Processing of 2D Signals (Images)
Lab 10, DSP

Objective

Students should understand and be able to operate with 2D data (images).

Exercises

1. Create a chessboard image with each square having size $5x5$ pixels.

   - black = 0, white = 1
   - show the image with `imshow()`

2. Load the `Lena` image (use `imread()`) and display it (use `imshow()`).

3. Apply the system $y[n] = \frac{1}{4}x[n-1] + \frac{2}{4}x[n] + \frac{1}{4}x[n+1]$ to **every row** of the Lena image, and then to **every column** of the image. Ignore the first and last row/column.

   b. Display the resulting image. How did it change?

4. Repeat the same operation further 9 times. Display a $2x2$ figure and display the original image, the image filtered once, the image filtered 5 times, and the image filtered 10 times.

5. **NU MERGE, RAMAN DOAR MUCHIILE, TB SCAZUTE COMPO-NENTA CONTINUA, ETC. DE REVAZUT** Apply the following 2D system on the Lena image. Display the resulting image. What has changed? What type of 2D filter is this?

$$y[i,j] = \frac{1}{16}x[i-1,j-1] - \frac{2}{16}x[i-1,j] + \frac{1}{16}x[i-1,j+1]$$
$$- \frac{2}{16}x[i,j-1] + \frac{4}{16}x[i,j] - \frac{2}{16}x[i,j+1]$$
$$+ \frac{1}{16}x[i+1,j-1] - \frac{2}{16}x[i+1,j] + \frac{1}{16}x[i+1,j+1]$$

5. Repeat the same operation 3 times. Display the resulting image. What has changed?

Final questions

1. TBD