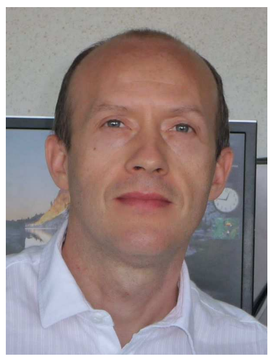

Panel and speech balloon extraction from comic books

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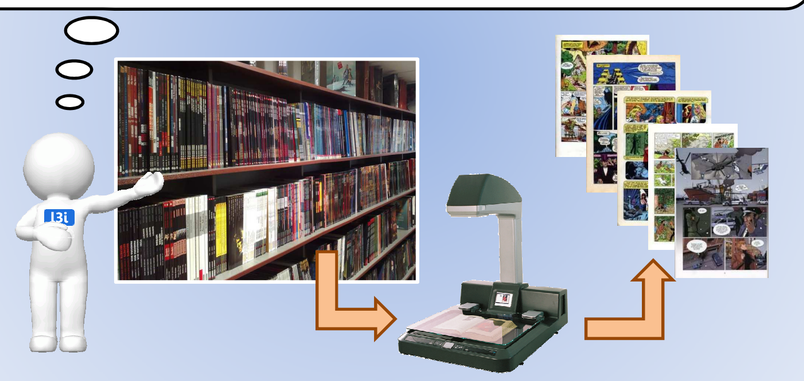
Context

- Comics represent an important cultural heritage
- Digitization of thousands comics albums
- Few researches exploit the content of digitized comics



Types of Comics

Manga,

American,

European comics,

So many types !

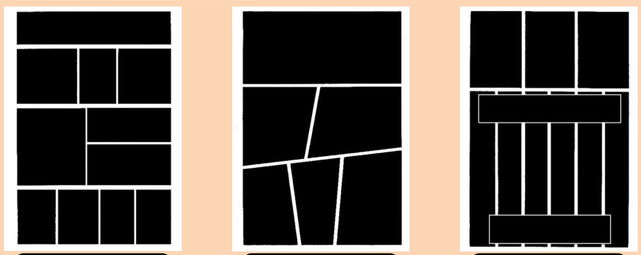
Let's consider only this 2 types on the right!

What strategy can I adopt to analyze the content such as characters, objects ?

Let's extract the layout first. So, I need to detect **panels**?

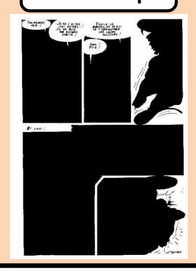
Speech ballons are also interesting elements

Types of Layout

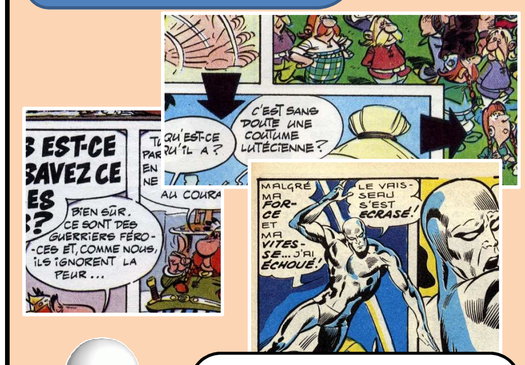


regular | irregular | overlap

3 types of comics page : **simple**, **complex**, **hard**



Extended contents



Extended contents are a real problem. They can overlap two or more panels

Speech balloons

We consider speech balloons drawn inside the panels

1 Candidate areas are selected. Criteria : size, shape, color

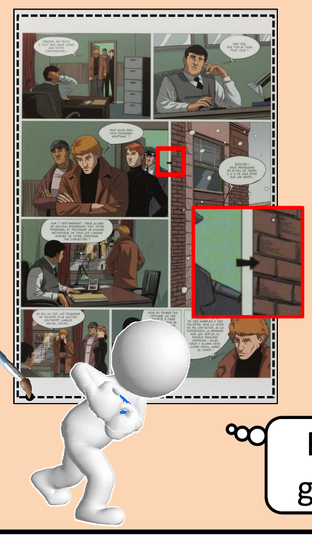
2 Is there some text inside ?

3 Balloons are extracted

1 - Candidate areas selection

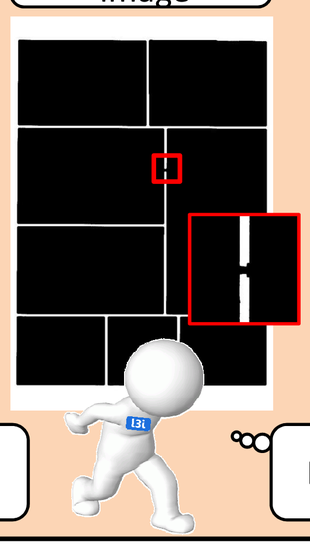
- RGB ➔ HSV color space
- High value (V), low saturation (S)
- Ratio size area/panel > 30 %

Panel extraction



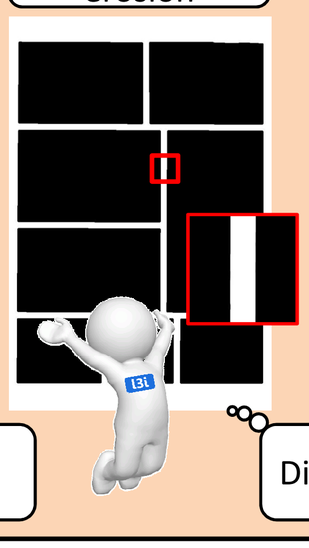
Region growing

Binarised image



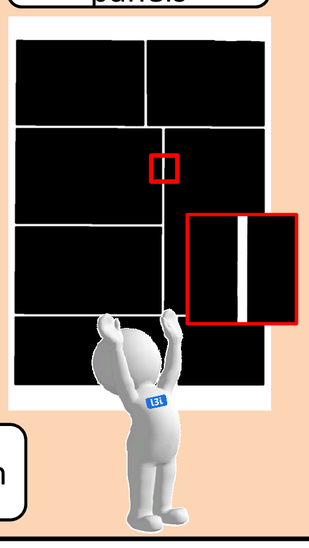
Erosion

Image after erosion



Dilatation

extracted panels



2 - Text detection

- Speech balloons contain text
- Text structure is supposed to be regular
- Dilation is applied on connected component (CC) to link text elements
  - ➔Small CC = noise
  - ➔Big CC = text block

3 - speech balloon extraction

- Candidate areas with text block are labeled as speech balloons.

Speech balloon detection

Candidate | CC | dilatation | Block text

noise

Data set

- 42 pages from 7 comics albums
- 14 pages for each type : simple, complex, hard
- 355 panels
- 150 speech balloons in 116 panels

Experimental results for panels

Comparison with other methods

Method	Ishi	Tanaka	Arai	Our method
Page (%)	30.9	42.8	47.6	**64.3**
Panel (%)	56.3	63.9	75.6	**87.3**

Success rate by type

Type	Simple	Complex	Hard
Page (%)	100	85.7	7.1
Panel (%)	100	91.8	55.6

Results for speech balloons

Method	Recall (%)	Precision (%)
Arai	56.8	94.69
Our approach	75.53	94.67

Conclusion and future works

Two methods to extract panels and speech balloons of comics based on region merging, mathematical morphology ➔ promising results

Next objective : Analyzing the content of panels to extract the characters, the complex objects, …

To be continued