its similarity to “middle gray” makes an exposure reading. To demonstrate the gray scale, and “middle gray;” I created an illustration of the gray scale. The user can then click a button to convert the gray scale into segments based on the zone system.

This allows the user to see the middle gray tone and how it relates to the rest of the scale. The tutorial goes on to explain how the meter can produce inaccurate readings in certain circumstances. This happens when the scene has an uneven quantity of light and dark areas, or when the subject’s color affects the meter, as is the case when photographing a white or black object.

I then explain the types of meter. The interactive illustration on this screen shows a scene of a lighthouse and the segment structure of a Multi-segmented meter (*fig. 14*). The user can then click between multi-segmented, center-weighted, partial, and spot metering to see which segments are used when metering in the selected meter type. To show center-weighted (less emphasis on the edges of the frame) I show the edge segments dimmed to 50%.

The fourth screen in the meter tutorial is on the zone system (*fig. 15*). This concept can be very technical and could fill its own tutorial. For the purpose of this tutorial though I keep it very simple. Once I explain the basics of the zone system I discuss how just taking into consideration the zone values of the scene and then changing your exposure 1 to 2 stops might correct for some meter inaccuracies and produce more consistent results. The zone system portion also includes a portrait with the likely zones noted. This may give the user an idea of where they may want to spot meter. It also demonstrates how a single surface, like the human face, may be one zone in the shadows and another in the highlights.

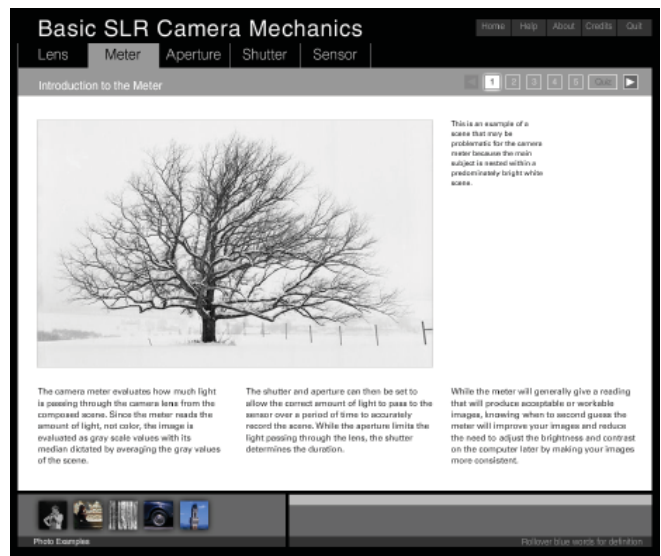


figure 13: Page one of the “Meter” tutorial

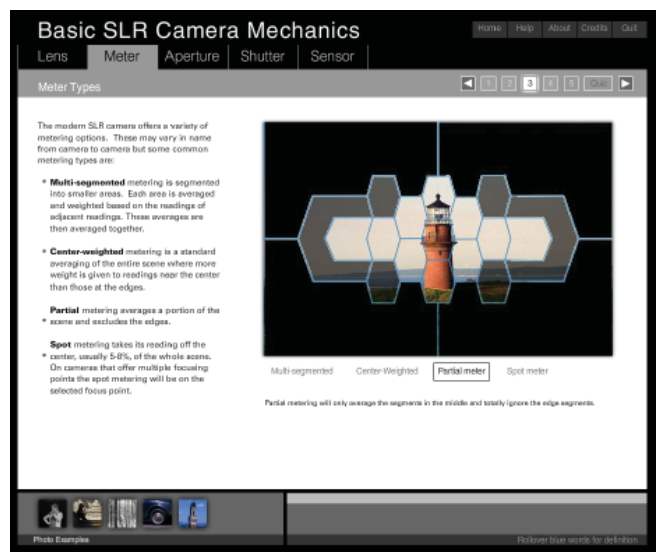


figure 14: Page three of the “Meter” tutorial

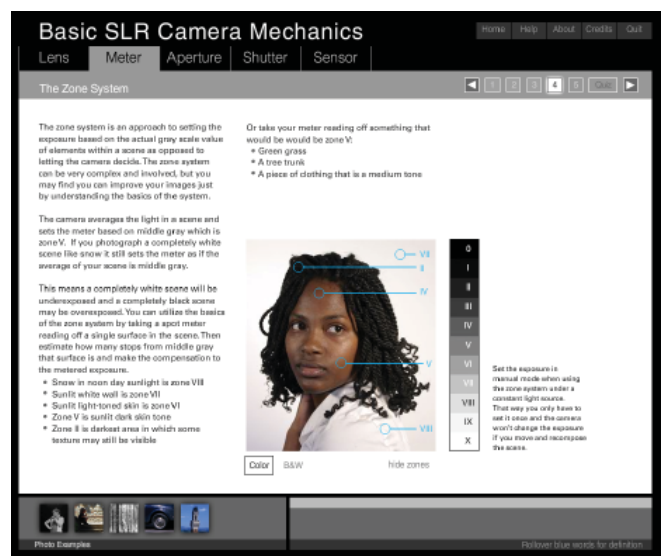


figure 15: Page four of the “Meter” tutorial

The final topic in the meter tutorial is spot metering. This type of metering only meters off a small percentage of the scene. Since the previous screen discusses metering of particular elements to set the exposure it seemed prudent to explain how best to do this.

This was an interesting interaction to figure out (*fig. 17*). The goal was to create an image which allows the user to move the pointer over the scene and see how the exposure changes as the pointer “meters off” different objects, like the sky or grass. I used a black and white image to emphasize how the camera meter reads the light in the scene, which would be similar to the scene in grayscale. The next thing I had to do was simulate the scene as it would appear were it overexposed or underexposed. Since brighter elements wouldn’t change at the same rate as darker ones I couldn’t just change the brightness of the image. Instead I used the exposure adjustment. This adjustment simulates a change to the cameras exposure. This is noticeable in the way the sky brightens more quickly than the shadow areas when over-exposing the scene.

The next issue was how to make the image change. Initially, I wrote the code so it responded to the coordinates of the pointer. If the horizon of the grassy

field were 300 pixels down from the top of the image I could tell the background movie, which holds the different exposure images, to change if the y position of the pointer were more than 300. But that method would have required a lot of code since I would have had to define edges of complicated elements, like the circular hay bales and the ridge of the mountain. After some thought it occurred to me that I could convert the image to a vector graphic that only consisted of five shades of gray (*fig. 16*). Thus, the sky became a block of light gray, the grass was all a block of a middle gray tone, etc. I then made the resulting blocks of color individual movie clips. It was an easily managed number of movie clips that I could then add rollover functionality to. Since this vector version is masked inside the pointer movie clip it isn’t visible, even though it is controlling the visible image. You can see a portion of it in the circle around the pointer.

To include additional information and techniques for metering difficult exposure conditions I selected example images that illustrated ways to deal with backlighting, bright subjects against dark backgrounds, spot metering from a distance, and the technique of removing the a bright sky from the metering equation.



figure 16: By making a vector version of the image I can make each block of color a button that will change the image when the mouse moves over it.



figure 17: The regular image is what the user sees but the vector image behind it is what the mouse responds to as it moves over the image.

Aperture Tutorial

The aperture tutorial explains the function of the aperture as it pertains to balancing the exposure, and how it affects depth of field. My first step was to explain how the aperture restricts the amount of light that reaches the sensor, and how the f-stop number relates to the aperture.

The first screen in the aperture tutorial contains an interactive illustration of how the aperture opens and closes, and how this affects the brightness of the image on the focal plane (*fig. 18*). It also shows the formula used to get the f-number. Since the focal length is necessary to calculate the f-stop I use 50mm to complete the formula.

The next screen explains the stop increments of the aperture. The table on this screen shows all the aperture increments that the average camera lens may provide and whether they are full, 1/2, or 1/3 stops (*fig. 19*).

The last two pages of this tutorial are dedicated to depth of field. To illustrate how the aperture affects depth of field I created an interactive graphic in which the user can click through the images of a single scene to see how changing the aperture will affect what is in focus (*fig. 20*). The image includes the loupe interaction I used in the lens distortion illustration. For the image I photographed asparagus that I stuck in a foam block to hold upright. To show the effect changing the aperture has on the depth of field I decided to go with a subject that would be about 2 feet from the camera. A close-up example seemed best since this is when achieving a long depth of field is most arduous.

The example images I chose for this tutorial were selected to demonstrate how depth of field could affect the aesthetics of an image, and to illustrate shooting techniques that utilize the full depth of field. Most people may think more depth of field is always best, but I wanted to show a few examples where shallow depth of field may improve an image. I use an image of a group of men on a bench to explain how having the background out of focus removes distracting elements and draws the viewer's eye to the main subject.

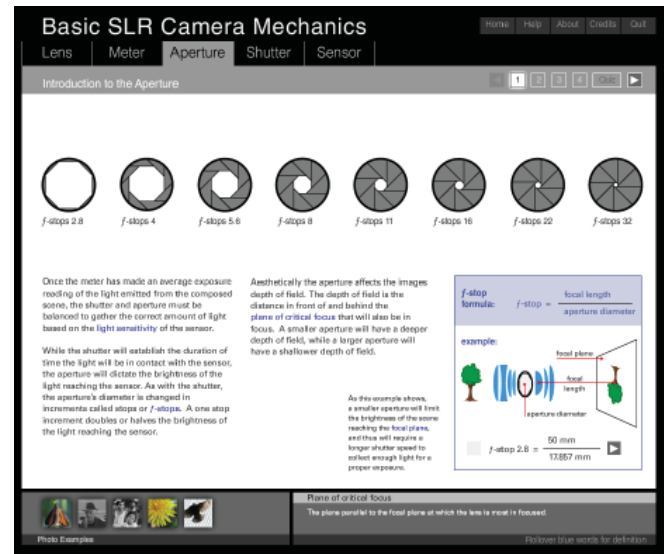


figure 18: Page one of the “Aperture” tutorial

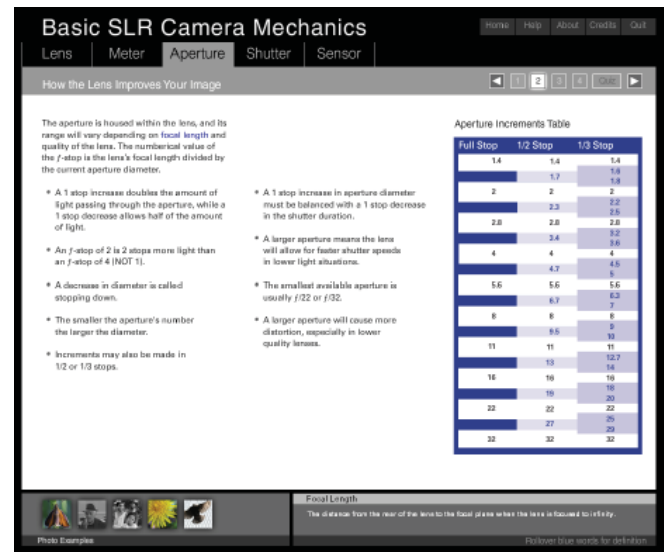


figure 19: Page two of the “Aperture” tutorial

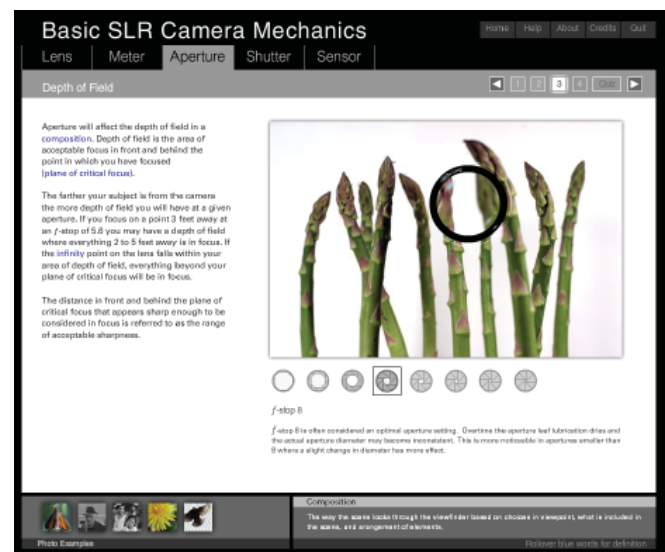


figure 20: Page three of the “Aperture” tutorial

Shutter Tutorial

For the shutter tutorial I follow a similar introduction to that of the aperture. I begin by explaining how the shutter relates to the exposure, how it affects the image aesthetically, and the stop increments of the shutter. I include a table that shows the possible full, $\frac{1}{2}$, and $\frac{1}{3}$ stop increments between 1 second and $\frac{1}{500}$ of a second (fig. 22). I then present an interaction similar to the one in the aperture tutorial (fig. 21). Here the user can click on the different shutter speeds to see how it affects the image. The faster shutter speed can capture the moving water as if it is just hanging in the air. The slow shutter speed captures the water as streaks, showing the motion of the water.

With the similar aperture illustration it was easy to photograph using all the aperture stops. But it was a little more difficult with the shutter. I wanted to photograph the scene using exposures between 1" and $\frac{1}{1000}$. But when I arrived at the falls, on a sunny day, I could not get a shutter less than $\frac{1}{15}$. If

I waited till it got darker I would not be able to get the faster shutter speeds. So to get a wide enough range of shutter speeds I waited till later in the day when

the sunlight was not on the falls. I started at $\frac{1}{500}$ with the ISO set to 800. When I reached my lowest shutter speed possible (when the aperture reaches $f/22$) I switched the ISO to 100. This made it possible to stop down 3 more stops on the shutter speed.

The next shutter topic is long-exposure photography (fig. 23). My target audience is photo enthusiasts who know what they want to photograph but who need to learn how to get the photos they want. They probably own a few photography books and have an appreciation for fine art photography. For this reason I thought it would be beneficial to cover long-exposure photography since it is one of the biggest obstacles people run into when photographing for fine-art purposes. If they have the camera on auto it will likely pop-up the flash and destroy the natural lighting that

figure 21: Page three of the "Shutter" tutorial

made the scene picturesque in the first place. While in college I went on a school art trip to Italy. We toured castles, old churches, heavily shaded gardens, and ancient cities at night. What made me want to photograph in these places was the natural light on the ancient stonework or sunbeams coming through a stained-glass window. Using the flash would not capture the scene I wanted, and was often not allowed in these places anyways. So I had to find ways to steady my camera for exposures that often exceeded a second. I would buttress it against a wall, prop it on a rolled up jacket, or hold it steady on my knee. So this section on long-exposure photography is meant to give the aspiring fine art photographer some ideas for dealing with such difficult lighting situations.

The final topic I cover in the shutter tutorial is achieving a faster shutter speed in low light (*fig. 24*). I make two points on this topic. First, I show them how photographers can change the sensitivity of the sensor with the ISO setting. Second, I remind the user to spot meter their main subject since they may be getting a slower shutter speed due to darker portions of the scene that aren't as important. As with the long-exposure topic, my goal here was to help the user learn what I like to call "critical thinking for photographers." This could be the title for a follow-up to this tutorial.

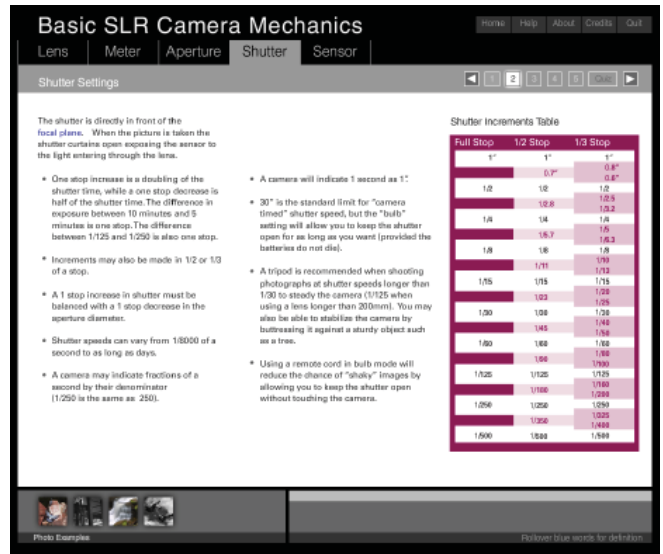


figure 22: Page two of the "Shutter" tutorial



figure 23: Page four of the "Shutter" tutorial

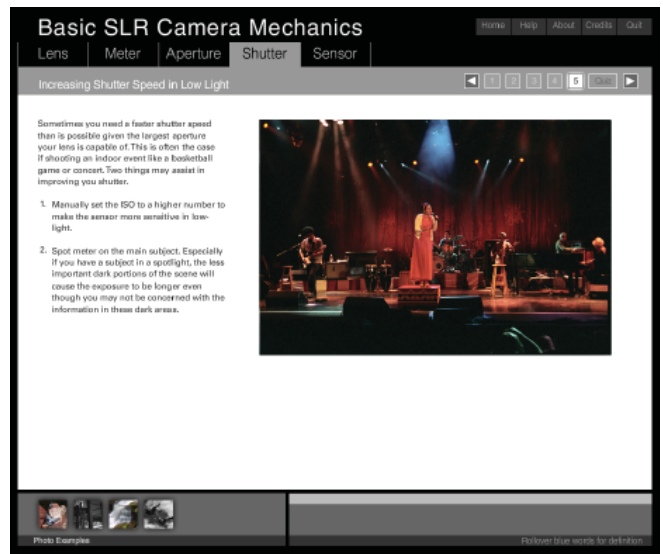


figure 24: Page five of the "Shutter" tutorial

Sensor Tutorial

The final tutorial is on the digital SLR sensor. Initially this was one of the hardest sections in terms of deciding what to teach. But as I designed the other tutorials there were two aspects of the photo process that I felt needed to be addressed, and are both related to the sensor. These were the light sensitivity setting (ISO) of the sensor and white balance.

But before I could get into those topics I had to explain how the sensor works. This can be a complicated concept, although in testing the tutorial it was the section most people noted as being fascinating. In writing the text for this first part of the tutorial I made a decision to only use the word “pixel” to describe the individual elements of the image once the image is captured. In my studies I found writers would sometimes use pixel to describe the individual cells that make up the sensor array of the sensor. While this may have become a common practice, I decided that since pixel is short for “picture element” it should only mean that and not the physical object that created it.

So to begin the tutorial I show the common grid pattern of the sensor (fig. 25). I also define and illustrate the pixel of the outputted image so the user can see how the two relate. I then explain how each sensor cell records the amount of light, uses filters

and the readings from adjacent cells to determine the color of each resulting pixel (fig. 26).

The next topic is on controlling the sensors sensitivity to light, or ISO setting. While the shutter and aperture need to be balanced based on the meter reading, the ISO speed can shift that meter reading up or down, thereby affecting the shutter and aperture. With film SLRs the ISO was decided by the choice of film speed and had to stay the same throughout the whole roll. With digital the user can change the ISO from image to image. But like film, setting the sensor to be more sensitive will affect the quality of the resulting image. It may be grainier or more contrasty. To demonstrate this I show an image shot at five different ISO settings (fig. 27). The user can also see a close-up image that shows a smaller portion of the image to make the change in grain more noticeable. I decided to photograph my watch because it is a simple shape and I thought the numbers would show changes in the quality of details.

The last topic covered is white balance. Like ISO this was a concept tied closely to the speed of film prior to digital. Now it is pretty automated and isn't affected that much by changes to the ISO. For the average person the auto setting will likely work fine, but as with several of the topics I cover the user may want

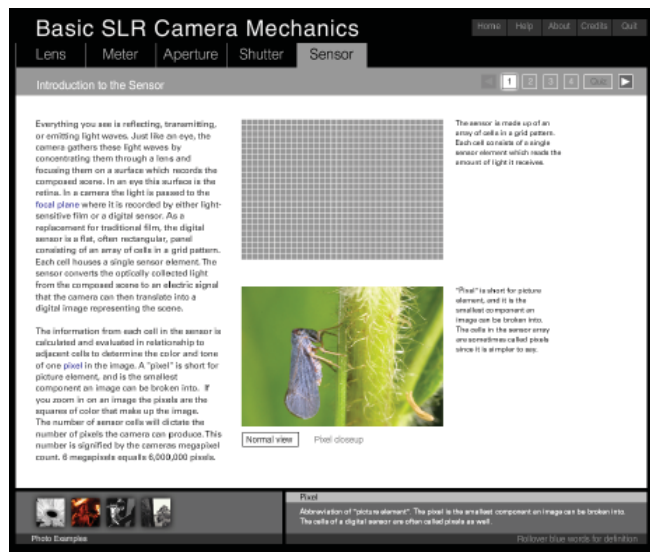


figure 25: Page one of the “Sensor” tutorial with sensor grid and pixel illustrations

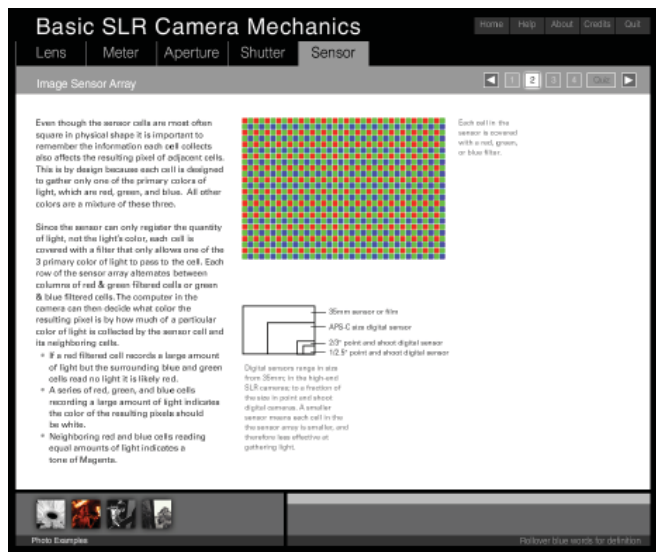


figure 26: Page two of the “Sensor” tutorial with sensor filter array and sensor size illustrations.

to adjust this setting for effect. The color of certain lighting types can be a powerful aesthetic choice. For example, the greenish cast from fluorescent lighting can imply that an environment is “institutional”, cold, or unpleasant. Also, the custom setting allows the photographer to set the white balance in odd lighting situations. To illustrate the white balance (*fig. 28*) I took an image of a scene that has daylight, shaded areas and tungsten lighting. Tungsten and daylight are at opposite ends of the spectrum, so the user can see a distinct change when they click through the different white balance settings.

For this tutorial’s example photos I selected images to give additional information on using reflective light, image noise, and to introduce RAW files. For the example photo on noise I made a simple interaction that allows the user to see the image with or without noise. I selected an image that had some noise and enhanced the noise for one example and fixed it in the other.

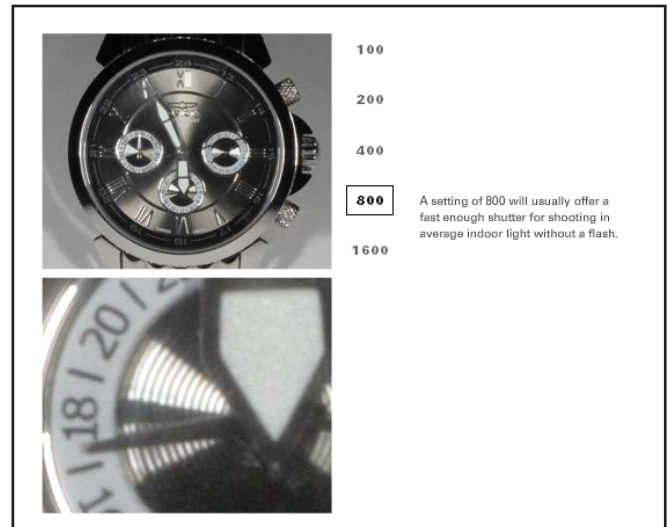


figure 27: The ISO sensitivity illustration shows the effect changing the sensors sensitivity to light has on the image.

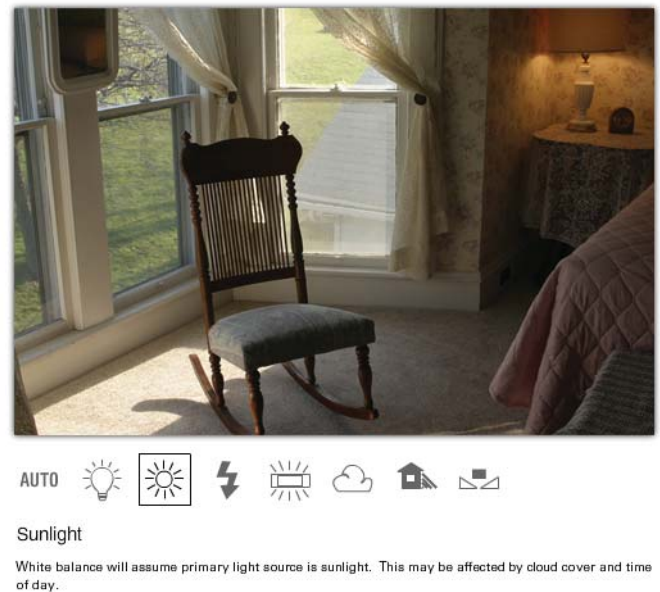


figure 28: White balance illustration

Summary

At my spring defense my project was well received, but still had several technical issues and unfinished interactions that would have been difficult to fix in the three weeks till graduation. As I decided to wait I took the opportunity to redo elements that would have otherwise been considered complete. I think the decision to hold off on presenting my project gave me the opportunity to refine the design. In comparing user response between earlier and later versions of the tutorial there are several things I learned about designing interfaces for interactive tutorials.

First, don't assume the user will understand your iconography. I created icons for each tutorial that made sense to me, but seemed to cause more confusion than they were worth. Unless it is a well-known icon, like a house to symbolize "home", be cautious. My decision to use icons was more aesthetic than useful.

Second, multimedia doesn't mean you have to use every media type. One big change I made from my

Spring defense to the one in the Fall was a decision to stick more to photos instead of creating 3D models to simulate photographic scenarios. Especially for a tutorial on photography, it seemed sensible to have more real world examples. The 3D models were likely to confuse the user.

Finally, design for the casual user. What I mean by this is assume the user has a short attention span and no knowledge of the topic. Keep the design clean, reduce text with bulleted information, and keep button styles consistent. Additional but unnecessary information can be included as optional interactions. This layering of information allows the user to decide how much added information they want, and makes the learning process more interactive. Also depending on the design, the user may not be going through the tutorial in a linear fashion, so it is important to make sure they have the information they need to comprehend whichever topic they are currently reading.

Conclusion

I am very pleased with the response I have received on the "Basic SLR Camera Mechanics" tutorial. It was an opportunity to merge my previous MFA in photography with my current MFA in computer graphics design. My goal now is to market this tutorial as a sales tool for camera retailers to up-sell consumers to digital SLRs. As the price of digital SLRs continues to drop and film SLRs are discontinued, more consumers are showing interest in digital SLRs. The inclusion of a tutorial on how the camera works would go a long way to closing sales that hinge on whether the consumer feels they will have any return on their investment. Printing at home has never been easier, and purchasing an SLR with a tutorial included could be perceived as an opportunity to learn the art of photography, which previously required expensive film and printing.

This tutorial may also be an example for tutorials in other fields. A tutorial on painting could involve interactive demonstrations on color theory. Products can be marketed with an interactive guide on a related hobby. Online tutorials could be seamlessly connected with an online store. An interactive product guide or tutorial is a way to market to consumers by offering them incentive to buy and information about accessories.

Appendix

I. External code for section tabs

The section tabs required extra code for events that were triggered by other functions in the tutorial. They also have three positions: inactive, mouse over, and active.

Code:

```
package
{
    import flash.display.*;
    import flash.text.*;
    import flash.events.*;
    import fl.transitions.Tween;
    import fl.transitions.easing.*;

    public class sectionButton extends MovieClip
    {
        private var buttonLabel:String;
        public var clicked:Boolean;
        private var inTween:Tween;
        private var outTween:Tween;
        private var inTweenR:Tween;
        private var outTweenR:Tween;
        private var maybeTween:Tween;
        private var maybeTweenR:Tween;
        private var maybeTweenR:Tween;
        private var alphaTween:Tween;
// direct interaction functions
        public function sectionButton()
        {
            this.buttonMode = true;
            this.mouseChildren = false;
            clicked = false;
            this.addEventListener(MouseEvent.MOUSE_OVER, expand);
            this.addEventListener(MouseEvent.MOUSE_OUT, shrink);
            this.addEventListener(MouseEvent.CLICK, chosen);
            this.bar_mc.scaleY = 0;
            this.bar_mc.alpha = 0;
        }
        public function setLabel(thisLabel_txt:String)
        {
            label_txt.text = thisLabel_txt;
        }
        public function expand(event:MouseEvent):void
        {
            if (clicked == false){
                inTween = new Tween(this.bar_mc,"scaleY",None.easeNone,this.bar_
                    mc.scaleY,1,.25,true);
                maybeTween = new Tween(this.bar_mc,"alpha",None.easeNone,this.bar_
```

```

        mc.alpha,.5,.25,true);
        label_txt.textColor = 0x000000;
    }
}
// Indirect funtions triggered by buttons in cross-section illustration and within tutorials
public function remoteExpand():void
{
    if (this.bar_mc.scaleY == 0){
        inTweenR = new Tween(this.bar_mc,"scaleY";None.easeNone,0,1,.25,true);
        maybeTweenR = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
        mc.alpha,.5,.25,true);
        label_txt.textColor = 0x000000;
    }else{
        inTweenR = new Tween(this.bar_mc,"scaleY";None.easeNone,this.bar_
        mc.scaleY,1,.25,true);
        maybeTweenR = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
        mc.alpha,.5,.25,true);
        label_txt.textColor = 0x000000;
    }
}
public function shrink(event:MouseEvent):void
{
    if (clicked == false){
        outTween = new Tween(this.bar_mc,"scaleY";None.easeNone,this.bar_
        mc.scaleY,0,.25,true);
        maynotTween = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
        mc.alpha,0,.5,true);
        label_txt.textColor = 0xB2B2B2;
    }
}
public function remoteShrink():void
{
    if (clicked == false){
        outTweenR = new Tween(this.bar_mc,"scaleY";None.easeNone,this.bar_
        mc.scaleY,0,.25,true);
        maynotTweenR = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
        mc.alpha,0,.5,true);
        label_txt.textColor = 0xB2B2B2;
    }
}
public function choosen(event:MouseEvent):void
{
    alphaTween = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
    mc.alpha,1,.25,true);
}
public function choosenR():void
{
    alphaTween = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
    mc.alpha,1,.25,true);
}
}

```



```

//This function resets the tabs to their starting position
    public function resetThis():void
    {
        clicked = false
        outTweenR = new Tween(this.bar_mc,"scaleY";None.easeNone,this.bar_
        mc.scaleY,0,.25,true);
        maynotTweenR = new Tween(this.bar_mc,"alpha";None.easeNone,this.bar_
        mc.alpha,0,.25,true);
        label_txt.textColor = 0xB2B2B2;
    }
}

```

II. Code for Loupe interaction

```

var dragIt:Boolean
lens_mc.buttonMode = true;
placement();
lens_mc.addEventListener(MouseEvent.MOUSE_DOWN, moveLens);
lens_mc.addEventListener(MouseEvent.MOUSE_UP, stopLens);
lens_mc.addEventListener(Event.ENTER_FRAME, magnifyImage);

function placement(){
    lens_mc.magimage_mc.x = -(lens_mc.x * 2);
    lens_mc.magimage_mc.y = -(lens_mc.y * 2);
}
function moveLens(event:MouseEvent):void {
    lens_mc.startDrag(false, new Rectangle(0, 0, 500, 333));
    dragIt = true;
}
function stopLens(event:MouseEvent):void {
    lens_mc.stopDrag();
    dragIt = false;
}
function magnifyImage(event:Event):void {
    if(dragIt){
        lens_mc.magimage_mc.x = -(lens_mc.x * 2);
        lens_mc.magimage_mc.y = -(lens_mc.y * 2);
    }
}

```

III. Code for buttons with flipping effect in upper right

The code for these buttons had to be written so they could be triggered by other types of buttons. For this reason the function of locking them in the active position had to be done with the use of a boolean variable.

```
package
{
    import flash.display.*;
    import flash.text.*;
    import flash.events.*;
    import fl.transitions.Tween;
    import fl.transitions.easing.*;

    public class globalButtons extends MovieClip
    {
        private var posTween:Tween;
        private var alphaTween:Tween;
        private var pos2Tween:Tween;
        private var alpha2Tween:Tween;
        private var textTween:Tween;
        private var clicked:Boolean;

        public function globalButtons(){
            topRoll_mc.alpha = 0;
            buttonMode = true;
            mouseChildren = false;
            clicked = false;
            this.addEventListener(MouseEvent.ROLL_OVER, flipUp);
            this.addEventListener(MouseEvent.ROLL_OUT, flipDown);
            this.addEventListener(MouseEvent.CLICK, choosen);
        }
        public function myLabel(thisLabel_txt:String)
        {
            this.text_mc.label_txt.text = thisLabel_txt;
            this.text_mc.label2_txt.text = thisLabel_txt;
        }
        public function flipUp(e:MouseEvent):void{
            //trace("hi");
            if (clicked == false){
                posTween = new Tween
                (bottomRoll_mc, "y", None.easeNone, bottomRoll_mc.y, 0, .40, true);
                alphaTween = new Tween
                (bottomRoll_mc, "alpha", None.easeNone, bottomRoll_mc.alpha, 0, .60, true);
                pos2Tween = new Tween
                (topRoll_mc, "y", None.easeNone, topRoll_mc.y, -25, .40, true);
                alpha2Tween = new Tween
                (topRoll_mc, "alpha", None.easeNone, topRoll_mc.alpha, 1, .40, true);
                textTween = new Tween
                (text_mc, "y", None.easeNone, text_mc.y, 0, .40, true);
            }
        }
    }
}
```

```

public function flipDown(e:MouseEvent):void{
    if (clicked == false){
        posTween = new Tween
        (bottomRoll_mc, "y"; None.easeNone, bottomRoll_mc.y, 25, .40, true);
        alphaTween = new Tween
        (bottomRoll_mc, "alpha"; None.easeNone, bottomRoll_mc.alpha, 1, .60, true);
        pos2Tween = new Tween
        (topRoll_mc, "y"; None.easeNone, topRoll_mc.y, 0, .40, true);
        alpha2Tween = new Tween
        (topRoll_mc, "alpha"; None.easeNone, topRoll_mc.alpha, 0, .40, true);
        textTween = new Tween
        (text_mc, "y"; None.easeNone, text_mc.y, 25, .40, true);
    }
}
public function deselect(){
    clicked = false;
    posTween = new Tween
    (bottomRoll_mc, "y"; None.easeNone, bottomRoll_mc.y, 25, .40, true);
    alphaTween = new Tween
    (bottomRoll_mc, "alpha"; None.easeNone, bottomRoll_mc.alpha, 1, .60, true);
    pos2Tween = new Tween(topRoll_mc, "y"; None.easeNone, topRoll_mc.y, 0, .40, true);
    alpha2Tween = new Tween
    (topRoll_mc, "alpha"; None.easeNone, topRoll_mc.alpha, 0, .40, true);
    textTween = new Tween(text_mc, "y"; None.easeNone, text_mc.y, 25, .40, true);
}
public function choosen(e:MouseEvent):void{
    posTween = new Tween
    (bottomRoll_mc, "y"; None.easeNone, bottomRoll_mc.y, 0, .40, true);
    alphaTween = new Tween
    (bottomRoll_mc, "alpha"; None.easeNone, bottomRoll_mc.alpha, 0, .60, true);
    pos2Tween = new Tween
    (topRoll_mc, "y"; None.easeNone, topRoll_mc.y, -25, .40, true);
    alpha2Tween = new Tween
    (topRoll_mc, "alpha"; None.easeNone, topRoll_mc.alpha, 1, .40, true);
    textTween = new Tween(text_mc, "y"; None.easeNone, text_mc.y, 0, .40, true);
    clicked = true;
}
}
}
}

```

IV. Code for rollover definitions

```

var myWord:String;
focalPlane_mc.addEventListener(MouseEvent.ROLL_OVER, choose);
slr_mc.addEventListener(MouseEvent.ROLL_OVER, choose);
function choose(e:MouseEvent){
    myWord = e.target.name;
    define();
}

```

```

function define(){
    switch (myWord){
        case "focalPlane_mc":
            word_txt.text = "Focal Plane";
            definition_txt.text = "the plane or surface on which a focused lens forms a sharp image.
This is where the film or sensor is positioned.";
            break;
        case "slr_mc":
            word_txt.text = "SLR camera";
            definition_txt.text = "the single-lens reflex camera allows the user to compose through the
lens by using a mirror that reflects the image to the viewfinder for composing.";
            break;
    }
}

```

V. Code for example image interaction

The example images load through XML. An issue I ran into was that the elements of the loaded SWF file would take on the button mode attribute of the thumbnail image. To fix for this I added an event listener that shut the button mode to false when the mouse moves off the thumbnail image.

```

var thumbLoader:Loader;
var exampleLoader = new Loader();
var xml:XML;
var xmlList:XMLList;
var xmlLoader:URLLoader = new URLLoader;
xmlLoader.load(new URLRequest("lensEx.xml"));
xmlLoader.addEventListener(Event.COMPLETE, xmlLoaded);

tint_mc.visible = false;
tint_mc.buttonMode = false;
var glowThumb:GlowFilter = new GlowFilter();
glowThumb.color = 0x000000;
    glowThumb.alpha = .5;
    glowThumb.blurX = 10;
    glowThumb.blurY = 10;
    glowThumb.quality = BitmapFilterQuality.MEDIUM;
function xmlLoaded(e:Event){
    //if (showMe == true){
        xml = XML(e.target.data);
        xmlList = xml.children();
        for(var i:int = 0; i < xmlList.length(); i++){
            thumbLoader = new Loader();
            thumbLoader.load(new URLRequest(xmlList[i].attribute("thumb")))
            thumbLoader.x = i * 50 + 24;
            thumbLoader.y = 615;
            // NEW - Link the thumbnail to the large image using the name property
            thumbLoader.name = xmlList[i].attribute("image");
            addChild(thumbLoader);
            // NEW - create an Event Listener for each thumbnail image

```

```

        thumbLoader.addEventListener(MouseEvent.CLICK, showImage);
        thumbLoader.addEventListener(MouseEvent.MOUSE_OVER, makeButton);
        thumbLoader.addEventListener(MouseEvent.MOUSE_OUT, unmakeButton);
        thumbLoader.filters = [glowThumb];
    }
}
var glowEx:GlowFilter = new GlowFilter();

    glowEx.color = 0x000000;
    glowEx.alpha = .5;
    glowEx.blurX = 100;
    glowEx.blurY = 100;
    glowEx.quality = BitmapFilterQuality.HIGH;
exampleLoader.filters = [glowEx];

function showImage(e:MouseEvent){
    // Load the image using the name stored with the thumbnail image
    exampleLoader.load(new URLRequest(e.target.name));
    // Change the position of the image on the Stage
    exampleLoader.x = 0;
    exampleLoader.y = 0;
    // Display the image on the Stage
    exampleLoader.contentLoaderInfo.addEventListener(Event.COMPLETE, done);
}
function makeButton(e:MouseEvent){
    this.buttonMode = true;
}
function unmakeButton(e:MouseEvent){
    this.buttonMode = false;
}
// create a function that responds to external file completely being loaded into Flash
function done(e:Event) {
    tint_mc.visible = true;
    addChild(exampleLoader);
}

```

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