**Introductory Digital Photography**

by Mervyn K C Sek  
Senior Advisor, NUS Photographic Society  
Honorary Secretary, NUS Alumni Photographic Society

---

**Introduction**

Digital cameras are slowly replacing conventional film cameras. Albeit being of lower resolution, the digital camera technology has been catching up, and the difference in quality is no longer visible in most high-end digital cameras.

This presentation shall help you to learn the basic skills of taking photographs, and includes:

- Learning about the different types of digital cameras
- Using a digital camera
- Creating the best images
- Making the most of camera features

---

**Contents**

A. Digital Cameras
   1. What is a digital camera?
   2. Parts of a digital camera
   3. Types of digital camera
   4. Resolution

B. Features of Digital Cameras
   1. Automatic exposure
   2. Flash
   3. Zoom
   4. Red-eye reduction
   5. Macro

C. Photographic Composition Techniques
   1. Choosing the orientation
   2. Placing the horizon
   3. Placing the subject
   4. Framing the image
   5. Choosing the perspective
   6. Controlling the depth of field
   7. Controlling the shutter speed
   8. Concluding remarks

D. Appendix
   1. References
   2. Acknowledgement
   3. Copyright notice
A. Digital Cameras

Digital photography is a fairly recent technological advancement, but rising quality and falling prices mean that the new possibilities it offers are becoming increasingly available.

1. What is a digital camera?

- All cameras take a picture by focusing the light passing through the lens onto a patch of light-sensitive medium.
  - Film camera: Photographic film → Stores image chemically
  - Digital camera: CCD chip → Stores image digitally

- Advantages:
  - Versatility → Can use PC to store, change, print and email images.
  - No need to purchase rolls of films and to send film for developing.
  - Can take a picture and choose whether to save it after reviewing it.

- Disadvantages:
  - More expensive than film-based cameras.
  - May need multiple memory cards for storage.
  - Needs more battery power than film cameras, so as to power the LCD screen.

2. Parts of a digital camera

- Shuttle release:
  - The button you press to take a picture.
  - Can be depressed halfway to lock the focus and check light level.

- Hot shoe:
  - The port to attach an external flash unit.

- Red-eye reduction light:
  - A small red light that comes on just before using the flash.
  - To reduce the optical red-eye effect.

- Optical viewfinder lens:
  - A small lens that passes light through to the optical viewfinder.
  - To allow the photographer to see the image that will be taken.

- CCD chip:
  - A small light-sensitive chip that is the key digital photography technology.
  - Light that passes through the lens barrel is focused onto it.

- Memory card:
  - A thin card that contains memory chips, eg. SmartCard, Compact Flash
  - To store the images taken.

- Batteries:
  - The power source.

- Optical viewfinder:
  - To line up the image.
  - BUT its offset from the main lens causes ‘parallax error’.
• LCD screen:
  o To preview the image to be taken.
  o To review images stored on the memory card.

• Lens barrel:
  o The entrance that light from the image passes through.
  o Contains a series of lens that focuses light from the image onto the CCD.

### 3. Types of digital cameras

• Compact:
  o Range from traditional cases to pocket-sized ones.
  o Camera size depends on battery size and storage medium type used.

• Rotating:
  o Lens is mounted on one half; the controls and LCD screen on the other.
  o Lens can be rotated through more than 270°.
  o Can still frame the shot when holding the camera above your head.

• Single Lens Reflex (SLR):
  o Has a mirror that reflects light through the main lens to the optical viewfinder.
  o A series of interchangeable lens is available for high-end models.
  o Offers professional quality, but at a price far above that of simpler models.

**Discussion:** So what should you consider when buying a digital camera?

4. Resolution

- CCD (Charge Coupled Device):
  - Converts light into a digital signal.
  - The surface is divided up into tiny squares called pixels, each of which records one small segment of an image.
  - The more pixels a CCD has, the more detail it can record.
  - Higher resolutions add to the cost of the digital camera and also increase the amount of data the camera needs to store.

- Resolution:
  - A digital image only has a resolution, not a size.
    - On monitors: Pixels
    - In printers: Dots per inch (dpi)
  - A 640x480 pixels image can be displayed on a 1600x1200 pixels monitor.
    - BUT the image has less information than the monitor can display.
    - SO each pixel will be spread over several pixels on the screen
    - AS SUCH, this results in blocks of colour or the ‘mosaic effect’.
  - 2560x1920 pixels = 4,915,200 pixels ≈ 5 million pixels = 5 megapixels (MP)

Discussion: So how many megapixels should you get for your digital camera?
http://www.megapixel.net/html/articles/article-megapixels.html
B. Features of Digital Cameras

Digital cameras generally come with a very wide range of features, as compared to their film-based counterparts. Here, we introduce the most common features.

1. Automatic exposure

- Exposure: The degree of exposure of the CCD to light when you take a picture.
- Most digital cameras automatically ensure the correct exposure by adjusting:
  - Aperture: The hole through which the light enters the camera. Also controls the depth of field.
  - Shutter speed: The duration for which the shutter is open. Also controls the sharpness of a moving subject.
- Works well in situations where the light levels are fairly constant across the scene.
  - OR ELSE, it may be best to use a fill-in flash.

Discussion: How can I learn more about exposure, aperture and shutter speed?
http://www.dpreview.com/learn/?/Glossary/Exposure

2. Flash

- Most digital cameras have a built-in flash unit: Automatic/on/off
  - BUT can always attach a more powerful external flash unit on the hot shoe.
- SITUATION: The background is bright, but the subject is not well-lit.
  - SO the camera may be fooled that flash is unnecessary.
  - AS SUCH, there will be a dark subject with an overexposed background.
- REMEDY: Use a fill-in flash
  - Illuminates the subject, and automatically adjusts the exposure.

![Without flash](image1.jpg) ![With fill-in flash](image2.jpg)

3. Zoom

- All digital cameras have the zoom feature: Optical/digital/both
- The power of a zoom = the number of times it can enlarge a section of the image.
  - 2x zoom = can double the size of an object.
• Optical zoom:
  o Enlarges an image by magnifying part of the subject.
  o Physically adjusts the distance between the lenses within the camera.
    ▪ BUT zooming in and out uses a lot of battery power.
    ▪ BUT the greater the zoom, the less light reaches the CCD.

• Digital zoom:
  o Enlarges an image by creating the digital image from a smaller area of the CCD.
    ▪ BUT the greater the zoom, the less the information recorded about the subject.
    ▪ SO the resolution/quality of the image drops.
  o REMEDY: Take the picture without zoom and enlarge the required section of the picture using Photoshop.

4. Red-eye reduction

• SITUATION: The subject is looking directly at the camera lens.
  o SO the light from the flash passes through the pupil of the subject’s eye and reflects off the retina straight back to the camera.
  o AS SUCH, the subject will have the red-eye effect.

• REMEDY: Activate the red-eye reduction feature.
  o The camera produces a small flash just before you take the picture.
  o SO the pupils of the subject’s eyes will contact before the main flash goes off
  o AS SUCH, this reduces the light that can be reflected back.

5. Macro

• Allows the photographer to get extremely close up to the subject (within inches).
  o Ideal for taking pictures of small wildlife and flowers.
C. Photographic Composition Techniques

Most cameras will take reasonable pictures if you just use the ‘point and click’ approach, but learning a few basic photographic composition techniques can help you to improve your pictures dramatically.

1. Choosing the orientation

   - Horizontal:
     - Draws the eyes from left to right, giving the sense of wide open spaces.
       - SO use a low horizon to make the most of this sweeping effect.

   - Vertical:
     - Draws the eyes from foreground to background, emphasising image depth.
       - SO use a high horizon to get a great deal of details in the image.

   - Diagonal:
     - Images do not have to be composed precisely horizontal or vertical.
       - A diagonal angle can add an ‘edge’ to an image.
• If you are not sure whether a subject will work best in horizontal, vertical or diagonal format, take a moment to rotate the camera and find out.
  o Soon you will develop a knack for which format will work best for any subject you encounter.

2. Placing the horizon

• CONVENTION: Do not put the horizon across the centre.
  o BUT you have to think about the specific subject/scene.

• GUIDELINES:
  o If the sky is the subject, place the horizon low.
  o If the land/sea is the subject, place the horizon high.
  o If both the sky and the land/sea are equally important, place the horizon across the centre of the frame.

• RULE: Keep the horizon horizontal, even if it does not appear in the frame.
  o Once you have established your basic composition and height of the horizon, check that the horizon is level before you take the picture.

3. Placing the subject

• CONVENTION: Do not place the subject dead-centre.
  o BUT ultimately, it depends on the particular situation and your own tastes.

• GUIDELINES:
  o Place the subject at a ‘rule of thirds’ intersection or along one of the lines.
  o If the subject is moving, leave a little room in the frame for it to move into.
Lock the camera’s focus on the subject before you compose the picture.
- Move the camera to position the subject in the centre of the frame.
- Depress and hold the shutter release halfway down to lock the lens.
- Keep the shutter release halfway down, and compose the picture.
- Depress the shutter release fully to take the picture.

4. Framing the image

- CONVENTION: Leave some room around the subject.
  - SO the subject remains intact (nothing is ‘chopped off’ in the picture).
  - BUT there may be some distractions in the background that challenge attention away from the subject.

- GUIDELINES:
  - Fill the frame with the subject.
    - Adds impact and minimises background problems.
    - Zoom in on the subject or physically move closer to the subject.
    - BUT be careful not to overfill the frame by cropping too tight.
  - Use a natural or structural frame.
    - Adds impact and creates a focal point.
5. Choosing the perspective

- Your choice of viewpoint, in terms of distance from the subject/scene or relative height, can greatly affect the perspective of the picture.
  - SO move around the subject/scene to identify a better perspective before taking the picture.

- RULE: Moving closer to the subject will expand perspective as well as increase the subject’s size in the image
  - BUT simply zooming in to the subject will merely increase the size of everything in the frame an equal amount.

- Parallel lines seem to converge to a point.
  - SO linear perspective is one of the simplest ways to create a 3D illusion of distance/depth.

- Shapes of identical or similar size receding into the distance.
  - SO the same object looks bigger close up and smaller further away.
  - AS SUCH, diminishing perspective is yet another way of adding distance/depth to an image.
6. Controlling the depth of field

- **RULE:** Anything within the camera’s depth of field will be sharp in the final image, and the further an object is outside of the field, the more blurred it will be.
  - SO use the aperture size to control the depth of field.

- **RULE:** The smaller the F-stop number, the larger the aperture, the shorter the depth of field.

- **GUIDELINES:**
  - Use a short depth of field.
    - Ideal for putting a particular subject in focus can make it stand out clearly, drawing the eye to this focal point and creating a 3D illusion.
    - SO set the aperture priority setting (A) to a large aperture like F2.8 (or use the ‘Portrait’ mode).
  - Use a large depth of field.
    - Ideal for landscape or group pictures where you want the foreground and background to be seen clearly.
    - SO set the aperture priority setting (A) to a small aperture like F8 (or use the ‘Landscape’ mode).
    - BUT this reduces the amount of light reaching the CCD.
    - AS SUCH, you will need a longer exposure (causing any moving subjects to be blurred) or a well-lit scene.

7. Controlling the shutter speed

- **RULE:** When the shutter is left open for longer periods, then:
  - Light in the scene becomes increasingly amplified.
  - Any motion captured becomes blurred.
GUIDELINES:
  o Use a low shutter speed.
    ▪ Ideal for capturing and conveying the effect of a subject in motion.
    ▪ SO set the shutter priority setting (S) to a low shutter speed like 1/15s to 1s.
    ▪ BUT the camera must be on a stable platform so as to prevent unwanted blurring of elements that are meant to be still.
    ▪ AS SUCH, hold the camera with a stable grip or mount it on a tripod.
  o Use a high shutter speed.
    ▪ Ideal for freezing motion.
    ▪ SO set the shutter priority setting (S) to a high shutter speed like 1/1000s to 1/30s (or use the ‘Sports’ mode).
    ▪ BUT more light is needed to create a proper exposure for the picture.
    ▪ AS SUCH, sunny days and well-lit environments are best for such shots.
    ▪ OR ELSE, use a flash.

8. Concluding remarks

• Photographic compositional rules are just guides to give you somewhere to start.
  o SO do not feel that you have to use one for every shot.
  o AS SUCH, do what looks and feels right to you.

• Examining photos by professionals or more experienced photographers will help you develop a feel for what works.
  o Attend photographic seminars and talks.
  o Participate in photographic competitions and, more importantly, attend their judging sessions if possible.
  o Visit photographic exhibitions and websites.
  o Show your pictures to your friends and ask, not for their compliments, but for their criticisms.

• Top photographer Eamonn McCabe: “I don’t think that equipment makes or breaks a picture. It’s the eye that sees it and takes it.”
  o SO first train your eye to observe photographic opportunities around you.
  o THEN, consider how you would compose and frame the images, and immediately create those images in your mind.
  o FINALLY, take out your camera and shoot away.

• After you have developed your aesthetic eye, the next thing is to understand and optimise the features of your camera.
  o Play around with the features of your camera until you are familiar with them.
  o Use these features to improve your photography and achieve your ideal image.
D. Appendix

1. References

- Print references:
  - Andrew Chan
    - Singapore Hardware Mag: Digital Photography Essentials: From Shot to Print
  - Alex May
    - Essential Computers: Multimedia: Digital Photography

- Online references:
  - Digital Photography Review http://www.dpreview.com
  - Megapixel.net http://www.megapixel.net
  - Silverlight Photography http://www.silverlight.co.uk

2. Acknowledgements

- Photo samples:
  - Joanna Askey
  - Phil Askey
  - Lynne Eodice
  - Nathan Hernandez
  - Jay Jorgensen
  - Mervyn Sek
  - Paula Sheil
  - Mike Stensvold
  - Neil Turner

3. Copyright notice

- Unless otherwise stated, the copyright and similar rights in all material published in this presentation are owned by Mervyn K C Sek.
- None of this material may be used for any commercial or public use.
- No part of this presentation or any material appearing in it may be reproduced on, stored in or transmitted to any other presentation.
- No material appearing in this presentation may be disseminated in any form, either electronic or non-electronic, nor included in any retrieval system or service without prior written permission from Mervyn K C Sek.