

Detection of comic characters in comic books and manga

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(research stay in IMP group until November 7th)

Presentation

Advisers

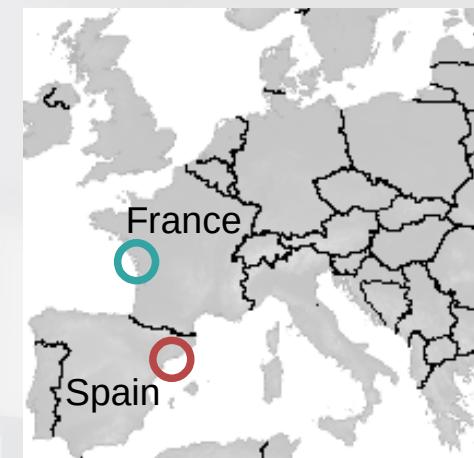
- Jean-Christophe Burie & Jean-Marc Ogier (L3i, La Rochelle, France)
- Dimosthenis Karatzas (CVC, Barcelona, Spain)

eBDtheque project

- **Comic book** image processing and understanding
- **Cultural heritage** in many countries
- **Paper ↔ digital** comic book conversion enhancement
- New usages using the **new technologies**

Applications

- Text/image search, augmented reading, reflowing...



What researchers can do for the paper to digital transition?

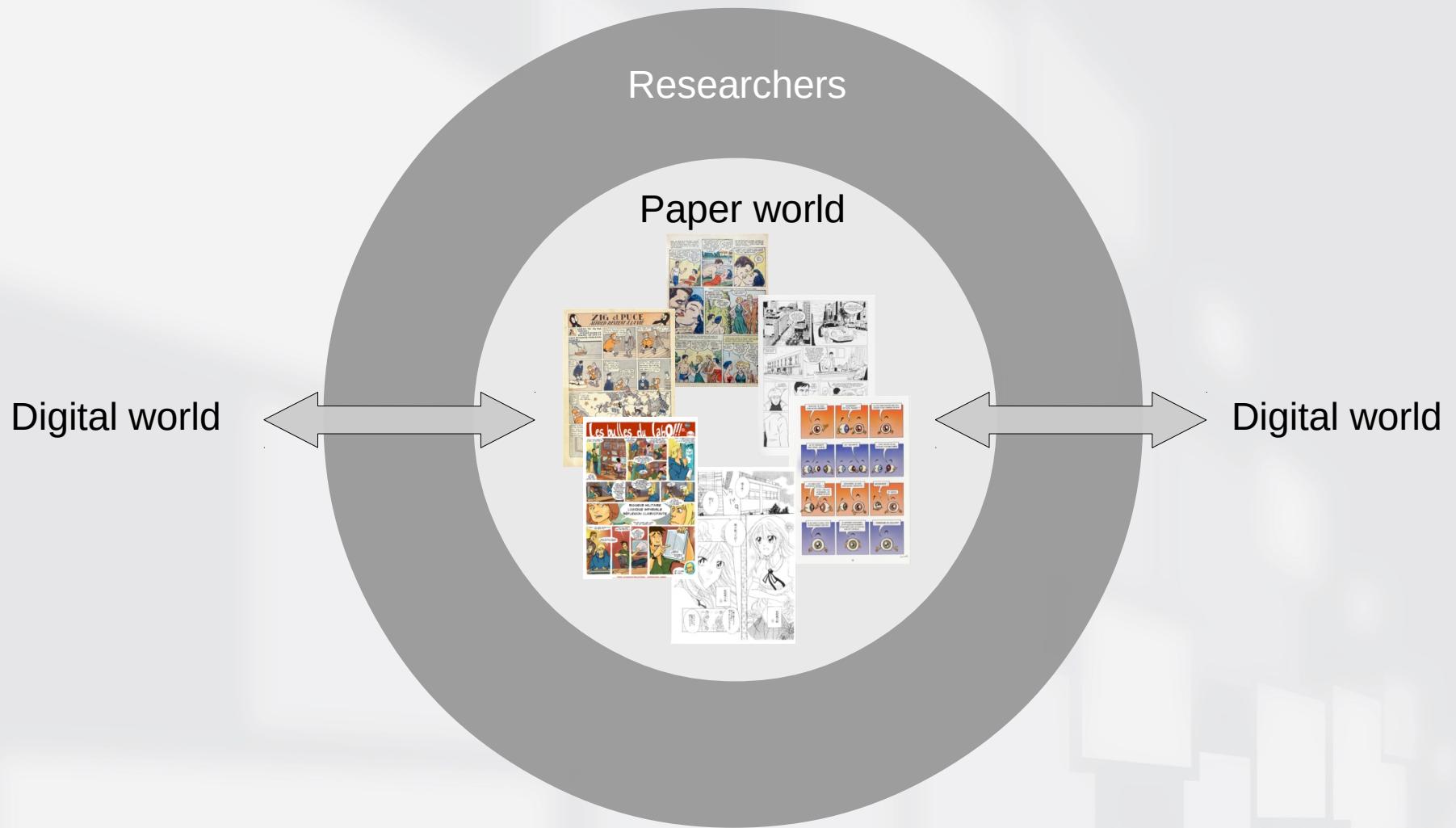


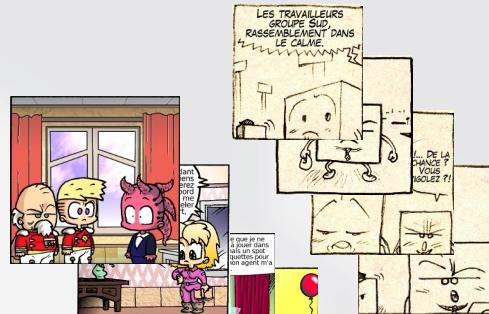


Image credits: contributors of the eBDtheque dataset

Scene understanding

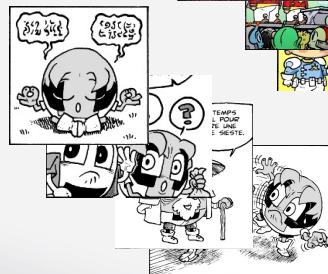
Balloon classification

Layout analysis



Speaker localization

Panel retrieval



Text timestamps

Reflowing

Researchers



Tone and pitch

De-hyphenation



Pose retrieval

Speech synthesis



Facial expression

Language analysis

PANELS

Relationship retrieval

Translation assistance

Character localization and recognition

Scene understanding

Balloon classification

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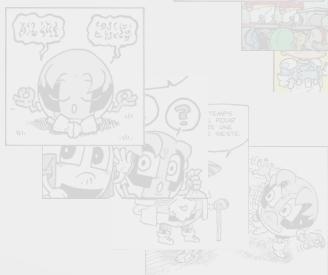
Translation assistance

Character localization and recognition

Scene understanding



Layout analysis

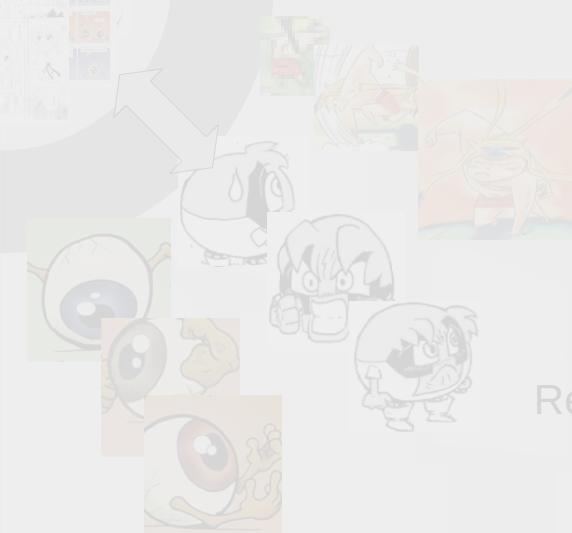


Panel retrieval

Researchers



Reflowing



De-hyphenation

BALLOONS

Speech synthesis



Language analysis

Translation assistance

Balloon classification



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Text timestamps



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CHARACTERS

Panel retrieval

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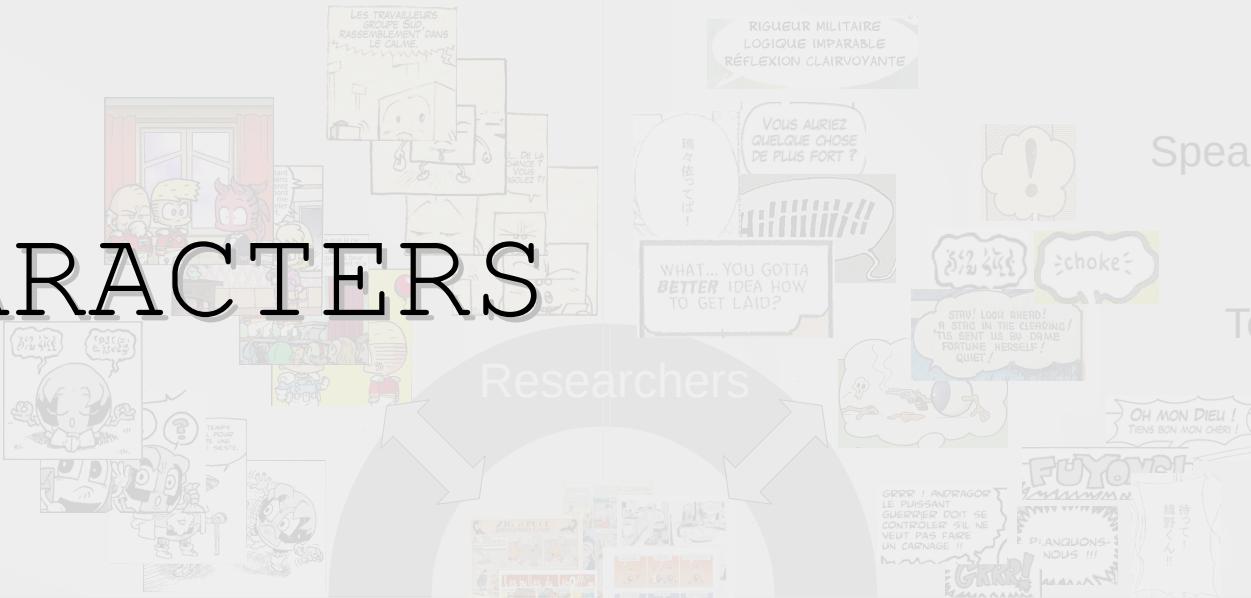
Facial expression

Language analysis

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Translation assistance

Character localization and recognition



Challenges of comics analysis

- Variation of **comic book styles**
- **Printing & scanning** method changes over time (press, ink-jet, computer-based)
- **Diversity of information** to extract
- A lot of **semantic relations** to retrieve (element's relationships, text meaning)

Summary of comic character extraction

- Supervised approaches
 - Character **spotting** given an example
- Unsupervised approaches
 - Hypothesis from speech **balloon tail** position and orientation
 - Region of interest from simple **object removal**
 - **Graph-based approach** (Nam)

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Character spotting given an example [5]

- Aim: retrieve all the instances (apparitions) of a given character in all the pages of a comic book title/album/collection
- Method summary:
 - 1) Reduction of the number of colors
 - 2) Get the colors of the query example (user interaction)
 - 3) Compute the user query descriptor
 - 4) Spot similar character instances

[5] C. Rigaud, D. Karatzas, J-C Burie, J-M Ogier Color descriptor for content-based drawing retrieval DAS'14

1) Color reduction/quantization

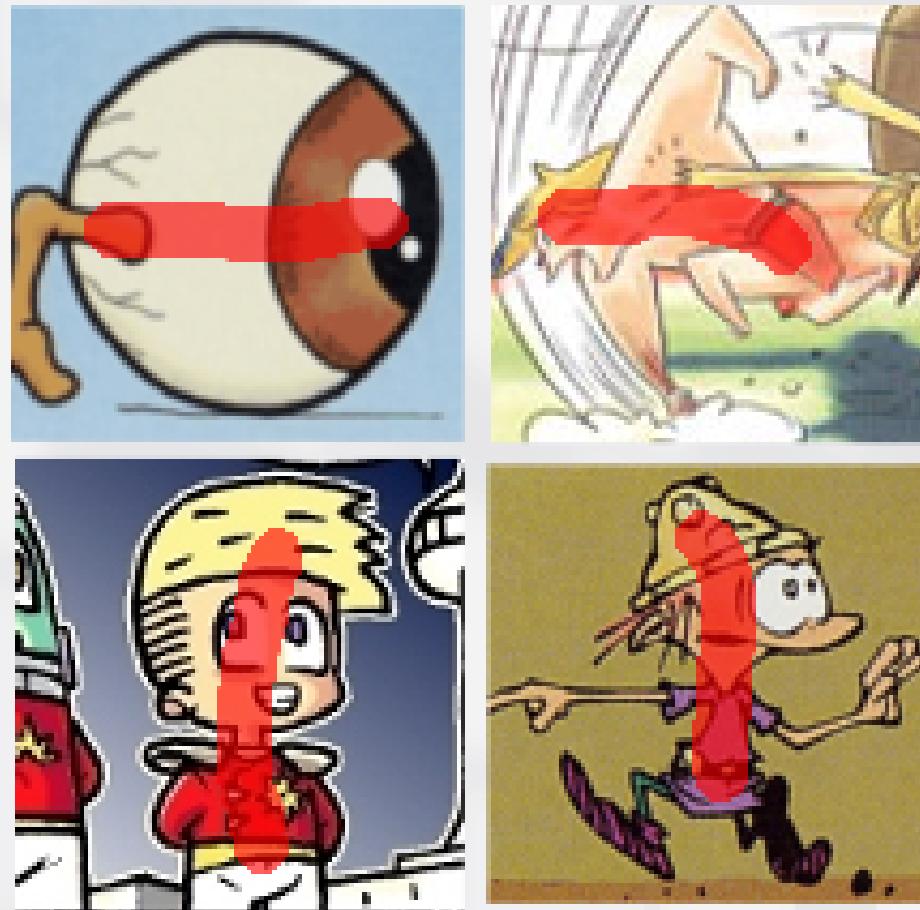


N>10000

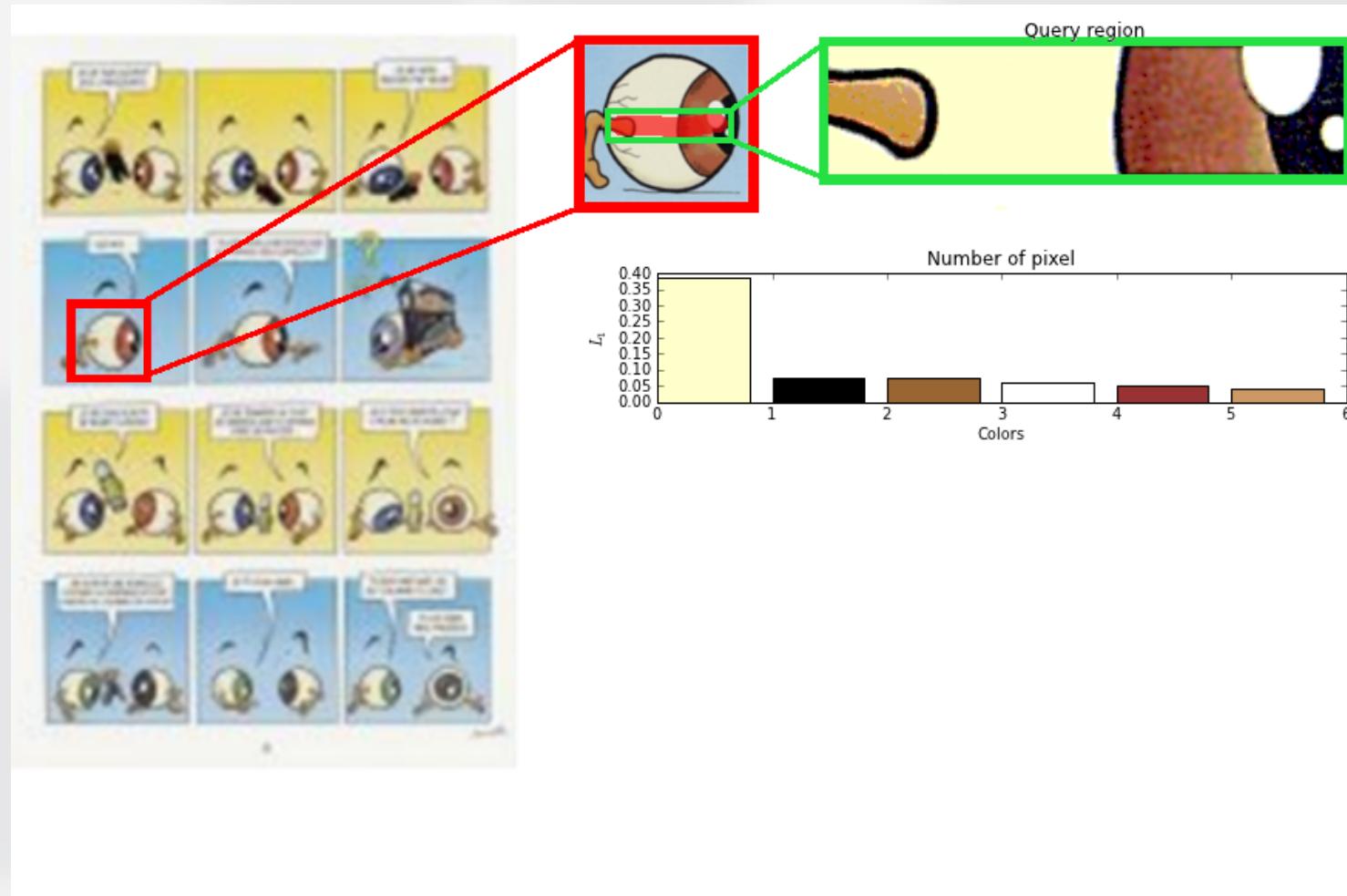
N=256

N=32

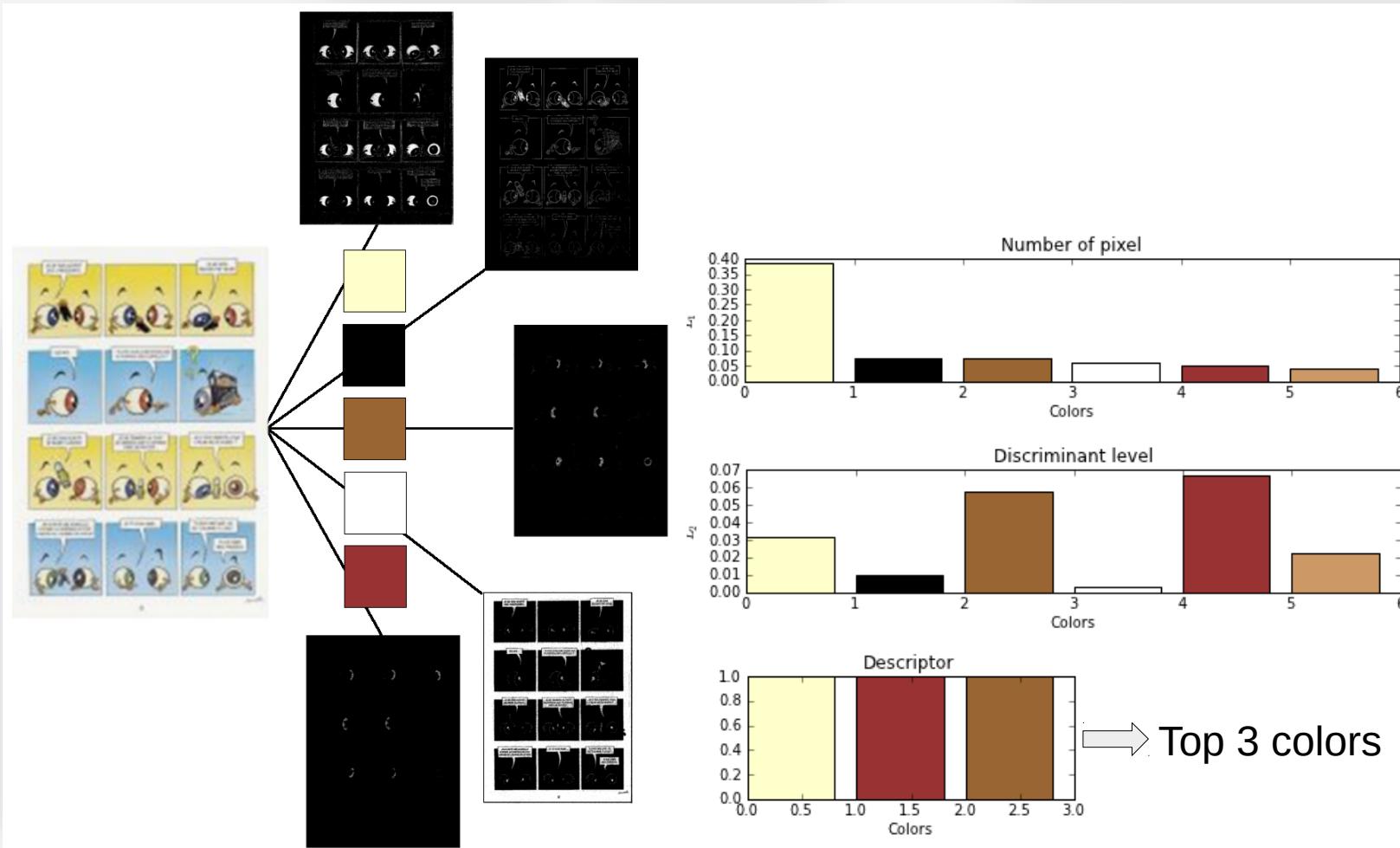
2) User query



3) Color selection: occurrence level



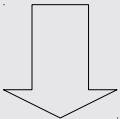
3) Color selection: occurrence + discriminability levels



4) Character spotting: example



User input

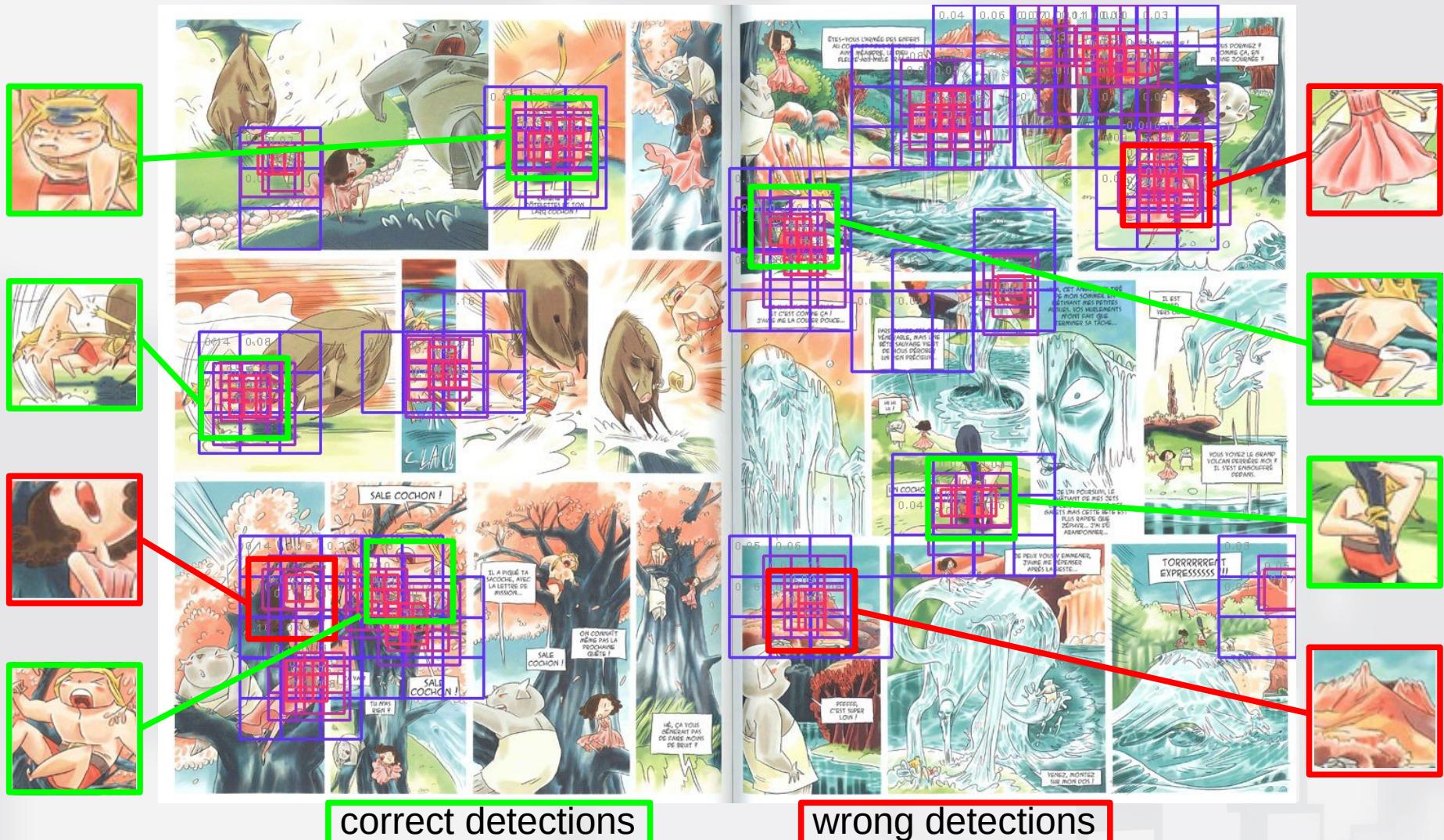


Descriptor



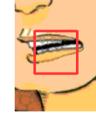
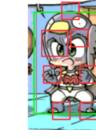
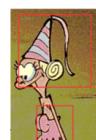
Image credits: (Prunelle, la fille du cyclope, Ankama, 2010)

4) Character spotting: example



Conclusions

- Contributions
 - Content Based Drawing Retrieval
 - Color descriptor robust to scale, rotation, translation, deformation and occlusion
 - Benefit of redundant information
- Limitations
 - Colored comics
 - Number of color (quantization)
 - Requires one example of each character

Query	Correct	Wrong
		
		
		
		
		
		

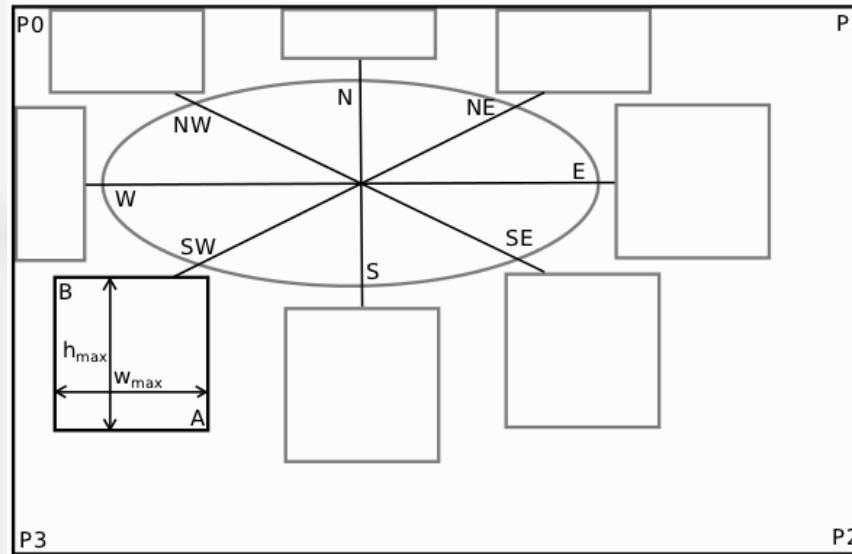
Result examples

Summary of comic character extraction

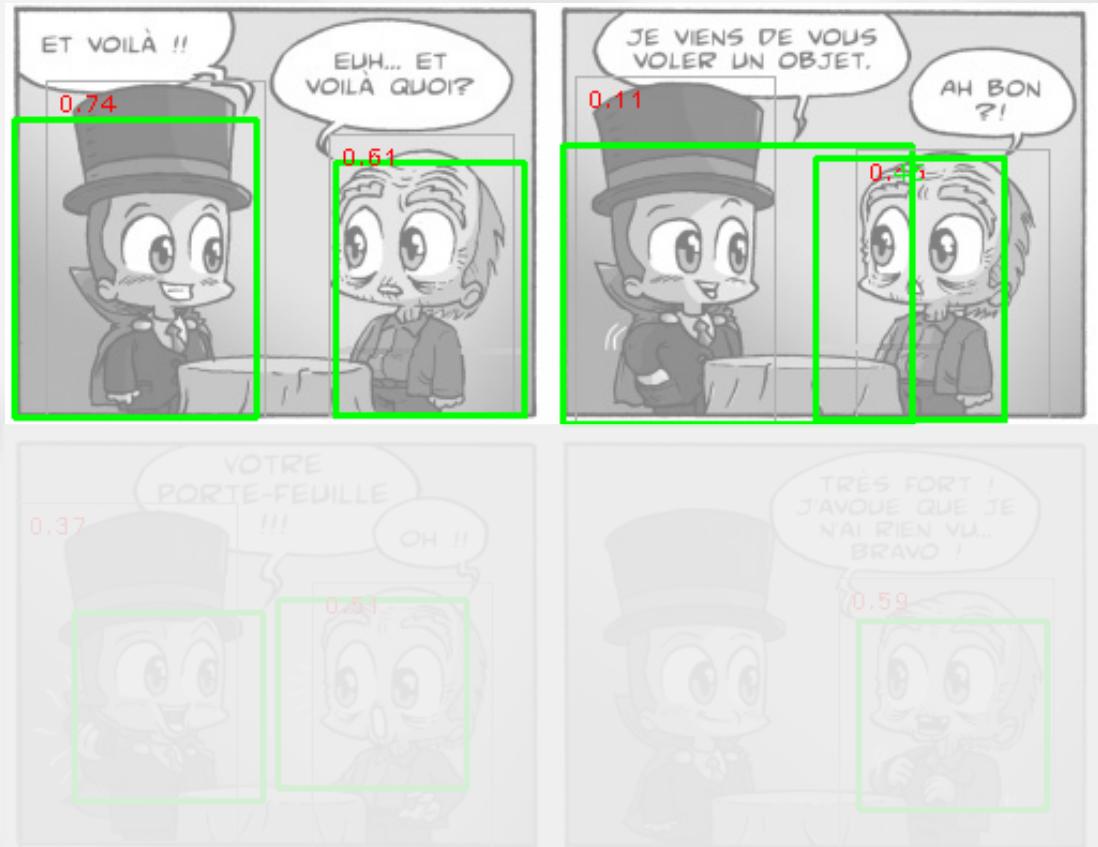
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Hypothesis from speech balloon tail position and direction

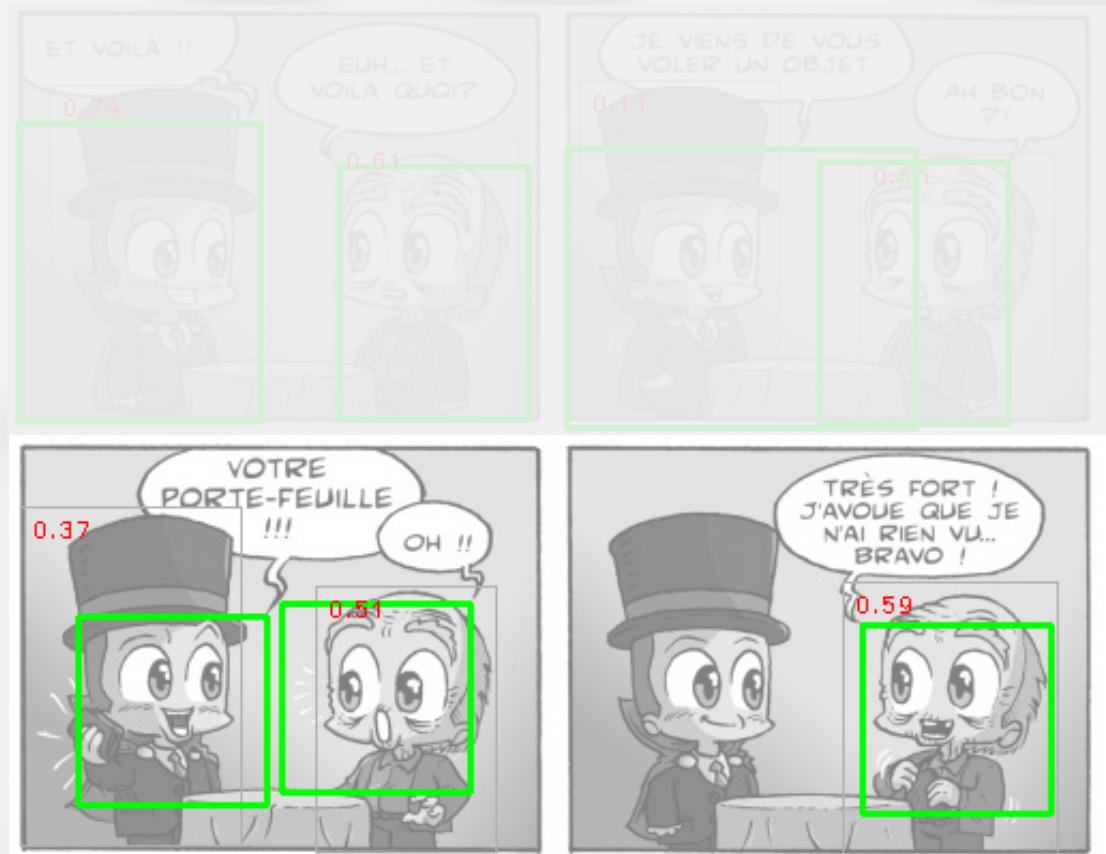
- Given balloons in a panel, where are the (speaking) characters?



Example



Example



Conclusions

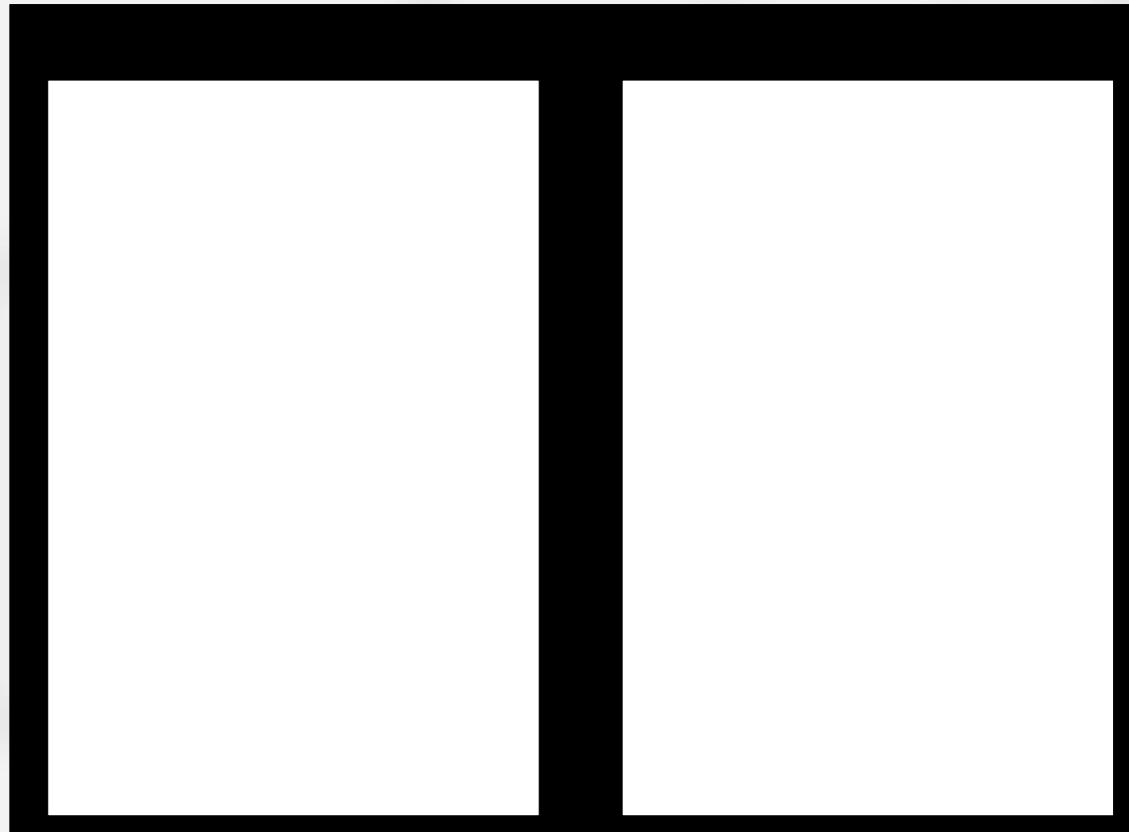
- Preliminary results
- Highly relies on the quality of the tail detection
- Only for “**speaking**” characters
(others can be spotted)
- Implicitly retrieves the
relationship between balloon and
character

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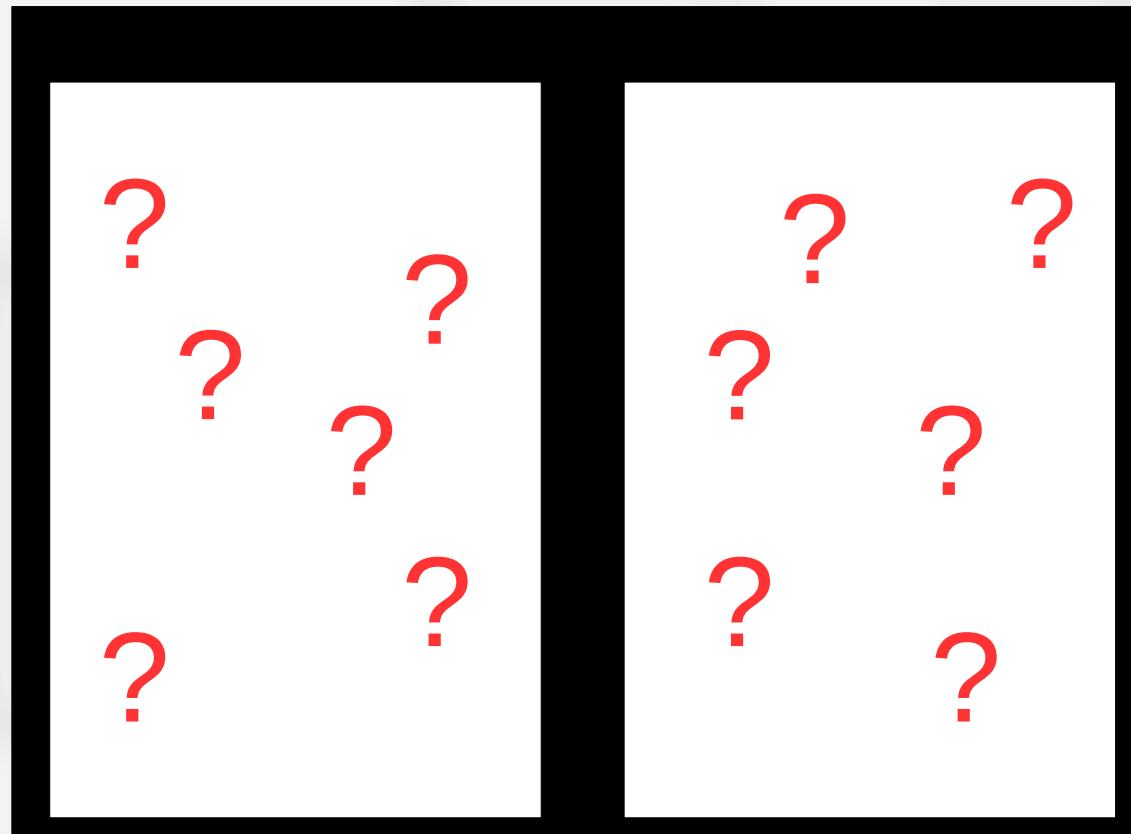
Region of interest (ROI) from simple object removal

- Given an image from a double page of manga, can you predict where the characters are?



Region of interest (ROI) from simple object removal

- Given an image from a double page of manga, can you predict where the characters are?



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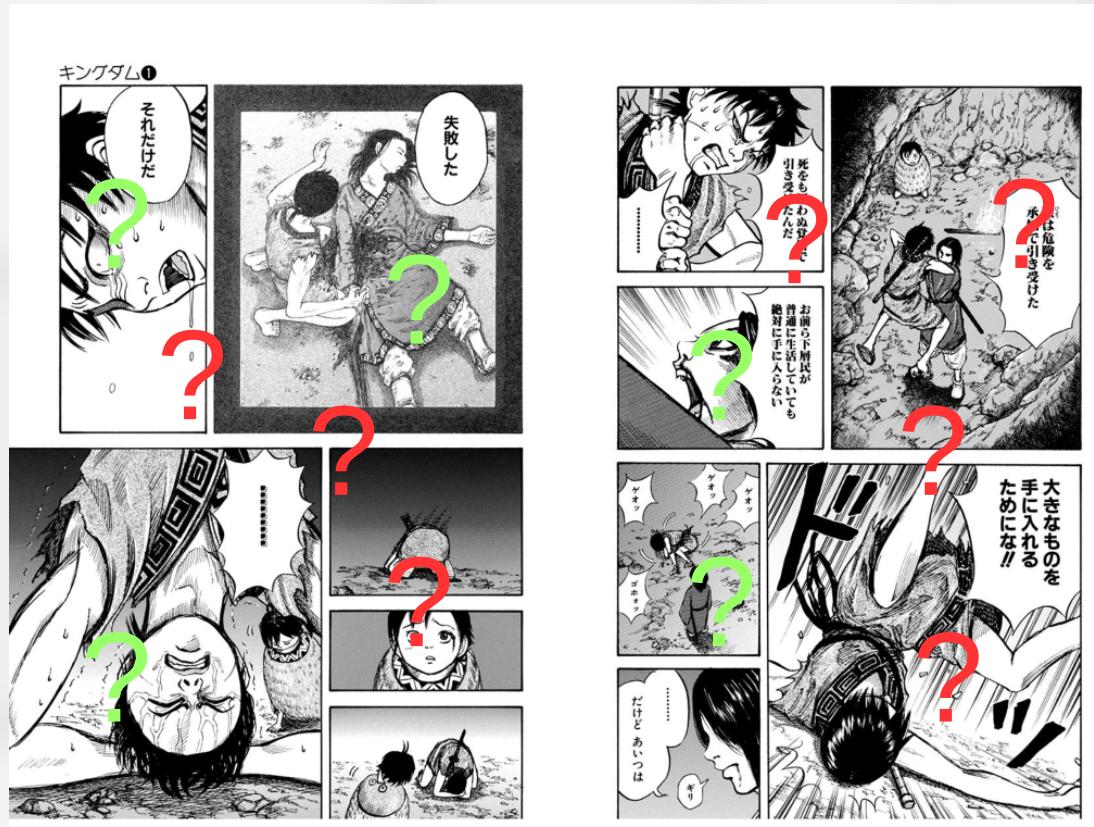
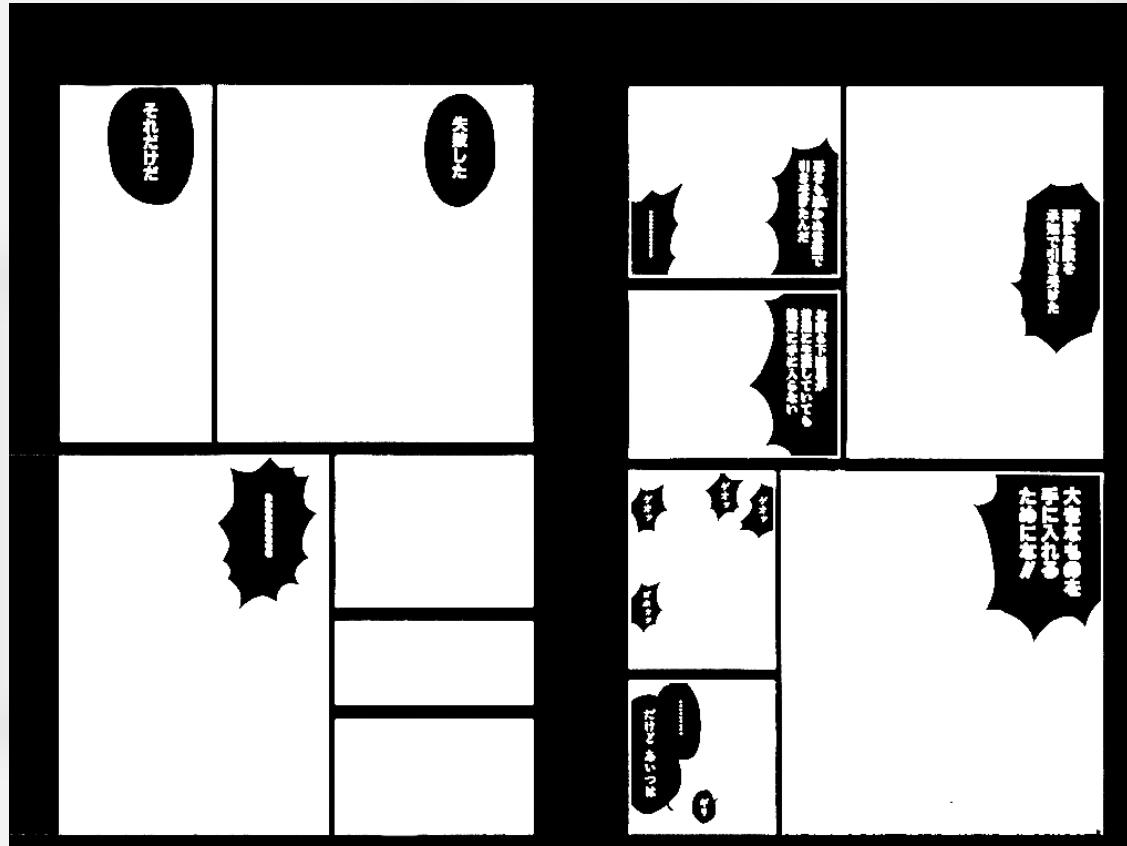


Image credits: Yasuhisa Hara, "Kingdom", Shueisha, since 2006.

42%
correct

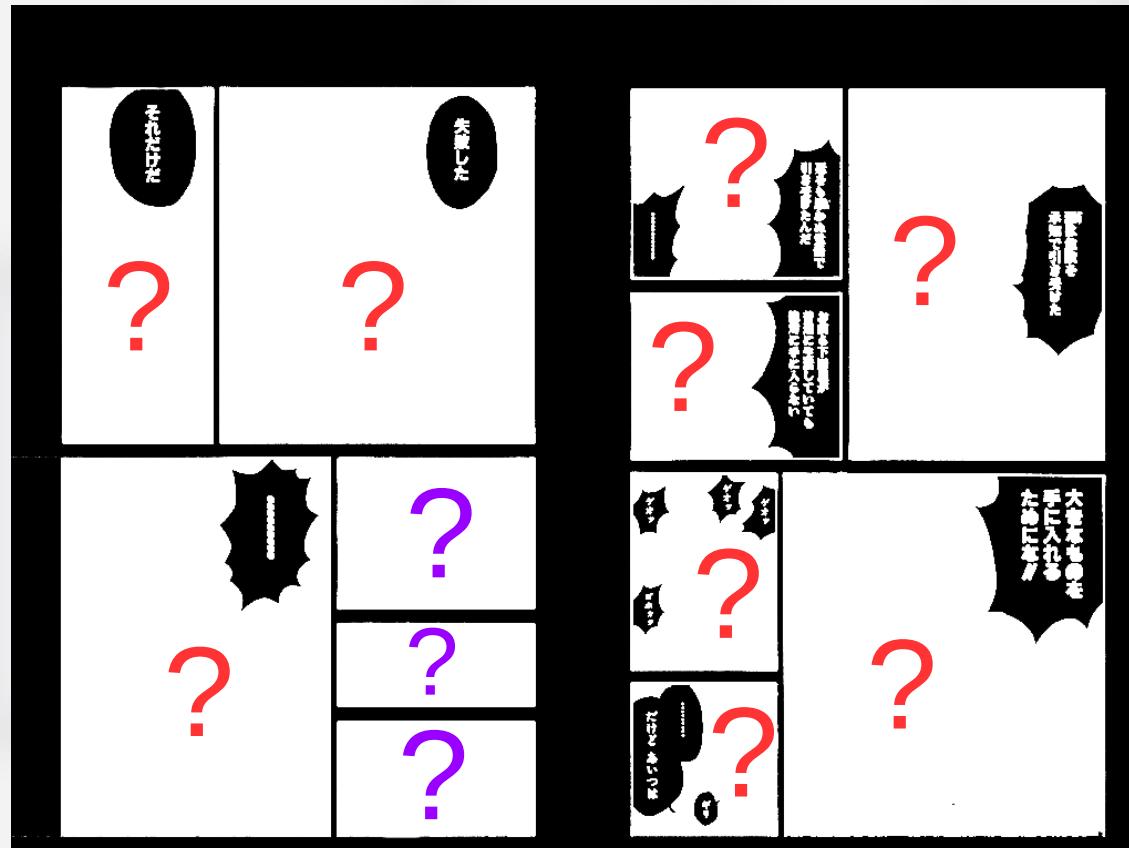
Region of interest (ROI) from simple object removal

- In the same image, knowing the **position of panels and balloons**, can you predict where the comic characters are?



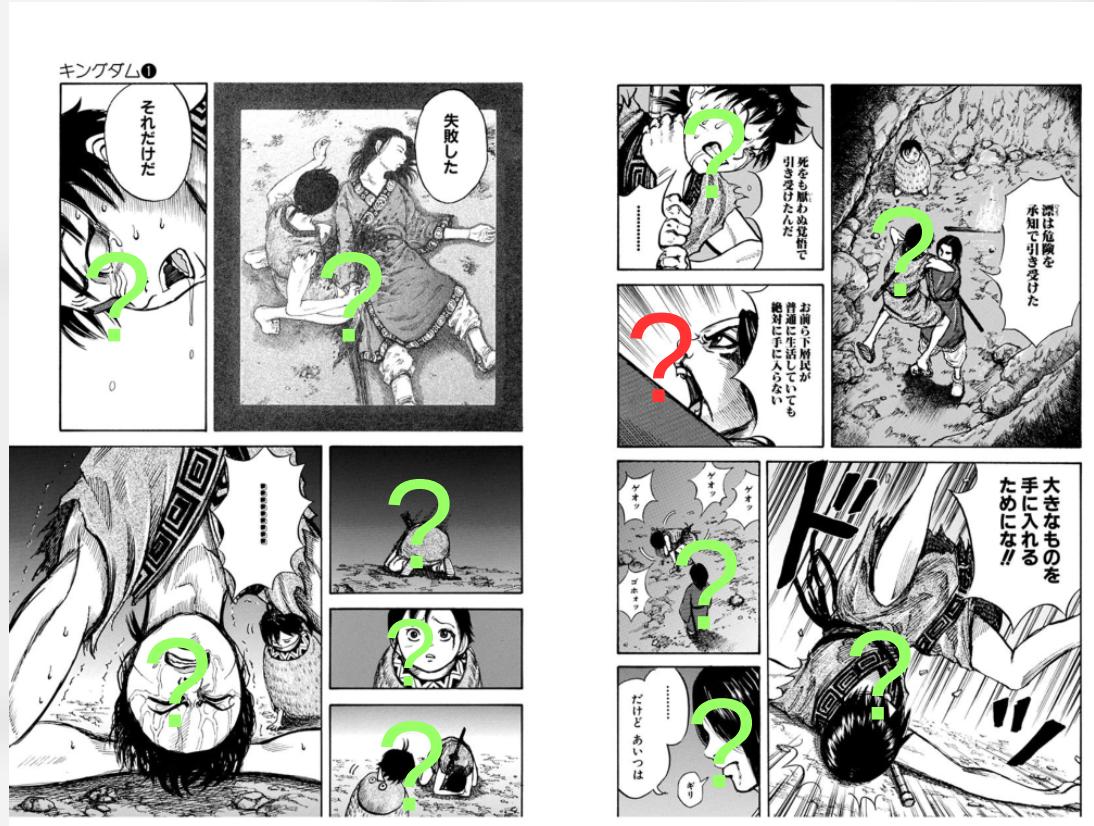
Region of interest (ROI) from simple object removal

- Knowing the position of **panels** and **balloons**, can you predict where the comic characters are?



Region of interest (ROI) from simple object removal

- Et voilà !



83%
correct

A first test from automatic panels and balloons extraction...

Original image

キングダム①

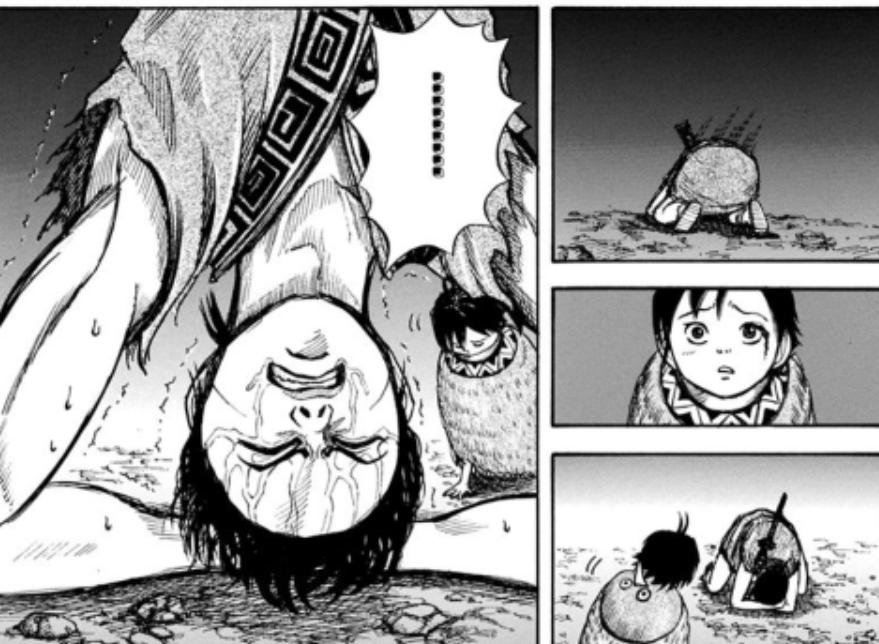
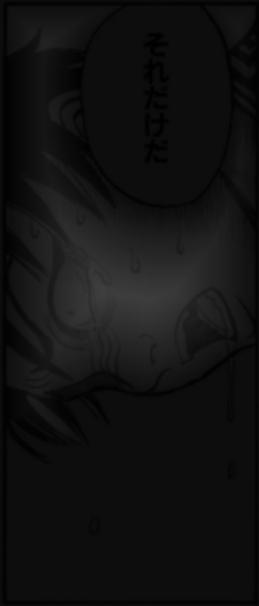


Image masked



Image masked + distance transform

キングダム①



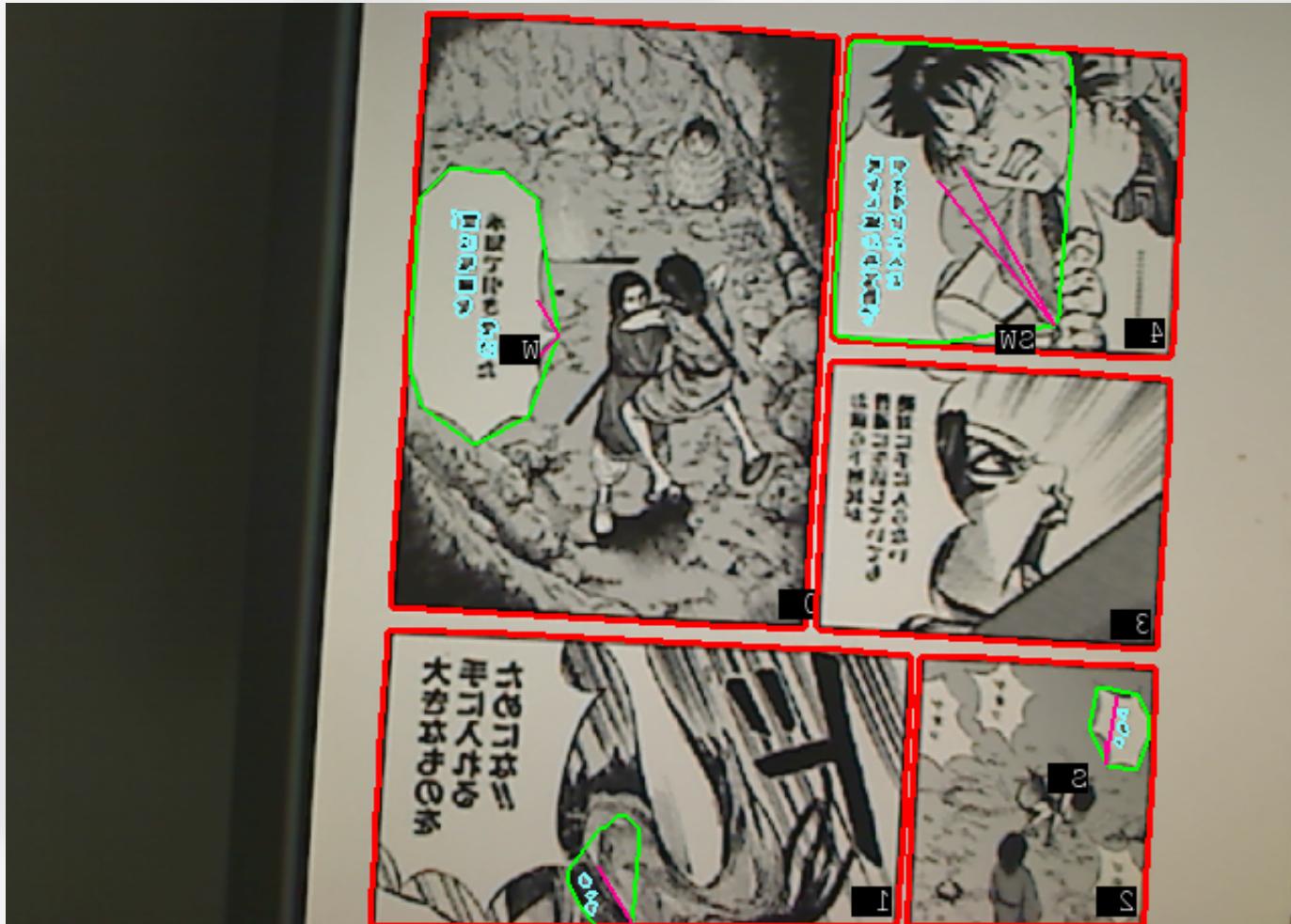
To be continued...

Graph-based approach

- Presented by Nam Le Thanh

<https://copy.com/e9E4xK0SIUStKoO>

Live demo: real time panels and balloons extraction



ありがとうございました
Thank You Very Much

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https://github.com/crigaud/publication/tree/master/2014/TALK/intelligent_media_processing_group