Note

All printed documents allowed. Use either French or English to answer.

1 Warm-up questions

1.1 Thresholding methods

Cite different methods in order to find a threshold value to binarize a grayscale image. Explain the Otsu's method. What are its limits?

1.2 Image filtering

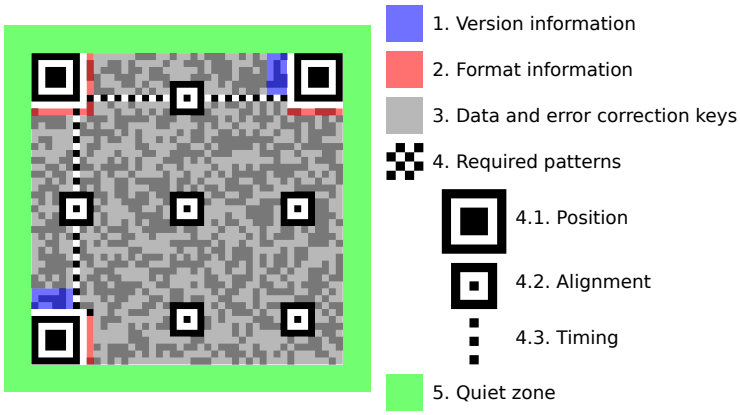
- What is the difference between a rank filter and a linear filter?
- Cite the name of a filter of each type.
- In case of a salt and pepper noise present in the image, what type of filter would you require to restore it? Why?
- For the latter, precise its limits and propose a way to improve the result.

1.3 Retina images

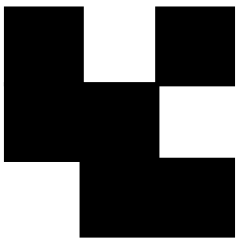
As a project, you coded a method for retina vessels segmentation. Explain the principles of the algorithm.

2 Open question: QR code

A QR code is a binary code represented as a 2D matrix. A scanner is in charge of reading it (via a camera) and translating it into the actual code. The structure of a QR code is represented in Fig.1.



(a) Structure of a QR code.



(b) Code.

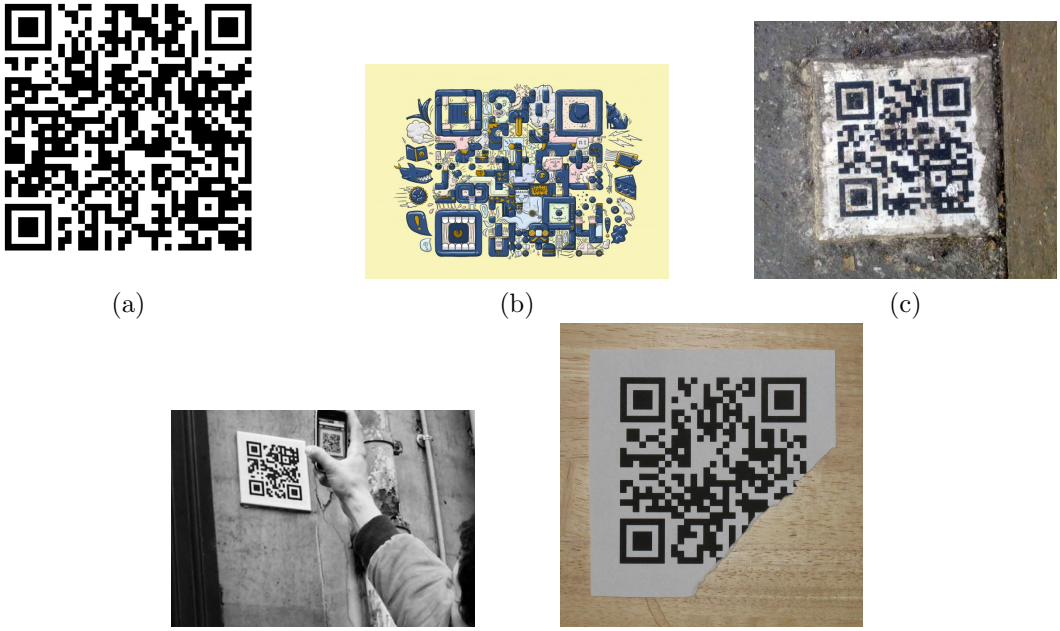
1	0	1
1	1	0
0	1	1

(c) Matrix.

Figure 1: Conversion of a binary pattern into a binary matrix.

Describe the different steps required to perform the acquisition and geometric transformation of the QRcode into a binary 2D matrix representing the code (1 value for 1 square, see Fig.1).

- List different situations that may complicate the image acquisition and analysis.
- Propose some (image processing) solutions in order to deal with these situations. Explain them, give the necessary details describing the methods.



(a) (b) (c)

(d) (e)

Figure 2: Different QR codes. The image acquisition and analysis must be tolerant to different observation conditions...