

Understanding Camera Settings

Ritu Ann Roy George
B170106EC
S7 ECE B-Batch
NIT Calicut

September 15, 2020

1 Introduction

This assignment is aimed at understanding some of the fundamental terms in the world of photography. Knowing how to utilise these modalities can help us take photographs that look quite professional and realise the true significance of the costly smartphone cameras we carry around everyday.

The features discussed are:

1. ISO Value
2. Shutter Speed
3. Exposure
4. White Balance

2 ISO Value

ISO measures the sensitivity of the image sensor. The lower the number the less sensitive your camera is to light and the finer the grain. Higher numbers mean the camera sensor becomes more sensitive to light which allows the photographer to click pictures in darker situations.

3 Shutter Speed

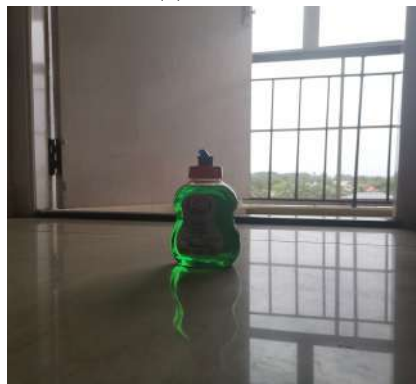
Shutter speed is the unit of measurement which determines how long shutter remains open as the picture is taken. The slower the shutter speed, the longer the exposure time. The shutter speed and aperture together control the total amount of light reaching the sensor. Shutter speeds are expressed in seconds or fractions of a second. For example 2, 1, 1/2, 1/4, 1/8, 1/15, 1/30, 1/60, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000. Each speed increment halves the amount of light.



(a) ISO=50



(b) ISO=160



(c) ISO=400



(d) ISO=1000

Figure 1: Effect on Changing ISO Value



(a) $S = \frac{1}{100} \text{ s}$



(b) $S = \frac{1}{20} \text{ s}$



(c) $S = \frac{1}{10} \text{ s}$



(d) $S = \frac{1}{4} \text{ s}$

Figure 2: Effect on Changing Shutter Speed - Moving Object



(a) $S = \frac{1}{4000} \text{ s}$



(b) $S = \frac{1}{125} \text{ s}$



(c) $S = \frac{1}{8} \text{ s}$

Figure 3: Effect on Changing Shutter Speed - Still Object

4 Exposure

Exposure Value (EV) is a number that represents a combination of a camera's shutter speed and f-number, such that all combinations that yield the same exposure have the same EV (for any fixed scene luminance). Exposure value is also used to indicate an interval on the photographic exposure scale, with a difference of 1 EV corresponding to a standard power-of-2 exposure step, commonly referred to as a stop. Greater exposure values are appropriate for photography in more brightly lit situations, or for higher ISO speeds.

$$EV = \log_2 \frac{N^2}{t}$$

where N is the f-number and t is the exposure time ("shutter speed") in seconds.

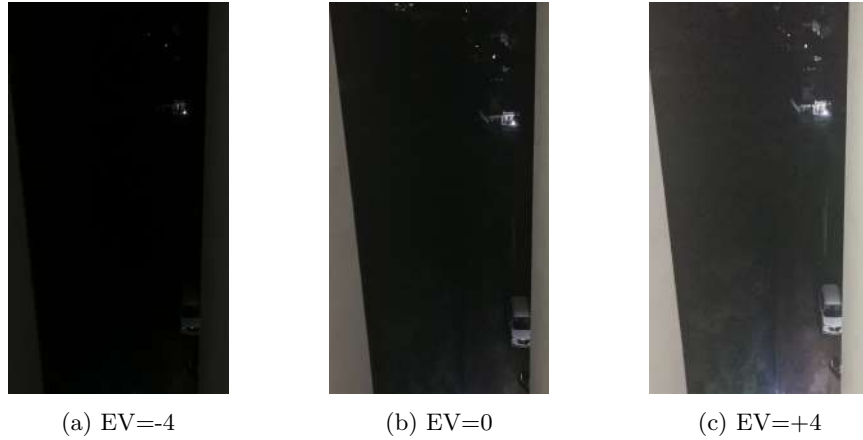


Figure 4: Effect on Changing Exposure Value

5 White Balance

White balance (WB) is the process of removing unrealistic color casts, so that objects which appear white in person are rendered white in the photo. While the human eyes are very good at judging what is white under different light sources, digital cameras often have great difficulty with auto white balance (AWB) — and can create unsightly blue, orange, or even green color casts. Proper camera white balance has to take into account the "color temperature" of a light source, which refers to the relative warmth or coolness of white light.

For instance, sunlight in the morning and evening can make colors a little redder or "warmer". Ambient light on an overcast day can be a little bluer or "cooler". This warmth or coolness in the colors is referred to as "color temperature" and is measured in Kelvin Scale.

- Very cool white balance setting (2,500K)
- Manual white balance setting (5500K)
- Very warm white balance setting (10,000K)



Figure 5: Effect on Changing White Balance

6 Inference

When one of ISO or EV or S (shutter speed) was changed, it was noted that the other two values also automatically changed in the camera settings. After reading about each term, it became clear that there is a relationship among these modalities when the output image is taken into account. On further reading, it is found that the relationship between ISO, aperture and shutter speed is termed as Exposure Triangle.

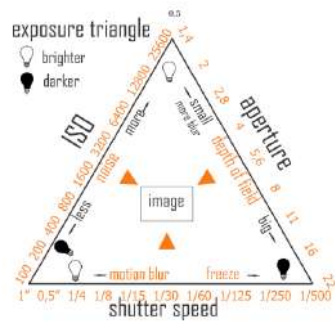


Figure 6: Exposure Triangle

7 Source and Reference

- Figure 6 : <https://photo-voyager.com/13-the-basics-the-exposure-triangle/>
- <https://digital-photography-school.com/iso-settings/>
- https://en.wikipedia.org/wiki/Exposure_value
- <https://www.cambridgeincolour.com/tutorials/white-balance.htm>
- <https://www.picturecorrect.com/tips/how-to-get-your-white-balance-right/>
- https://www.webopedia.com/TERM/S/shutter_speed.html