



UNIUNEA EUROPEANĂ



GUVERNUL ROMÂNIEI



Instrumente Structurale
2007-2013



Platformă de e-learning și curriculum e-content pentru învățământul superior tehnic

AEACD

13. Preprocesarea documentelor: Projection Profiling. Cross correlation. Neighbour clustering. Tranformata Fourier

Projection profiling

1499.] ALONZO DE OJEDA—FIRST VOYAGE. 9

The Spaniards smiled at their simplicity in attaching an extraordinary value to such worthless trifles; while the savages, in all probability, were equally surprised at beholding the strangers so eager after gold, and pearls and precious stones, which to themselves were objects of indifference.

Their manner of treating the dead was similar to that observed among the natives of some of the islands. Having deposited the corpse in a cavern or sepulchre, they placed a jar of water and a few eatables at its head, and then abandoned it without moan or lamentation. In some parts of the coast, when a person was considered near his end his nearest relatives bore him to the woods, and laid him in a hammock suspended to the trees. They then danced round him until evening, when, having left within his reach sufficient meat and drink to sustain him for four days, they repaired to their habitations. If he recovered and returned home, he was received with much ceremony and rejoicing; if he died of his malady or of famine, nothing more was thought of him.

Their mode of treating a fever is also worthy of mention. In the height of the malady they plunged the patient in a bath of the coldest water, after which they obliged him to make many evolutions round a great fire, until he was in a violent heat, when they put him to bed, that he might sleep: a treatment, adds Amerigo Vespucci, by which we saw many cured.

Puncte de maxim

Puncte de minim

Imagine skew free

1499.] ALONZO DE OJEDA—FIRST VOYAGE. 9

The Spaniards smiled at their simplicity in attaching an extraordinary value to such worthless trifles; while the savages, in all probability, were equally surprised at beholding the strangers so eager after gold, and pearls and precious stones, which to themselves were objects of indifference.

Their manner of treating the dead was similar to that observed among the natives of some of the islands. Having deposited the corpse in a cavern or sepulchre, they placed a jar of water and a few eatables at its head, and then abandoned it without moan or lamentation. In some parts of the coast, when a person was considered near his end his nearest relatives bore him to the woods, and laid him in a hammock suspended to the trees. They then danced round him until evening, when, having left within his reach sufficient meat and drink to sustain him for four days, they repaired to their habitations. If he recovered and returned home, he was received with much ceremony and rejoicing; if he died of his malady or of famine, nothing more was thought of him.

Their mode of treating a fever is also worthy of mention. In the height of the malady they plunged the patient in a bath of the coldest water, after which they obliged him to make many evolutions round a great fire, until he was in a violent heat, when they put him to bed, that he might sleep: a treatment, adds Amerigo Vespucci, by which we saw many cured.

Imagine rotita la 3 grade

Projection profiling

- Imaginea este rotita la mai multe unghiuri in cautarea unghiului corect de deskew
- Pentru fiecare unghi sunt realizate proiectii verticale si orizontale (numarul de pixel din linia / coloana corespunzatoare)

Projection profiling

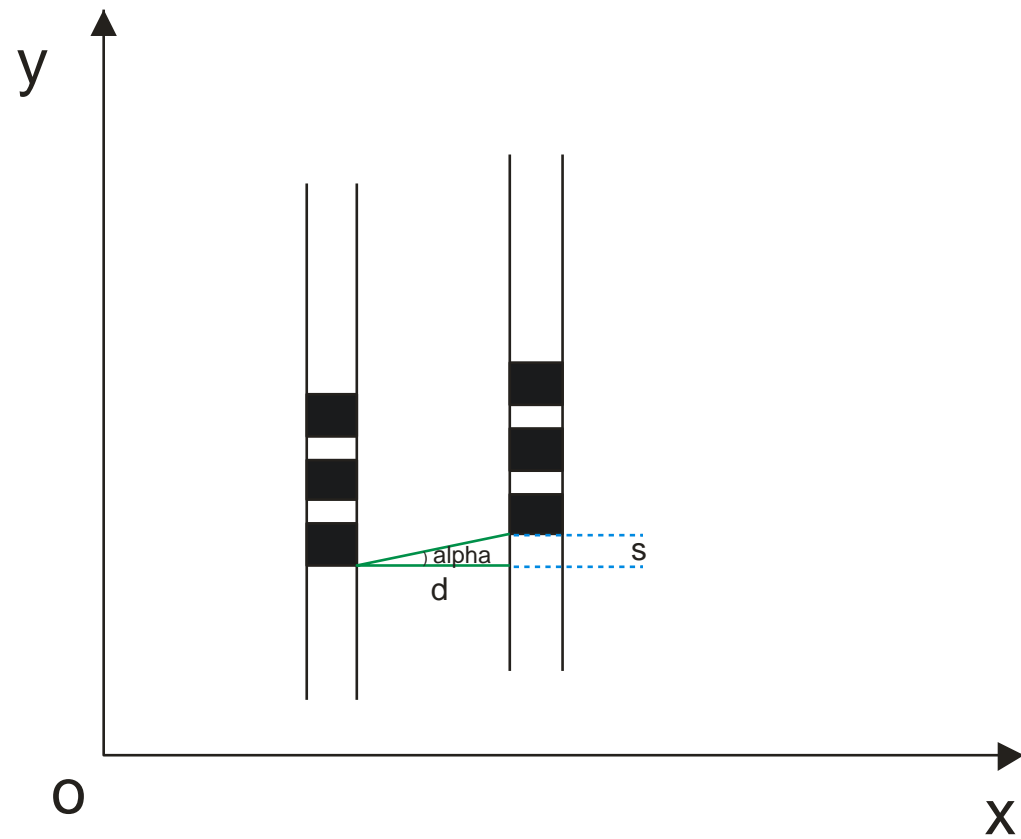
- In general textul este aranjat in linii verticale, astfel liniile de text vor produce aglomerari iar spatiile dintre linii goluri =>
- Pentru un document in care scrisul este orizontal (documente latin-based) histograma proiectilor verticale va prezenta un numar maxim de Puncte de maxim si Puncte de minim pentru unghiul de deskew

Cross correlation

- Plecand de la observatia ca intr-un document liniile de text vor fi in general verticale si paralele se poate formula ideea ca intre doua sectiuni verticale dintr-un text va exista un grad mare de coeziune
- Aceata coeziune poate fi folosita pentru aflarea unghiului de skew
- Determinarea unghiului de skew se face folosind projection profiling pe fasii verticale din imagine

Cross correlation

- Identificand zonele asemanatoare din cadrul a 2 fasi verticale, se poate calcula unghiul de skew

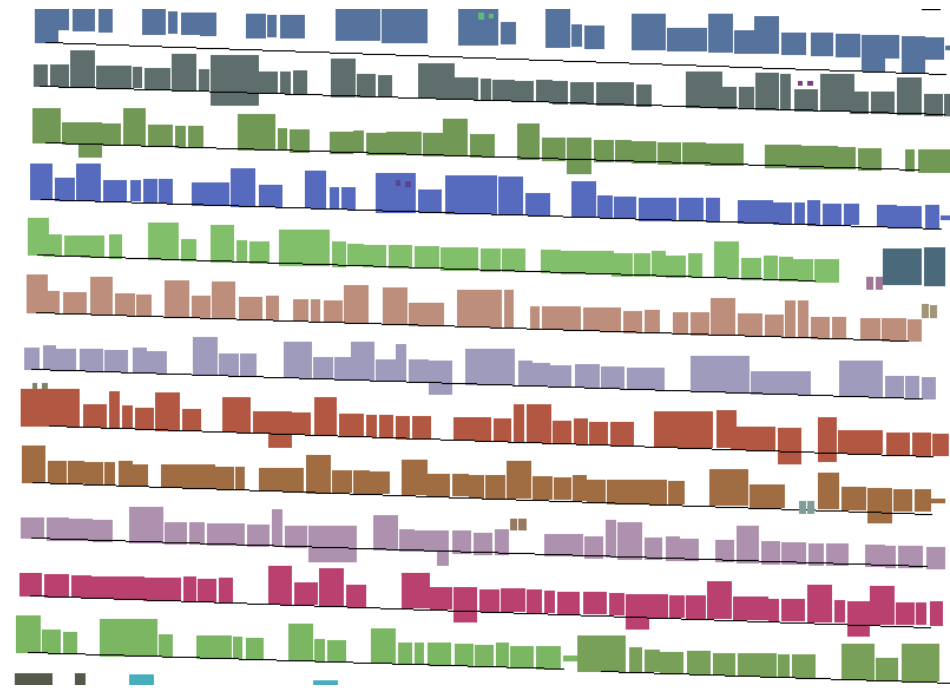
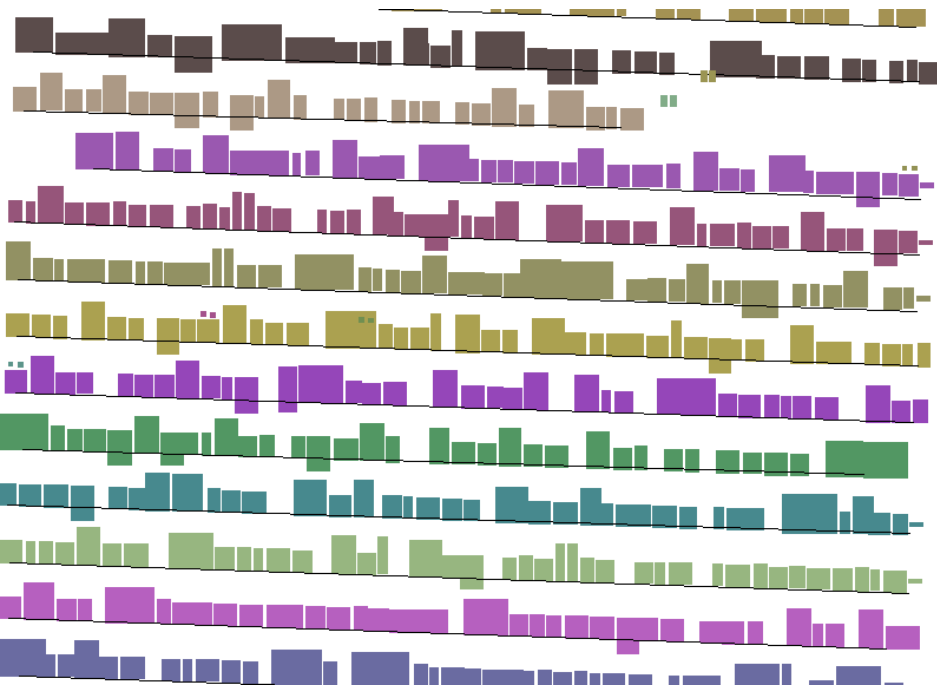


Neighbour clustering

- Aceasta este o categorie mai generica de algoritmi, in cadrul careia exista multe abordari propuse
- Ideea de baza poate fi sumarizata in felul urmator:
 - Sunt dedectate literele
 - Sunt formate grupuri – cuvinte, linii de text
 - Se aleg puncte semnificative (centroizi, punctele de jos) si se foloseste o metoda de tip line fitting pentru determinarea unghiului
 - Unghiul global de skew este aflat cu ajutorul unei histograme sau printr-o simpla medie

Neighbour clustering

- In general se folosesc metode de filtrare pe baza de dimensiuni pentru a face diferentierea intre litere si zgomote / imagini mari



Transformata Fourier

- Descompune imaginile in componentele sinus si cosinus ale transformatei Fourier
- Input-ul apartine domeniului spatial, in timp ce output-ul rezultat se gaseste in domeniul Fourier (sau domeniul frecventei)
- Este folosita pentru o larga varietate de aplicatii:
 - Analiza imaginii
 - Filtrarea imaginii
 - Reconstructia imaginii
 - Compresia imaginii

Transformata Fourier

- Transformata Fourier

$$F(u) = \int_{-\infty}^{\infty} f(x) e^{-j2\pi ux} dx$$

- Transformata Fourier inversa

$$f(x) = \int_{-\infty}^{\infty} F(u) e^{j2\pi ux} du$$

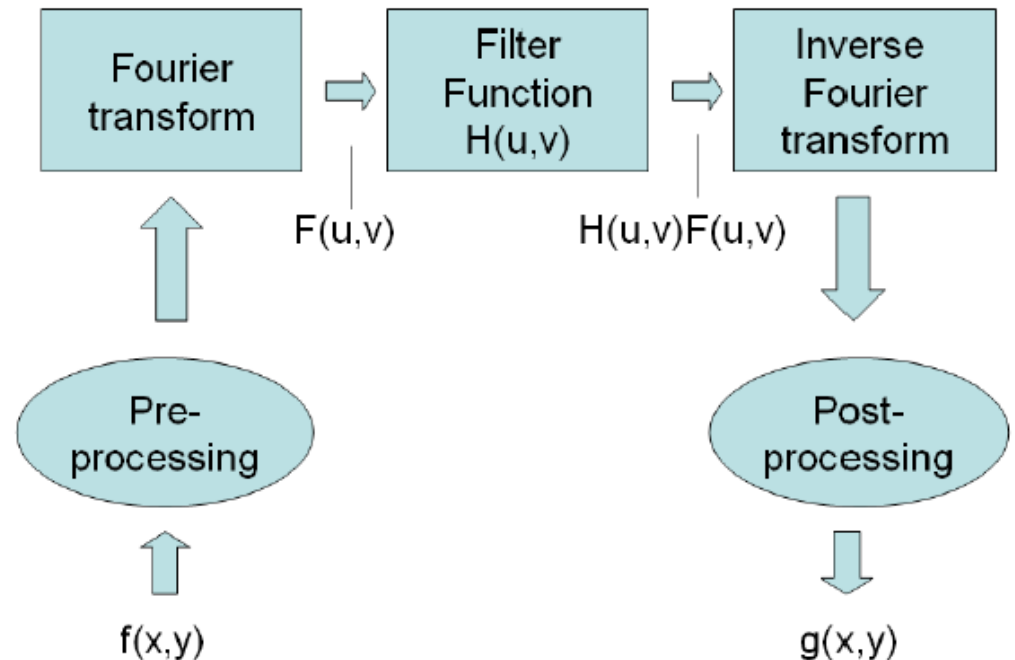
- Se observa ca prin intermediul functiei inverse se recupereaza functia originala fara pierderi
- j este radacina patrata din -1

Transformata Fourier

- Transformata Fourier poate usor sa fie extinsa la doua variabile u si v

$$F(u, v) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(x, y) e^{-j2\pi(ux+vy)} dx dy$$

- Similar se procedeaza si pentru transformata Fourier inversa



Transformata Fourier Discreta (DFT)

- Deoarece luam in discutie doar procesarea imaginilor digitale vom discuta doar Transformata Fourier discreta
- Descompune o secventa de valori in componente de diferite frecvente
- Transformata DFT nu contine toate frecventele care formeaza o imagine, ci doar un set care este suficient de mare pentru a descrie domeniul spatial al unei imagini
- Numarul de frecvente corespunde cu numarul de pixeli din domeniul spatial al imaginii
- Acest lucru este echivalent afirmatiei ca domeniul spatial sau Fourier al imaginii au aceeasi dimensiune

Transformata Fourier Discreta (DFT)

- Transformata Fourier discreta pentru functia $f(x,y)$ a unei imagini de dimensiuni $M \times N$ este data de ecuatie:

$$F(u, v) = \frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x, y) e^{-j2\pi(ux/M + vy/N)}$$

- Inversa acesteia este:

$$f(x, y) = \frac{1}{MN} \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} F(u, v) e^{j2\pi(ux/M + vy/N)}$$