Exercises 05

Image & Optics (1020)

Exercise_01

320 points

- Place the 5 given images in the folder with the relative address: /dataset/images

1. Read all content of the folder (/dataset/images), Regardless of the file type and file name in the folder using python. (use os.scandir() or os.listdir())[40]

2. Check the type of image (Color, gray or binary).[70]

3. If the image is in color, convert it to grayscale, and then find the opposite of the image (255 - pixel intensity). [70]

4. If the image is in gray, convert it to binary, and then find the opposite of the image (255 - pixel intensity).[70]

5. If the image is binary, find the opposite of the image (255 - pixel intensity).[70]

- for convert gray to binary image use cv2. threshold()
- Use opencv library!
- Use color space conversion, correctly! (cvtColor())

Exercise_02

150 points

An engineer wishes to image an object $0.01m$ in height that is $0.20m$ in front of a lens and have its image appear on a screen $0.40m$ behind the lens. What focal length lens should they use? How large will the image be?

Exercise_03

150 points

The engineer now wants to image another different object onto a CCD camera. The pixel pitch of the camera is $10\mu m$ and it has 512×512 pixels. If the object is $0.75m$ in height and $4m$ away from the lens what focal length lens should they use to ensure the object fills 90% of field of view?

Exercise_04

200 points

If two lenses are placed next to each other and the first has a power of 40 diaopters and the second has a power of 10 diaopters. What is the focal length of the system?

Exercise_05

200 points

An optical system consists of two lenses. The first has a focal length of $60mm$ and the second has a focal length of $70mm$. If they are separated by $200mm$ find the position of the image after the second lens if the object is placed $200mm$ in front of the first lens.