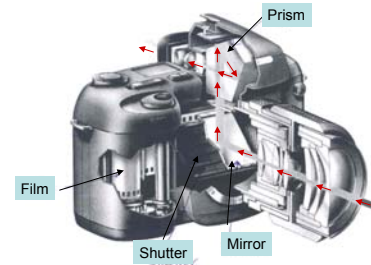


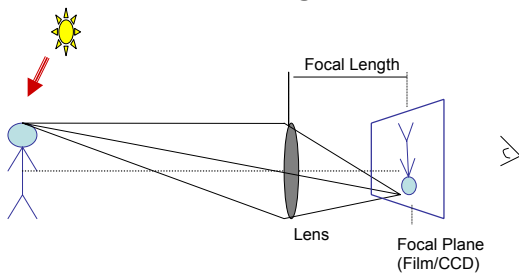
Basic Photography

SLR (Single Lens Reflect) Camera :

- When you press shutter release button, mirror in the camera opens and picture is stored in the film.

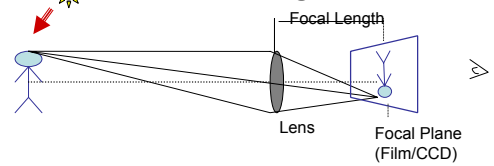


Focal Length



CCD- Charged Couple Device used in Digital Camera (See later)

Focal Length



The distance between the optical center of the lens and the focal plane (film/CCD), when the lens is focused at a great distance (infinity).

Lens Angle (angle of view)

- The angle covered by the camera lens (Decide how much of the scene will take in)
- As the focal length is changed, its lens angle alters correspondingly.
- The shorter the focal length, the wider view the lens angle covers.

Long Focal Length

- Narrow angle lens (Telephoto lens)
 - Subject magnified and appears closer
 - Shows only a small part of the scene.
 - Difficult to hold camera steady; camera shaking is exaggerated. A Tripod is recommended.
 - Shallow depth of field. (See later)

Short Focal Length

- Wide angle lens
 - Show more of the scene
 - Subject Looks further away
 - Unnatural distance, emphasized space and depth, exaggerated perspective
 - Distortion when the subject is very close.



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Zoom Lens

- Variable focal length
- Angle of view is adjustable
 - Easily alter the size of the subject in view finder.
 - Select how much of the scene appears in the shot.
- More convenient than the prime lens (a fixed focal lens)



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Exposure

- Controlling the brightness of the image falling onto the film or CCD.
- Controlled by the **aperture size** (F-Stop)
- Controlled by the **shutter speed**



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Exposure cont..

- Aperture controls the amount of light that reach the film/CCD.
- Shutter controls the length of the time the light can reach the film/CCD



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F-stop (size of aperture)

- Determined by dividing the focal length of the lens by the diameter of the aperture opening.
- Standard : 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32, 44.....



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F-stop (size of aperture) cont..

- The smaller the number, the larger the opening.
- Each f-stop opening admits half the amount of light as the stop before it.
- f2, f2.8, f4, f5.6, f8



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Shutter speed

- Measured in fractions of a second.
- Standard: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{15}$, $\frac{1}{30}$, $\frac{1}{60}$, $\frac{1}{125}$, $\frac{1}{250}$, $\frac{1}{500}$, $\frac{1}{1000}$, $\frac{1}{2000}$, ...



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Shutter speed cont..

- The smaller the denominator number, the slower the shutter traveling.
- Each shutter speed admits half the amount of light as the stop before it.



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Correct Exposure

- The tone (brightness) you're most interested in are clearly reproduced



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Over-Exposure

- Surface tones look pale, light area is detail less white and colour looks washed out.
- Too much light, aperture being too large or shutter speed being too slow.



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Under-Exposure

- All tones appear unduly dark with shadows
- Insufficient illumination, aperture being too small or shutter speed being too fast.



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Depth of Field

- An image on the true focusing point is absolutely sharp.
- Things that are nearer or further away may still look reasonably sharp.
- Such sharpness zone is called **Depth of field**.



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Depth of Field

- It is the zone of acceptably sharp focus extending both in front of and behind the true focusing point.
- The Depth of field can vary from a few centimeters to infinity.



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What affects the Depth of Field?

- Whenever you alter...
 - The lens aperture
 - The focal length
 - The focused distance

The Depth of Field gets deeper or shallower.



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Depth of Field

- **Altering Aperture size:**
The smaller the aperture, the greater the depth of field.



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Depth of Field

- **Altering Focal length:**
Shorter the focal length, the greater the depth of field.



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Depth of Field

- **Altering Focused Distance:**
Further away the lens focuses, the greater the depth of field.



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Shallow Depth of field

- Eg. Portrait Picture
- Largest aperture
 - Longest focal length
 - Shortest focused distance



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Deep Depth of Field

- Eg. Huge Architecture
 - Smallest aperture
 - Shortest focal length
 - Longest focused distance



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Shooting Moving Objects

- Slower the shutter speed (eg. $\frac{1}{2}$) the more blurring the moving object.
- Slow shutter creates an illusion of movement as if a object was moving.
- Fast shutter speed freezes the motion of object in an instant.



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The Factors of Motion Picturing

- When you capture a moving object, factors below are considered.
 - The shutter speed
 - The speed of the moving subject
 - The subject distance : Closer the subject distance, more blurring the moving subject.
 - Focal length: Longer the focal length, the more blurring the moving subject.



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Rule of Third

- An equally divided frame allows only formal balance (dull and monotonous)
- Divide the frame vertically and horizontally into three equal parts, one can compose shots so that the main subject comes on these lines or where they cross.



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Digital Photography



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Digital vs Conventional Cameras

- In the past 20 years most of the major technological breakthroughs in consumer electronics have really been part of one large breakthrough.
 - Converting analog information into digital information represented by 1s and 0s or **bits**.
- This fundamental shift in technology totally changed how we handle visual and audio information.



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Digital vs Conventional Cameras

- The **Digital camera** is one of the most remarkable instances of this shift because
 - It is so truly different from its predecessor **Conventional Camera**.
- **Conventional Cameras** depend entirely on chemical and mechanical processors.
- All **digital cameras** have a built-in processor.
- **Digital cameras** record images in an entirely electronic form.
- Most **Digital cameras** have a LCD screen



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Digital vs Conventional Cameras

- If you want to get the picture into digital form:
 - Take a picture using a conventional camera, process the film chemically, print it onto photographic paper, use digital scanner
 - The negative taken from a conventional camera film, can be converted to digital form using a negative scanner.
 - Use a digital camera.



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Digital vs Conventional Cameras

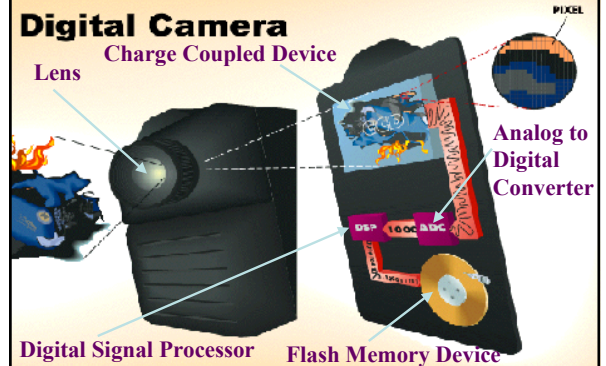
- The main difference between a digital camera and a conventional film based camera is:
 - The digital camera has no film.
 - Instead, it has a sensor that converts light into electrical charges.
- The image sensor employed by most digital cameras is a chip called a **Charge Coupled Device (CCD)**



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How a Digital Camera Works



Lens

- Light passes through the lens of a Digital Camera the same way it does in a film camera.



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Charge-Coupled Device

- In Digital Cameras images focused on a chip called CCD. The face of a CCD is studded with transistors.
- They create current in proportion to the intensity of light striking them.
- These transistors make up the pixels of the image.
- CCD does not output digital signals (Electrical charges that built up in CCD are not digital)



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ADC , DSP

- ADC (Analog to digital converter)– Converts in to digital form.
- DSP (Digital Signal Processor) – programmed specifically to manipulate photographic images.
 - compression done here



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Resolution in a Digital Camera

- The amount of detail that the camera can capture is called the **resolution**.
- It is measured in pixels
- Typical resolutions that you find in Dig. Camera.
 - 256 x 256 pixels. Find in very cheap cameras. ~65000 pixels
 - 640 x 480 pixels. Low end on most 'real' cameras. ~307,000 total pixels.
 - 1024 x 768 - ~ 786000 pixels
 - 1280 x 1024 ~ 1.3 Mega pixels (1,300,000)
 - 1600 x 1200 – This is high resolution. ~ 2 million total pixels. (2.0 Mega pixels)



Storage Systems used in Digital Camera

- Built-in memory
 - Some extremely inexpensive cameras have built-in Flash memory.
- SmartMedia cards
 - Small flash memory modules
- CompactFlash cards
 - Similar to but slightly larger than SmartMedia cards.
- Memory Stick
 - Proprietary form of Flash memory used by Sony.



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Storage Systems used in Digital Camera cont...

- Floppy disk
 - Some cameras store images directly onto floppy disks.
- Hard Disk
 - Some high-end cameras use small built-in hard disks.
- Write able CD and DVD
 - Some of the newest cameras use.



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Transfer photos from Flash Memory to Computer

- USB cable is commonly used.



Image Capacity

- For Flash Memory increasing all the time. Several megabytes to – 1 GB
- The two main file format used by digital cameras:
 - TIFF – uncompressed
 - JPEG – Compressed



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Compression

- It takes a lot of memory to store a picture with over 2.0 million pixels.
- Almost all digital cameras use some sort of **data compression** to make the files smaller.
- There are two features of digital images that make compression possible.
 - Repetition
 - Irrelevancy



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Aperture and Shutter Speed

- **Aperture** – Size of the opening in the camera. It is located behind the lens.
- **Shutter Speed** - Amount of time that light is allowed to pass through the aperture.
 - Film based cameras have a mechanical shutter.
 - Once you expose film to light, it can not be wiped to start again.
 - Digital cameras has a **digital shutter**.
 - The sensor in a digital camera can be reset electronically and used over and over again.



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Aperture and Shutter Speed

- **Aperture** and **shutter** speed work together to capture the proper amount of light needed to make a good image.
- Most Digital Cameras automatically set the **aperture** and **shutter** speed for optimal exposure.
- Some Digital Cameras offer ability to set them using menu options on the LCD panel.



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Optical Zoom vs Digital Zoom

- Optical zoom is the real zoom. Changes the focal length of your lens.
- Digital zoom is a computer trick that magnifies the portion of the information that hits the sensor.
- It will use interpolation techniques to add details to the photo.
- You can get the same result by
 - Shooting the photo with out a zoom
 - Blow up the picture using computer software.



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Digital Zoom



Image as captured by the CCD software now takes the center 50%

The 50% image is interpolated (resampled) back up to full resolution

Crop the center portion and then interpolate.



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Basic Image Processing

- How can you enhance your photograph taken by digital cameras / image scanners?
 - Before doing any “creative” operation in Photoshop/Fireworks, you should do basic (but important) image adjustment
- Necessary basic image adjustment
 1. Color correction / White balance correction
 2. Dynamic range correction
 3. Gamma correction
 4. Retouching



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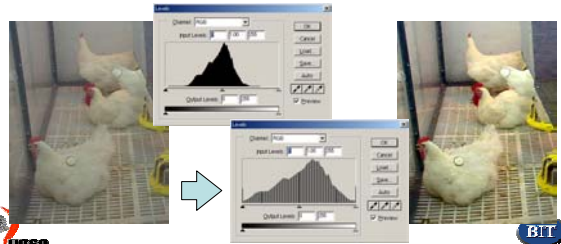
White Balance Correction

- Especially useful for photos taken in house
 - Incandescent lamp → Photo shifts to **Red**
 - Fluorescent lamp → Photo shifts to **Green**
 - Shadow in sunny day → Photo shifts to **Blue**



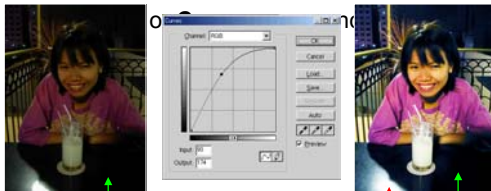
Dynamic Range Correction

- Especially useful for scanned image
 - Black is not truly black, White is not truly white
- Use **Levels** or **Auto Contrast** Tool



Gamma Correction as a Tool

- Useful for too under/over exposed image
 - Also used for detailed tone normalization

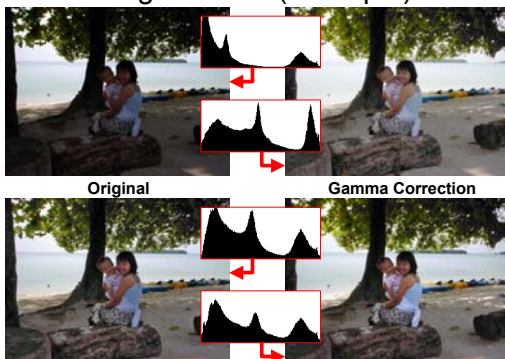


Highlight and shadow are the same. Only middle tone changes

Dodge & Burn

- Adjustment of dynamic range (lightness) of selected area in an image
 - Traditionally the most sensitive task for professional photographer in darkroom
 - Use **masking** and **histogram manipulation**
- Automatic local dynamic range correction
 - The latest software has function to automatically perform typical Dodge & Burn
 - But it still needs manual operation for real “content-based” correction

Dodge & Burn (Example)



Shadow/Highlight (Photoshop)

Manual Dodge & Burn

Photo Retouching

- Correct the defect in photograph
 - Especially useful for scanned image (because it always has many dust or scratch on the image)
 - Use **Clone Stamp Tool**

