

Indexing big colored image bank : Texture 3.0

**Etienne CAILLAUD, Thomas LE BRIS, Ibrahima GUEYE,
Gaetan ADIER**

XLIM-SIC Laboratory UMR CNRS 7252, Poitiers, France



Outline


- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement
 - 5 Results and Discussion
 - 6 Project Management
 - 7 Conclusion

Image Indexing

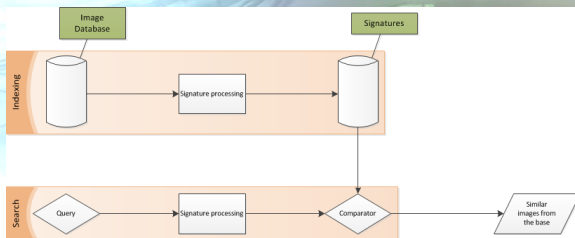


FIGURE: Online image indexing

Descriptor

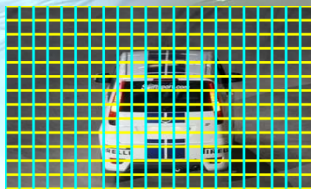


FIGURE: Dense grid keypoints

Descriptor



FIGURE: Points of interest keypoints

Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement
 - 5 Results and Discussion
 - 6 Project Management
 - 7 Conclusion

Deadlines

XLIM-SIC Laboratory of University of Poitiers

- Noel Richard (Researcher in Color images) : Supervisor
- David Helbert (Researcher in Signal-Image-Communications) : Supervisor
- Thierry Urruty (Researcher in Color images) : Customer

Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement**
 - 4 Work achievement
 - 5 Results and Discussion
 - 6 Project Management
 - 7 Conclusion

Software

- Design software programs :
indexation of images database, calculate descriptor according to nature images
- Adapt the last up to date designed color and texture attributes to the current image classification
- Compare our results (using CLEF challenge metrics)
- Provide an abstract of the comparisons and a technical report

Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement**
 - 5 Results and Discussion
 - 6 Project Management
 - 7 Conclusion

SIFT(Scale-Invariant Feature Transform)

Key-points detection (x, y, σ)

- Scale-space extrema detection
Find the best locations which characterize well the image
- Key-point location
Improve the position of the keypoints detected
- Orientation assignment
Assign orientations to the key-points
- key-point descriptor
Describe the key-point with with a vector of 128 dimension

SIFT(Scale-Invariant Feature Transform)

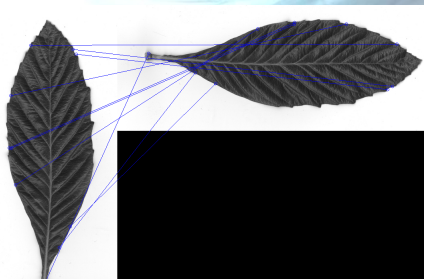


FIGURE: SIFT test1

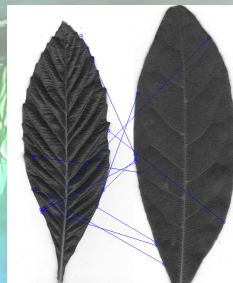


FIGURE: SIFT test2

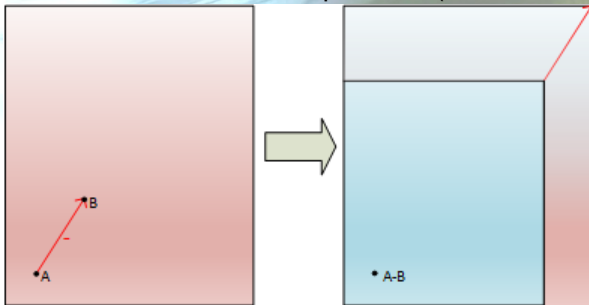
$C_2O(1/3)$

- The C_2O matrix
 - Conversion to $L^*a^*b^*$ space
 - C_2O matrix calculation.
 - C_2O signature extraction.

C₂O(2/3)

- The C₂O matrix

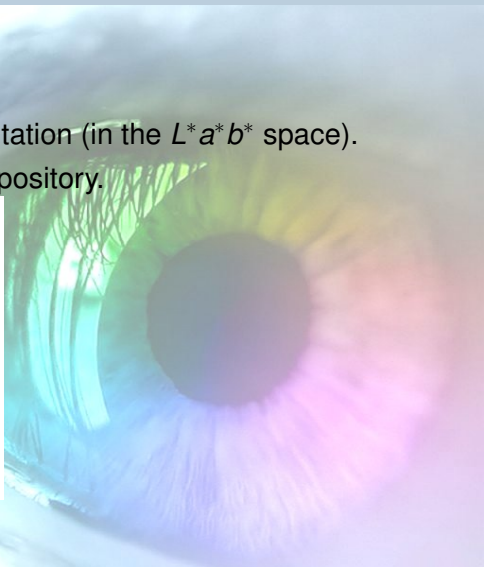
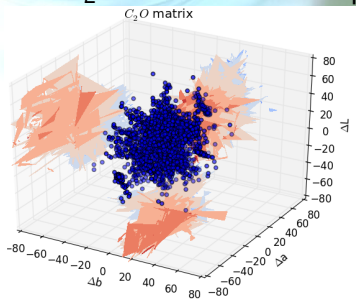
- The color difference computation (in the $L^*a^*b^*$ space).



$C_2O(2/3)$

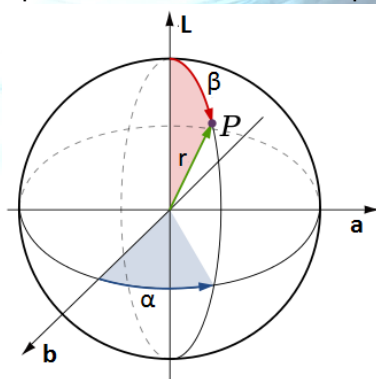
- The C_2O matrix

- The color difference computation (in the $L^*a^*b^*$ space).
- The C_2O matrix in a 3-D repository.



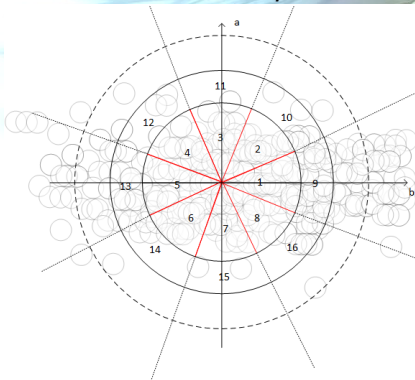
$C_2O(3/3)$

- The C_2O feature extraction
 - Spherical from cartesian repository.



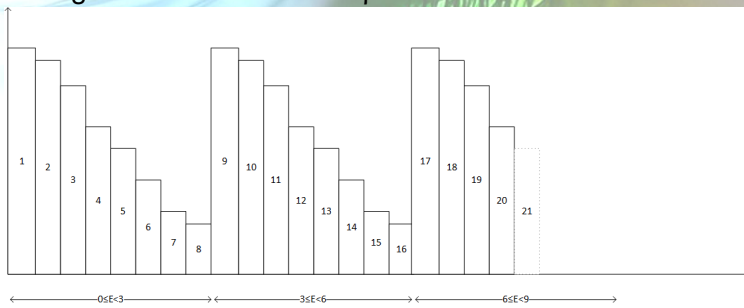
$C_2O(3/3)$

- The C_2O feature extraction
 - Spherical from cartesian repository.
 - Quantization for one β interval.



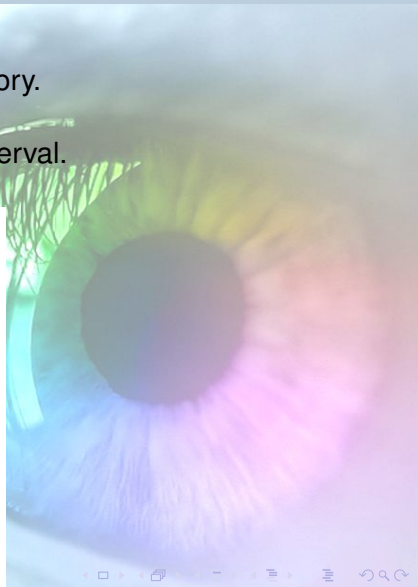
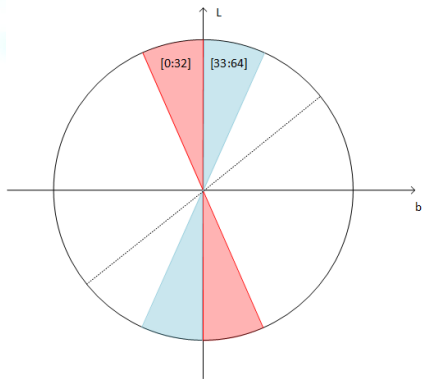
$C_2O(3/3)$

- The C_2O feature extraction
 - Spherical from cartesian repository.
 - Quantization for one β interval.
 - Histogram obtained for one β interval.



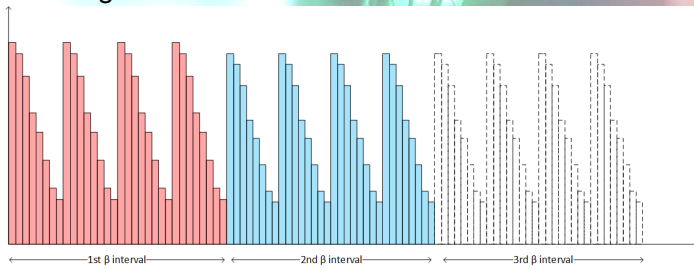
$C_2O(3/3)$

- The C_2O feature extraction
 - Spherical from cartesian repository.
 - Quantization for one β interval.
 - Histogram obtained for one β interval.
 - Quantization for each β interval.



$C_2O(3/3)$

- The C_2O feature extraction
 - Spherical from cartesian repository.
 - Quantization for one β interval.
 - Histogram obtained for one β interval.
 - Quantization for each β interval.
 - Final signature obtained.



Classification (Bag of words)

Reducing the number of points.

- K-means

- Attribute the vectors to centroid vectors.

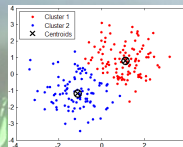


FIGURE: K-means

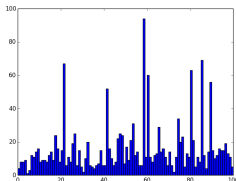


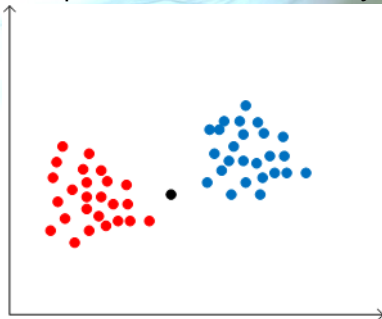
FIGURE: Signature

- Signature

- Design histogram in function of assignment of the vectors.

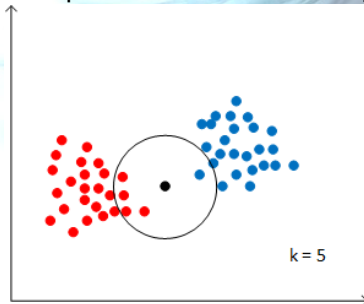
Classification (K-nn(1/2))

- The k nearest neighbor method
 - Comparison to the dictionary .



Classification (K-nn(1/2))

- The k nearest neighbor method
 - Comparison to the dictionary .



- 4 Occurrences of the 'red' class , - 1 occurrence of the 'blue' class
- The new point is attributed to the 'red' class

Classification (K-nn(1/2))

- Application for image classification
 - More complex data.
 - Distances on signature vectors extracted from the K-mean method.
 - One most adapted distance type for each descriptor .

CLEF

- What is CLEF ?
- What did we gained from enrolling ?



FIGURE: Points of interest keypoints

- benchmark

Process flow

- Main function which control all the process
 - Create the tree structure.
 - Allows the choice of descriptors.

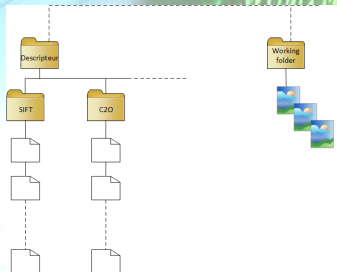


FIGURE: Tree structure

Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement
 - 5 Results and Discussion**
 - 6 Project Management
 - 7 Conclusion

Results

- Reduce data-base of 100 images composed of only 4 species.
- Compare the two descriptors SIFT and C₂O.

TABLE: SIFT result

ID	Training Base	Test Base	Correct	Accuracy
173	17	8	4	50%
1102	22	3	1	33%
1889	16	9	1	11%
2717	15	10	7	70%
Total	70	30	9	/

TABLE: C₂O result

ID	Training Base	Test Base	Correct	Accuracy
173	17	8	1	12.5%
1102	22	3	1	33%
1889	16	9	0	0%
2717	15	10	7	70%
Total	70	30	9	/

Discussion

- Classification
 - To much reducing on the K-means (100 words).
 - Euclidean distance not the most efficient or adapt.
- C_2O
 - The concatenation way is not optimal.

Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement
 - 5 Results and Discussion
 - 6 Project Management**
 - 7 Conclusion

Project management (1/2)

- The scrum methodology
 - One sprint per week.
 - Daily scrum meeting.
 - Complete time repartition on the product backlog.



Project management (2/2)

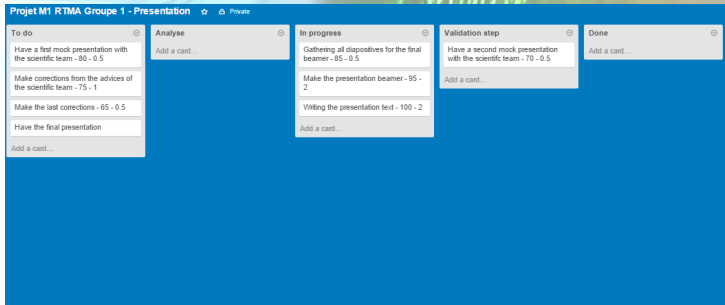
- The sprint backlog : Trello board
 - Progress on one sprint.

The screenshot shows a Trello board for 'Projet M1 RTMA Groupe 1 - Presentation'. The board is organized into five columns: 'To do', 'Analyse', 'In progress', 'Validation step', and 'Done'. The 'To do' column contains a list of tasks for the sprint backlog, each with a description and a time estimate. The other columns are currently empty, each with an 'Add a card...' button.

To do	Analyse	In progress	Validation step	Done
Writing the presentation text - 100 - 2	Add a card...	Add a card...	Add a card...	Add a card...
Make the presentation beamer - 95 - 2				
Gathering all diapositives for the final beamer - 85 - 0.5				
Have a first mock presentation with the scientific team - 80 - 0.5				
Make corrections from the advices of the scientific team - 75 - 1				
Have a second mock presentation with the scientific team - 70 - 0.5				
Make the last corrections - 65 - 0.5				
Have the final presentation				
Add a card...				

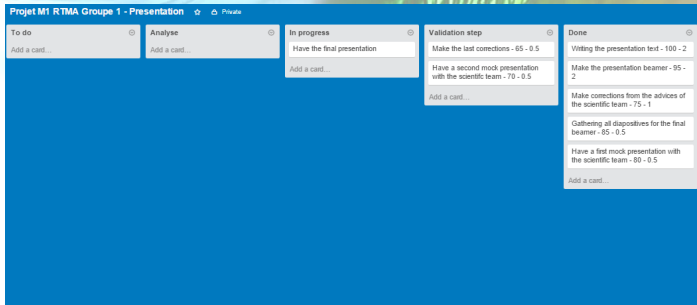
Project management (2/2)

- The sprint backlog : Trello board
 - Progress on one sprint.



Project management (2/2)

- The sprint backlog : Trello board
 - Progress on one sprint.

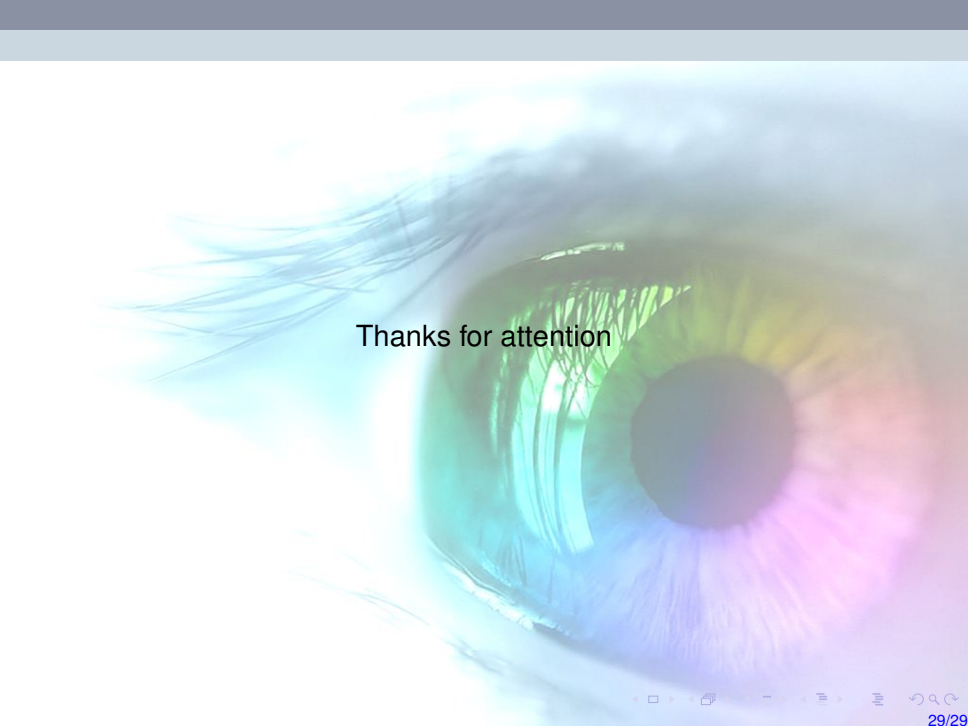


Outline

- 
- 1 Introduction
 - 2 Team presentation
 - 3 User requirement
 - 4 Work achievement
 - 5 Results and Discussion
 - 6 Project Management
 - 7 Conclusion**

Conclusion

- Things we learned
- Errors/Perspectives



Thanks for attention