Curs 4 – Prima parte pg. 1-33

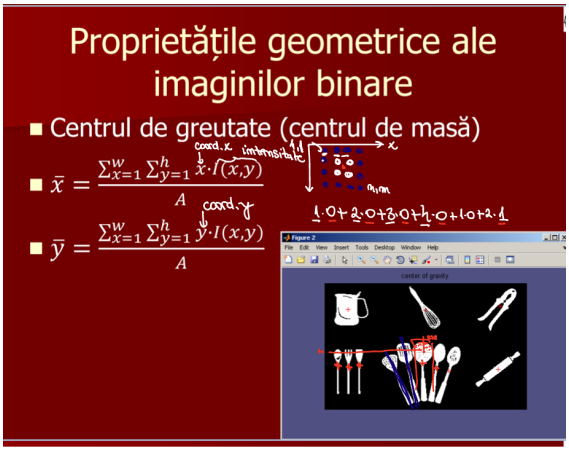
Transformări geometrice

Regionprops: Proprietăți de regiune: aria obiectelor, perimetrul lor, înclinarea $\times$ ox, oy, centru de greutate

$\Downarrow$

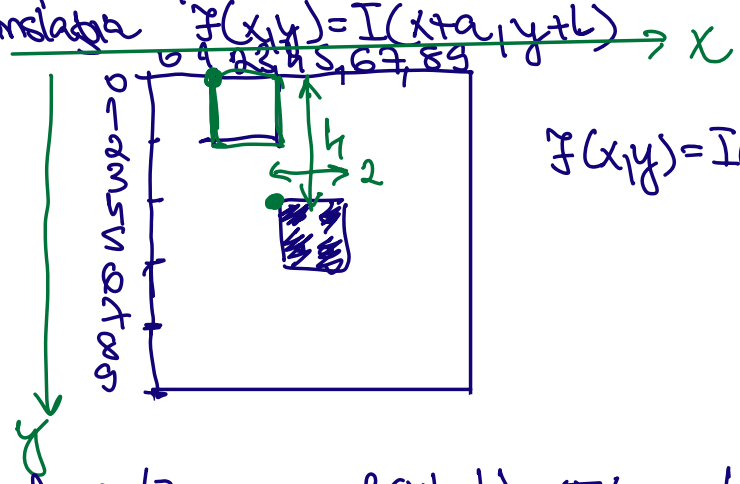
Imagini BW (binare)

Grayscale (de nivele gri) > prag threshold $= \begin{cases} \text{alb } 255/1, & \text{prag} > 128 \\ \text{negru } 0, & \text{altfel} \end{cases}$



Transformări geometrice:

1. Translația $f(x,y) = I(x+a, y+b)$



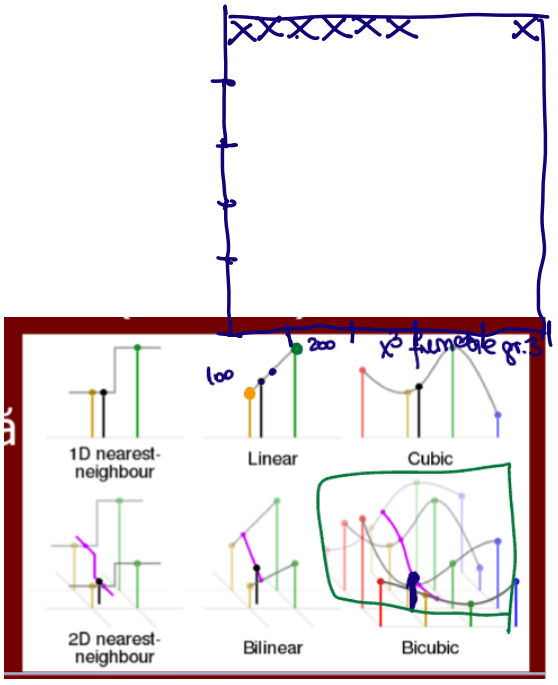
$f(x,y) = I(x-4, y-2)$

2. Scalare / Zoom: $f(x', y') = I(a \cdot x, b \cdot y)$

$\Downarrow$

factor de scalare a, pe axa X
b, pe axa Y

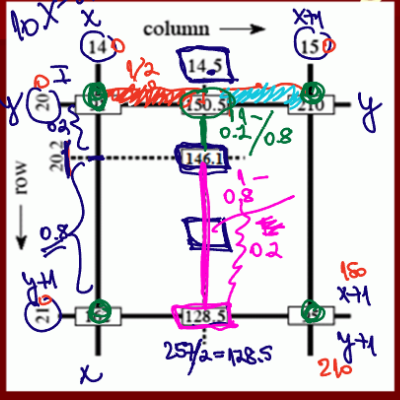
10x10 ⇒ 20x20



Pixeli lipsă se interpolează prin metode matematice de interpolare: interp. liniară 1D ✓
2D (bilineară) ✓
interp. cubică
interp. bicubică
Lanczos
spline (cubic??? spline

Matlab resi

Interpolarea biliniară în cazul imaginilor



$$I_{20.2,14.5} = \frac{21-20.2}{21-20} \cdot 150.5 + \frac{20.2-20}{21-20} \cdot 128.5 = 146.1$$

$$I_{20.2,14.5} = \frac{0.8}{1} \cdot 150.5 + \frac{0.2}{1} \cdot 128.5 = 146.1$$

$$I_{14.5,20} = \frac{14.5-14}{14-15} \cdot 91 + \frac{15-14.5}{15-14} \cdot 210$$

Se cunosc 4 pixeli
I(20,14)=91, I(21,14)=162, I(20,15)=210 I(21,15)=95
Se obține pt. I(14.5,20.2)=146.1

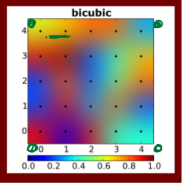
Interpolarea bicubică

- În acest caz se cunosc 4 puncte (0,0), (0,1), (1,0), (1,1)
- Se calculează derivatele f_x, f_y, f_{xy} în fiecare dintre cele 4 puncte

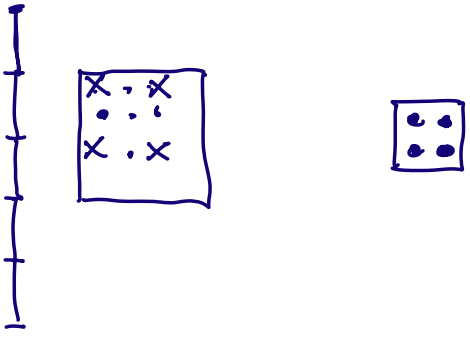
$$p(x,y) = \sum_{i=0}^{3}\sum_{j=0}^{3} a_{ij} x^i y^j.$$

1. $f(0,0) = p(0,0) = a_{00}$
2. $f(1,0) = p(1,0) = a_{00} + a_{10} + a_{20} + a_{30}$
3. $f(0,1) = p(0,1) = a_{00} + a_{01} + a_{02} + a_{03}$
4. $f(1,1) = p(1,1) = \sum_{i=0}^{3}\sum_{j=0}^{3} a_{ij}$

https://en.wikipedia.org/wiki/Bicubic_interpolation

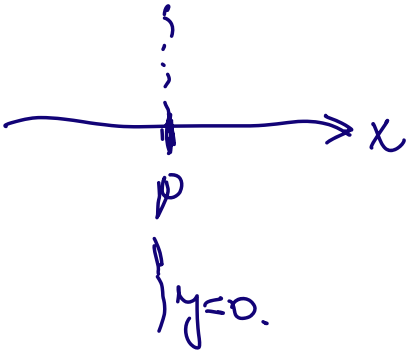


2. Rescale $1/2 = 0.5$ $30 \times 30 \Rightarrow 15 \times 15$.



3. Oglindire: Flip orizontal/vertical

$I'(x',y') = I(-x,y)$ dg. față axa X.
$I'(x',y') = I(x,-y)$ dg. față axa Y



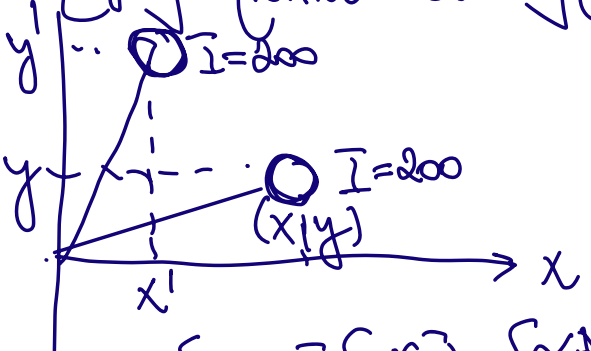
4. Rotație: $\begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$ θ: direcția trigonometrică inversă acelor ceasornicului

Transformare (translație, rotație, scală)

$$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$$

Translație $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} x_0 \\ y_0 \end{bmatrix}$

Rotație $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$



Scalare $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} \alpha & 0 \\ 0 & \beta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \alpha x \\ \beta y \end{bmatrix}$

Oglindire $\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$

$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$

$\begin{bmatrix} x' \\ y' \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$

Transformare generică afină: se păstrează unghiuri

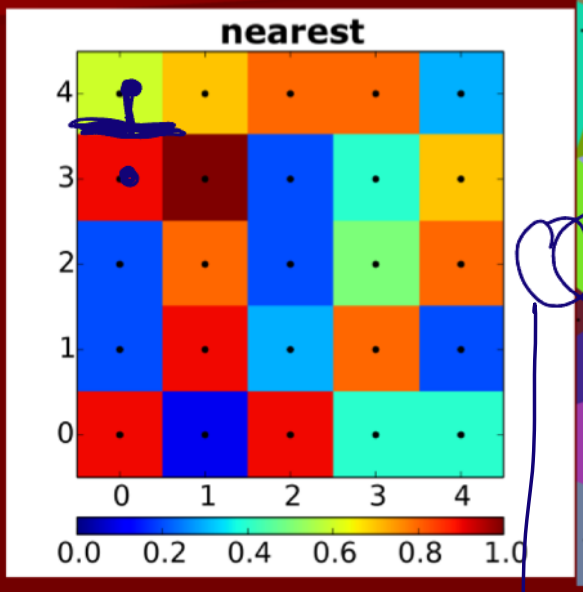
Transformare de împingere sheer

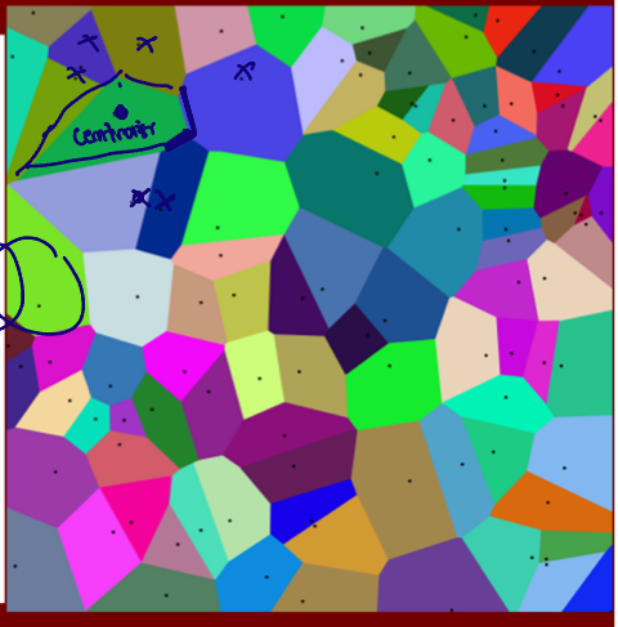
"distorsionare"

$\begin{bmatrix} 1 & 0 \\ m & 1 \end{bmatrix}$ y împingere $\begin{bmatrix} 1 & m \\ 0 & 1 \end{bmatrix}$ direcție x

Transformare proiectivă: liniile nu se mențin paralele

Interpolarea celui mai apropiat vecin





Diagrame Voronoi

antene tel. mobilă
rază circulară

Termen trimitere proiect/tutoriale joi 26.10.2023
ora 23:59.
Prezentare marți ora 16/17/18/19.