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Focusing procedure for ATIZ BookDrive DIY series

BookDrive DIY series are designed to use with canon digital SLR camera. These cameras are using Passive Auto-Focus method. They are unlike snapshot digital camera which using active autofocus. Users who using the BookDrive DIY is needed to know the camera's characteristic before capturing.

Active AF/Passive AF

Active autofocus is most found in snapshot digital camera which is cheaper. This method using visible light, infrared or even ultrasonic to measure the distance between camera and object. When camera knows the distance it can move its lens to fit the focus length. These method is easy but unreliable, user don't really know what position camera is using as focus point.

Passive autofocus is not emitted the energy to measure the distance but it analyzes the image from lens which is "real image". Using image processing and lens mechanism to determine the sharpness and estimate the image distance. They analyze image by using build-in special auto focus sensor which can measure the image sharpness while lens is moving (focusing). And when image is sharp enough, the lens is stop and it sound "beep" to indicate that image is focused and ready to shoot.

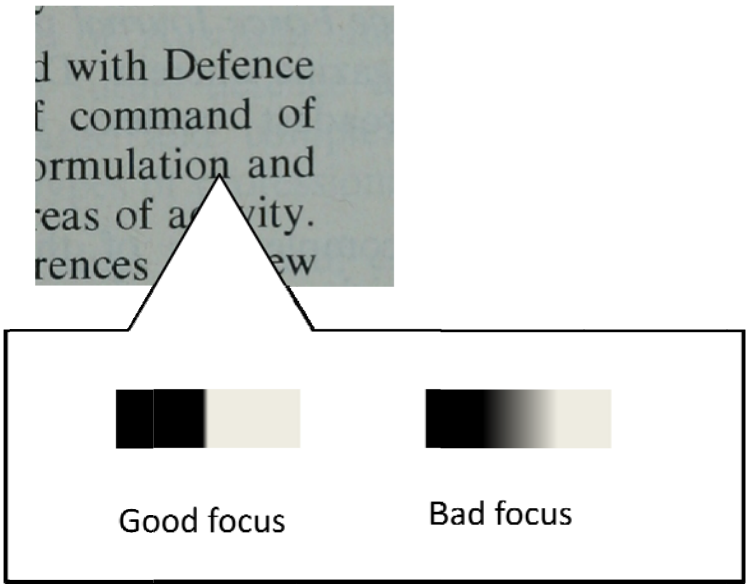

Figure 1. Passive Autofocus method.

In Canon digital SLR camera using method called Phase Detection. This means you can select which point you really want to focus on by selecting the focus point. You can select as much as 7 areas in 350D series and more in better model.

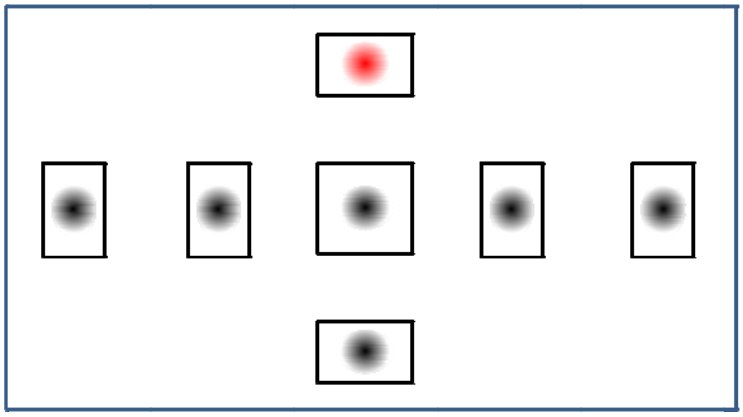

Figure 2. Focus point selection in Canon 350D

Comparing the difference between selecting various focus point on same camera position.

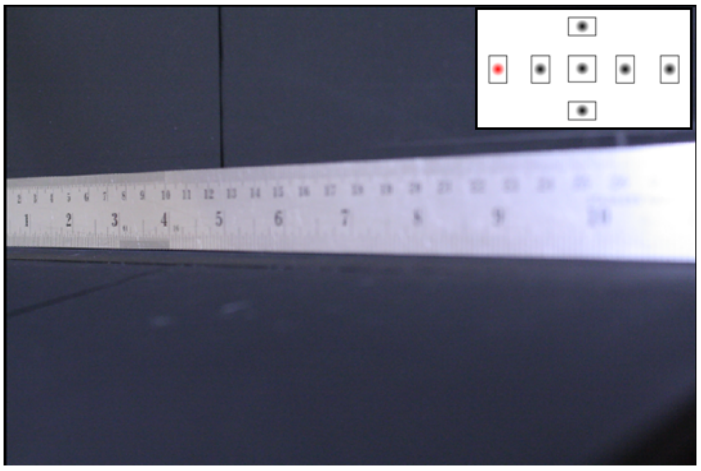

Figure 3. Focusing on the left

From the picture, camera focuses on the left focus point (which aims to 2 inch on the ruler). The number 2 is most sharpness.

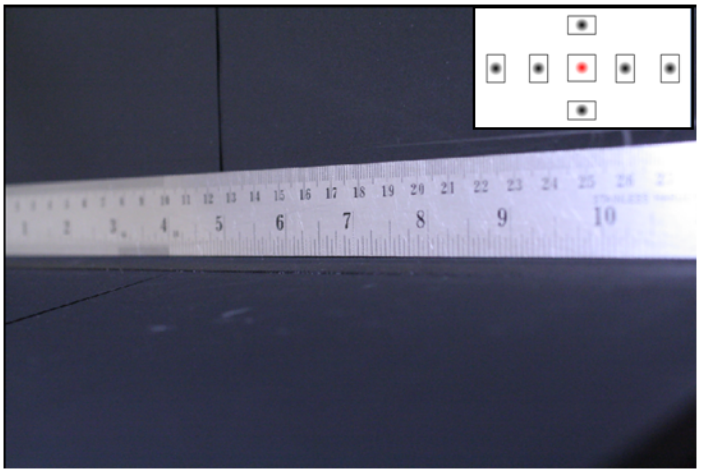

Figure 4. Focusing on the middle.

Then we are using same camera position and same ruler but change the camera focus point to the middle. We aim the camera to number 7. As you see in the figure, number 2 is now blurred.

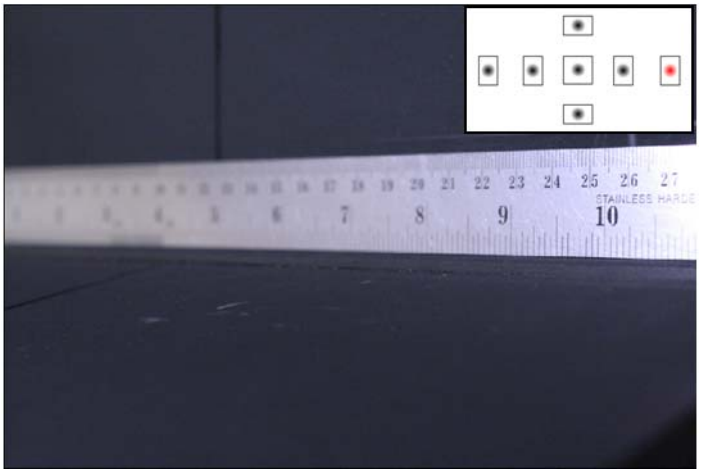

Figure 5. Focusing on the right.

Finally we using right camera focus point and aim it on number 10. Now the number which lower than 9 are now blurred.

You can manually set “focus point” by yourself. If you don’t know how to set the focus point please take a look on the Canon’ SLR camera user guide.

When you capture image with Canon d-SLR camera, it will automatically add the information in your image. Lighting setup, shutter speed, focusing method or even the focus point information are also added to your image. You can check focus point or other value of image by using program name “ZoomBrowser EX” which installed to your PC when you setup the camera driver.

In Zoombrowser choose your image and double click. Click on Show Auto Focus Points on the menu.

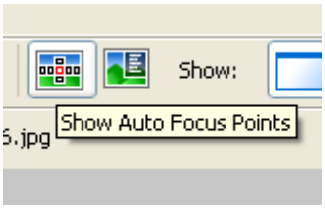

Figure 6. Show Auto Focus Points in Zoom Browse

You can determine the focus point on the image. The red square box is focus point which you selected before you capture the image.

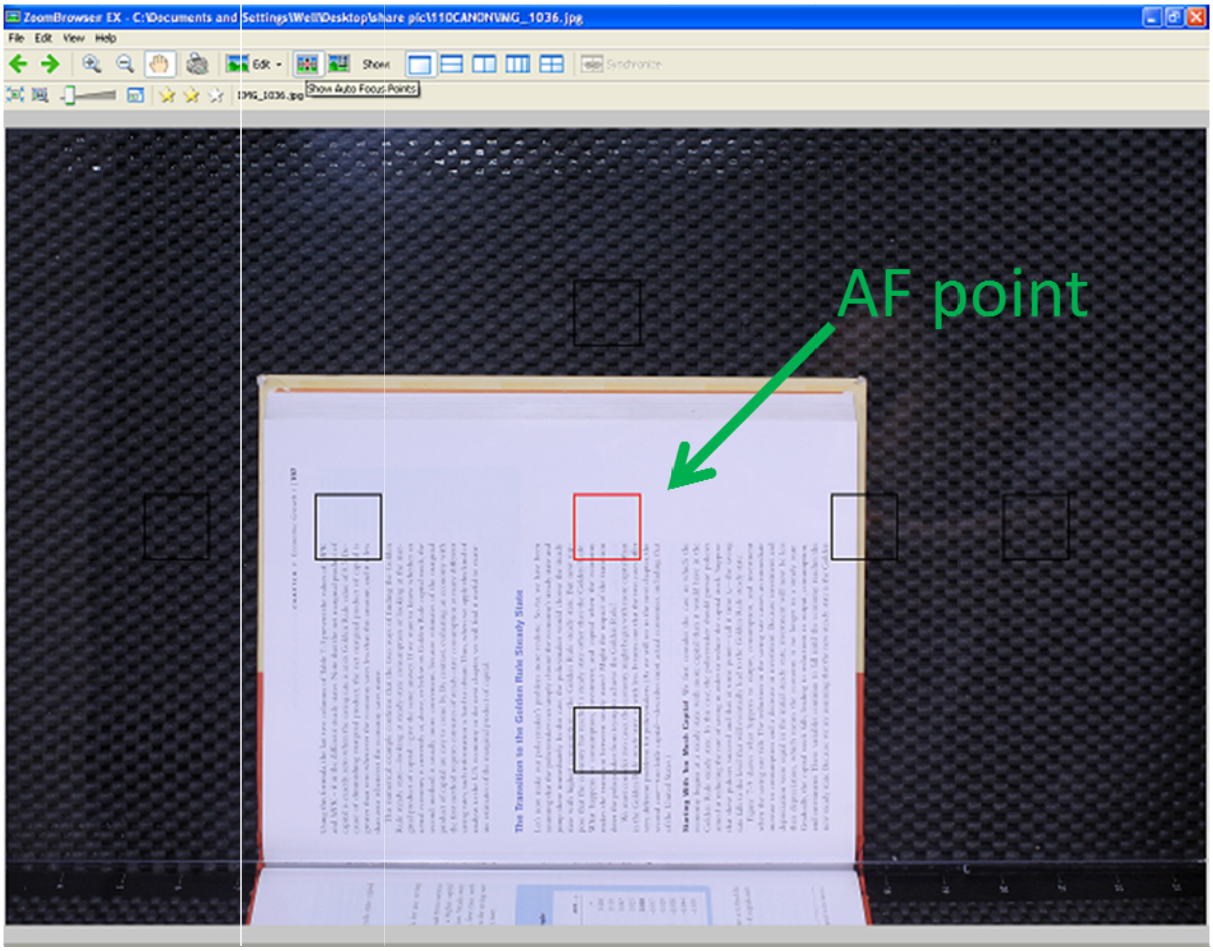

Figure 7. ZoomBrowser shows image's Auto Focus Point.

Camera and book Alignment

Figure 8. Good camera alignment on BookDrive DIY with middle focus point

In BookDrive DIY series, the book is pressed by transparent plate to keep it planar. This will keep book low light reflection and keep book plane match with focus plane. Camera can focus on any area on the book.

The book differ height must lower than Depth of Field (DOF). If all planar are in DOF, all area will be perfectly clear.

Figure 9. Good camera alignment with lower focus point

You can also using lower point focus. The results are same as using middle point if the book level is same or little difference.

Error Alignment, Camera setup

Focus On Cradle

Figure 10. Error Alignment: Focus on cradle.

Sometime book is smaller than the focus point (in case of using upper of middle focus point). Then the camera will focus on the cradle (usually focus on non-slipping material). Then the book will blur but the background will sharp.

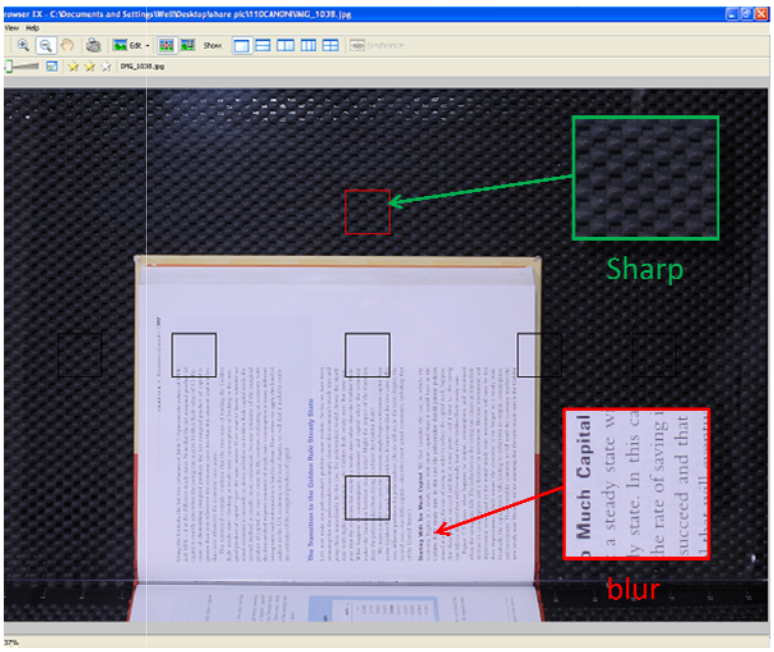

Figure 11. Camara focus on the cradle not the book.

Focus plane mis-alignment

Figure 12. Error alignment: focus plane not parallel with book

If the focus plane and book planar is not match. It will result an unclear image. Part which are in the DOF will result in sharp image but part where are out of DOF will result in blurred.

Figure 13. Error Aligment: image plane goes beyond Depth of Field (DOF)

We test the image with the line strip which will show result of alignment error.

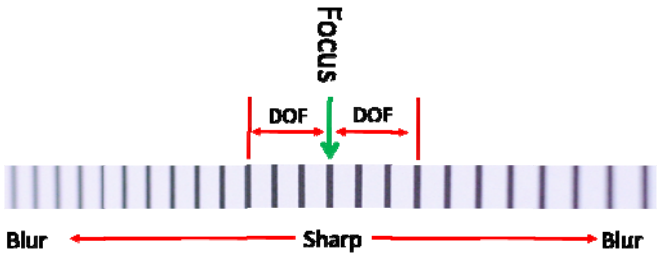

Figure 14. Alignment error (out of DOF).

The result shows that the middle of the image will sharp and blur start where the height difference is beyond the DOF.

This behavior also found in non planar book (very hard book or don't use the transparent plate)

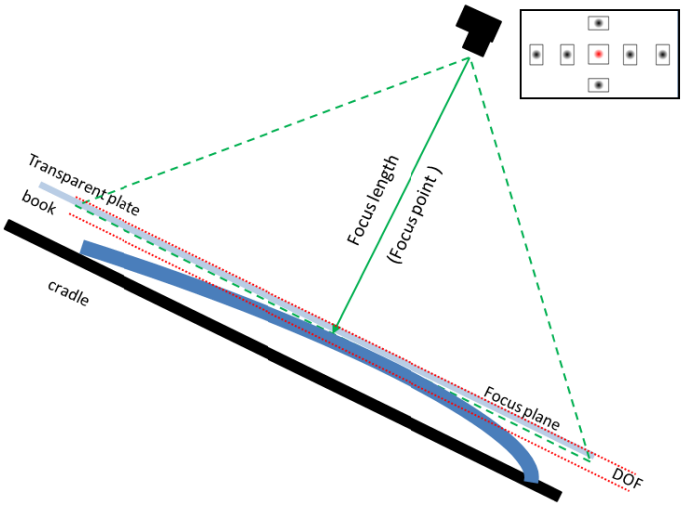

Figure 15. Error Alignment, Book is not plana.

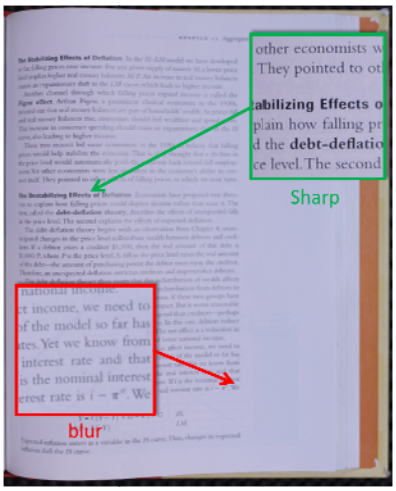

Figure 16. Image taken from non-planar book.