

# Séminaire thématique Mathématiques et Modélisation

## Applications des Mathématiques et de l'Informatique à des Problèmes liés à l'Aéronautique

### Analyse de document : application aux BD

Christophe Rigaud

Jeune chercheur au laboratoire L3i de La Rochelle (2<sup>ème</sup> année)

# Christophe Rigaud

Doctoral researcher (2nd year)

Segmentation and indexation of complex objects from comic books

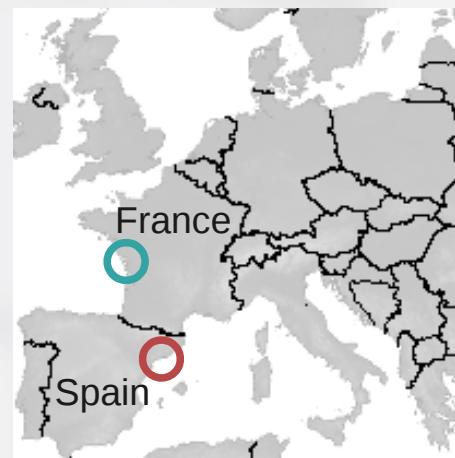
Advisers: Jean-Christophe Burie<sup>1</sup>, Jean-Marc Ogier<sup>1</sup>  
Dimos Karatzas<sup>2</sup>

<sup>1</sup>**L3i**

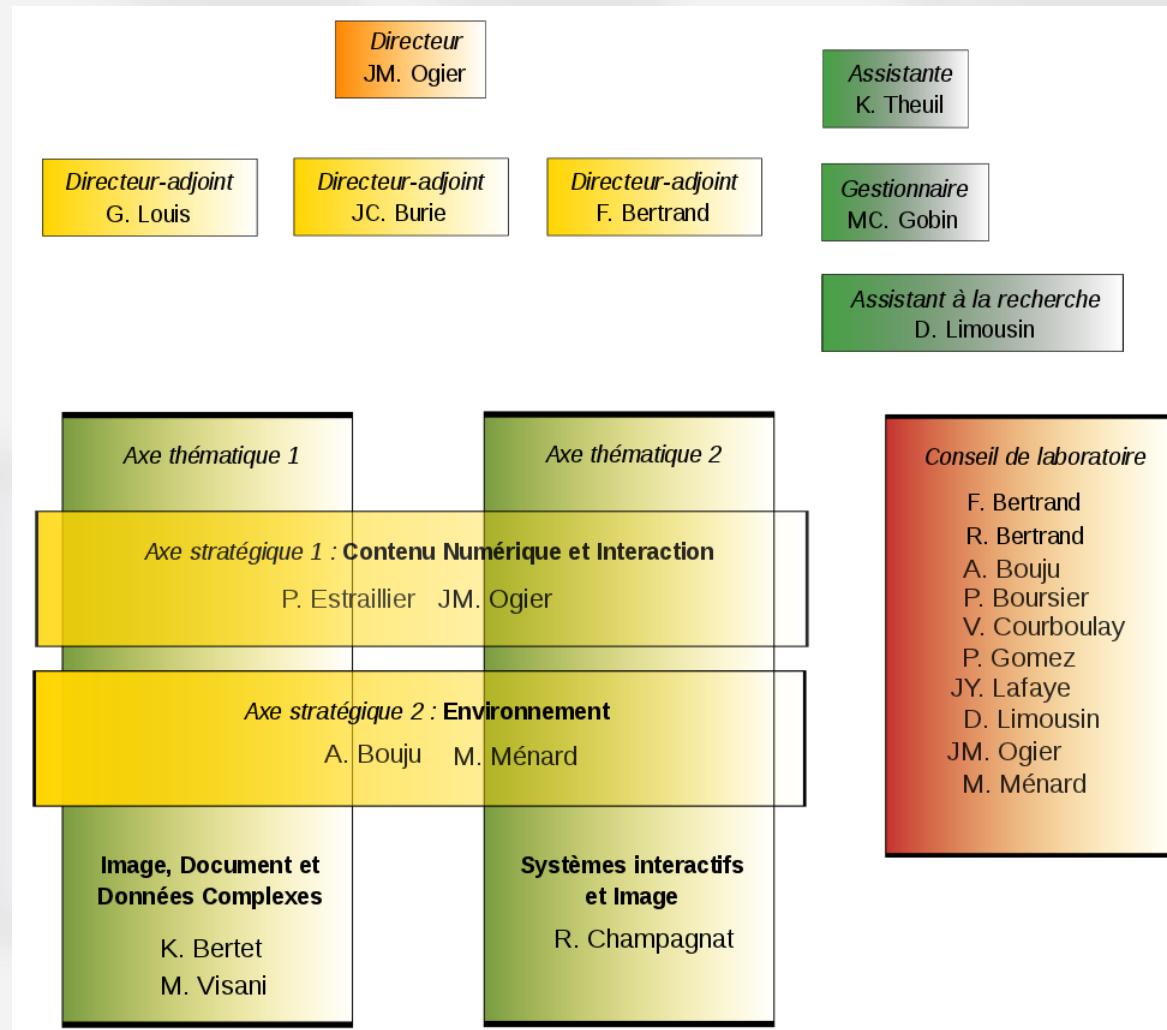
- La Rochelle University (ULR)
- 80 members
- Image and document analysis group
  - Comics project

<sup>2</sup>**CVC**

- Barcelona University (UAB)
- 175 members
- Document analysis group
  - Comics team



# L3i : Laboratoire Informatique, Image et Interaction



# Comics project

- June 2011 – September 2014
- Participants: 2 doctoral researchers, 5 assistant professors, 3 professors
- Comic books:
  - Cultural heritage
  - Need to be valorized by the new technologies
- Objectives:
  - Augmented reading experience
  - Information retrieval (semantic query, full text)
  - Dataset for scientists

# eBDtheque: comics database and ground truth

- 100 ground truth pages
  - ~800 frames
  - ~600 balloons
  - ~4500 text lines
- <http://ebdtheque.univ-lr.fr/database/>

```
<component name="Balloon" type="Region">
  <metadata-list>
    <metadata name="rank" constrained="no" type="int"/>
    <metadata name="shape" constrained="yes" type="String">
      <item>cloud</item>
      <item>ovale</item>
      <item>peak</item>
      <item>rectangle</item>
      <item>none</item>
    </metadata>
    <metadata name="queueDirection" constrained="yes" type="S
      <item>N</item>
      <item>NE</item>
      <item>E</item>
      <item>SE</item>
      <item>S</item>
```

Identifier:	CYB_BUBBLEGOM_T02_010
Collection:	Bubblegôm Gôm
Album:	La Légende des Yaouanks
Page:	32
Drawer:	Cyborg 07
Writer:	Cyborg 07
Editor:	Studio Cyborga
Release date:	2009
Language:	french
ISBN:	<a href="#">979-10-90655-01-0</a>
Website:	<a href="#">Link</a>
Definition (px):	750 x 1060
Panels:	16
Balloons:	19
Lines:	70



# Segmentation and indexation of complex objects

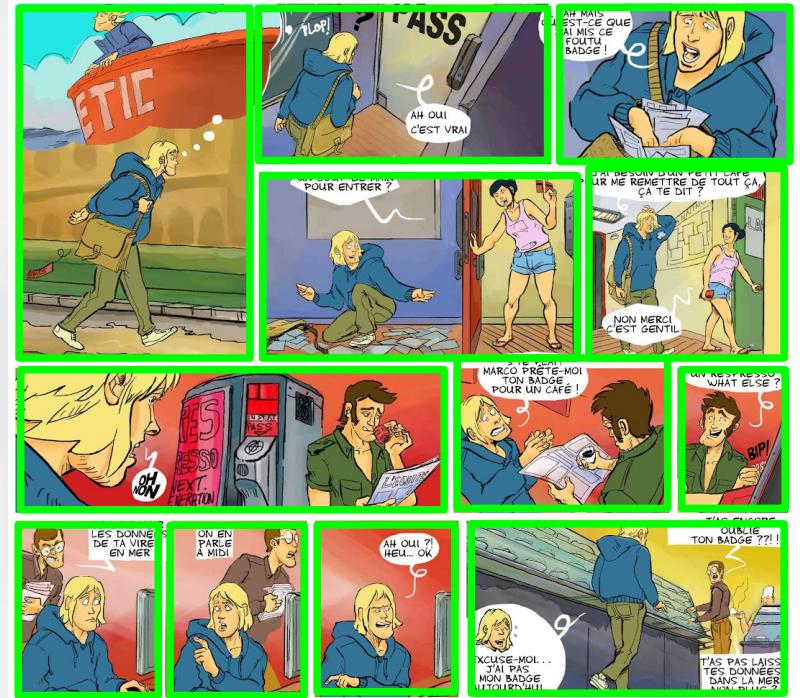
- Frame detection
- Text localization
- Speech balloon detection
- Object detection



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# Segmentation and indexation of complex objects

- Frame detection
- Text localization
- Speech balloon detection
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# Frame extraction [1]

Binary image

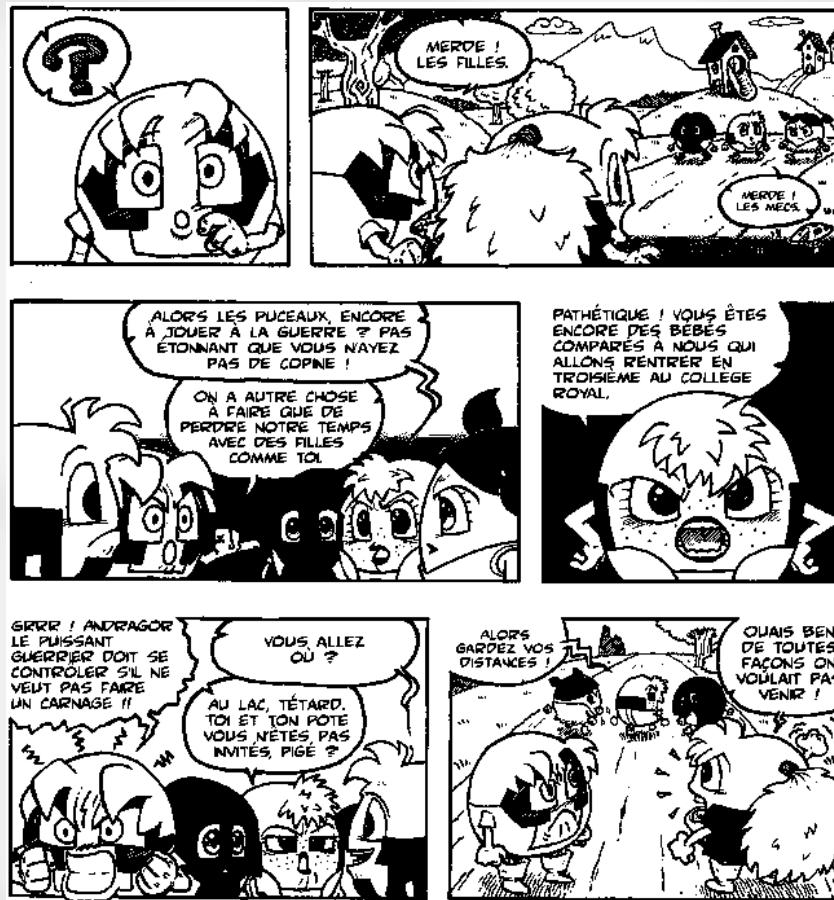


Image credit:  
Cyb, Bubblegôm,  
Studio Cyborga,  
Goven, France, 2009

## [1] Robust frame and text extraction from comic books

Christophe Rigaud, Norbert Tsopze, Jean-Christophe Burie, Jean-Marc Ogier

Lecture Note in Computer Science (LNCS), Graphics Recognition. New Trends and Challenges, vol. 7423, pp.129-138, 2013

# Frame extraction [1]

Connected  
component bounding  
boxes detection

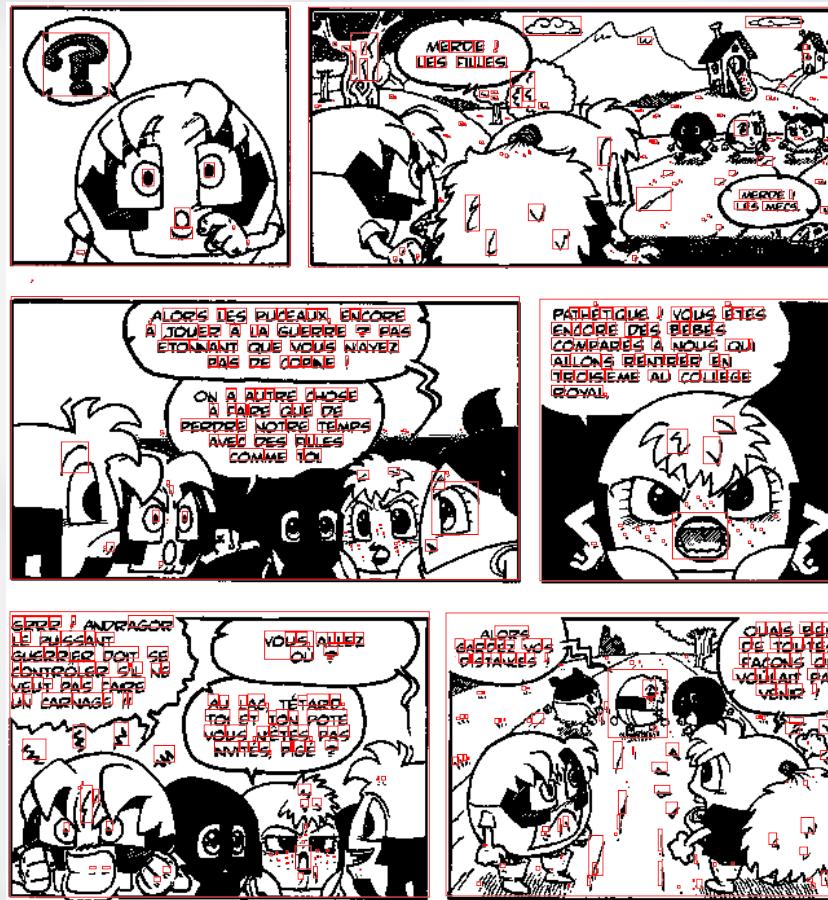


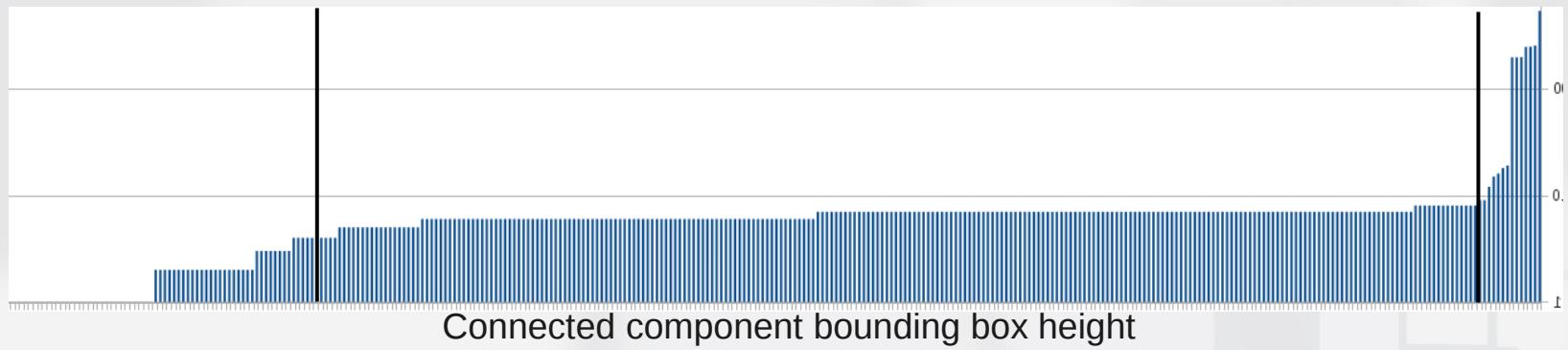
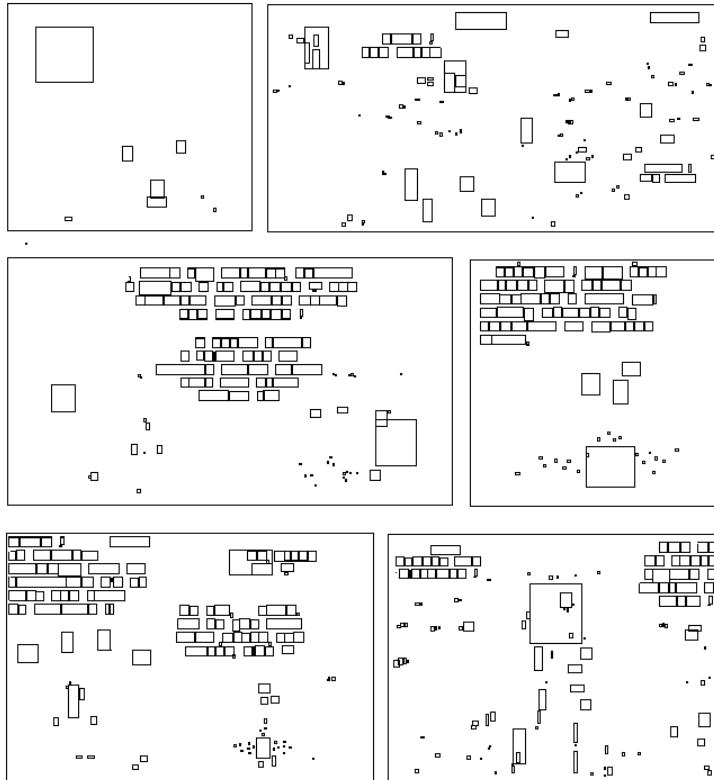
Image credit:  
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Goven, France, 2009

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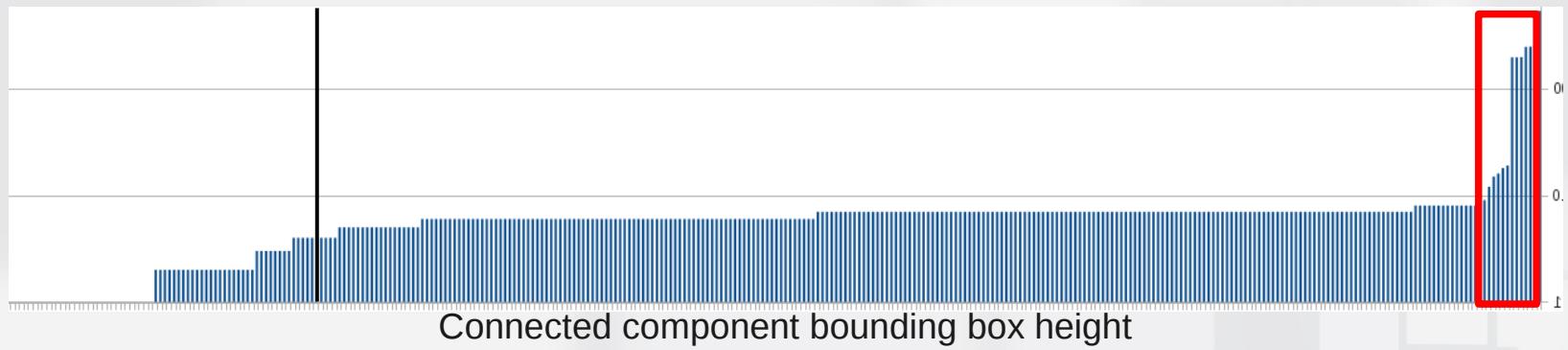
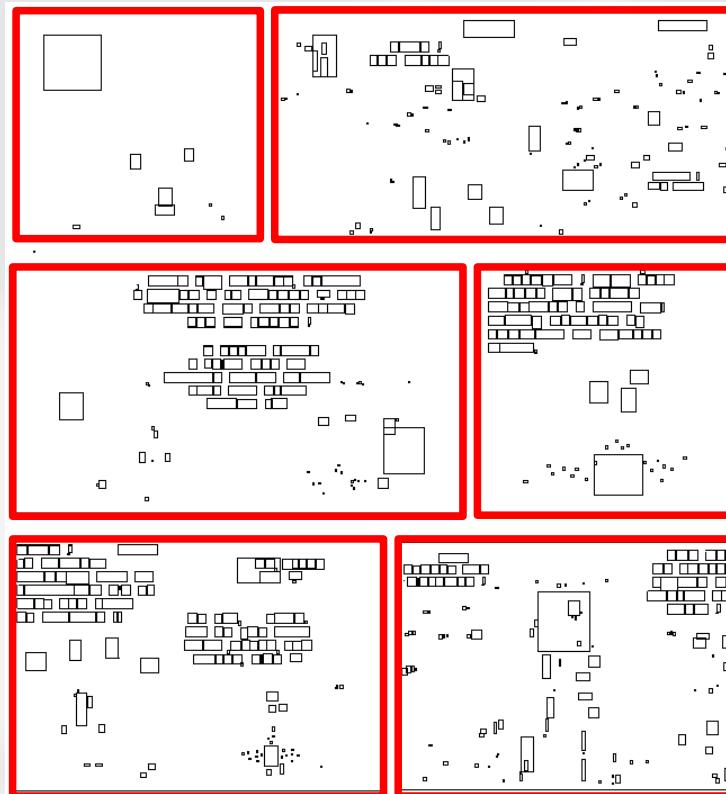
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# Frame extraction



# Frame extraction



# Segmentation and indexation of complex objects

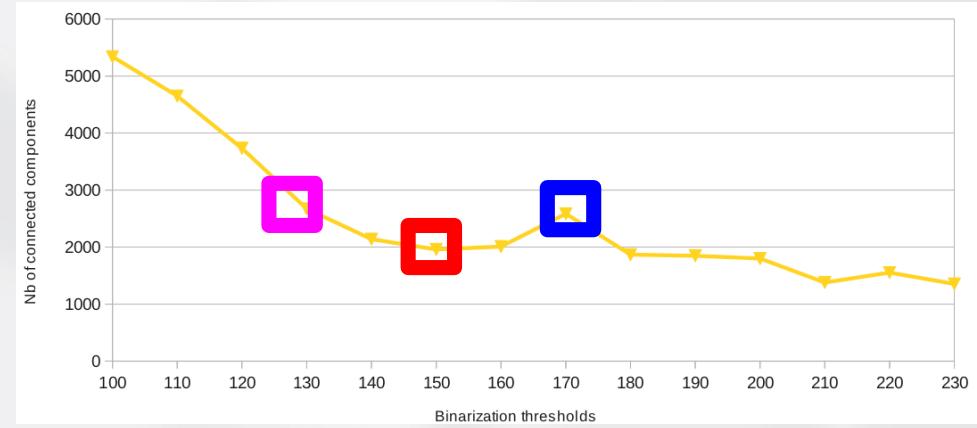
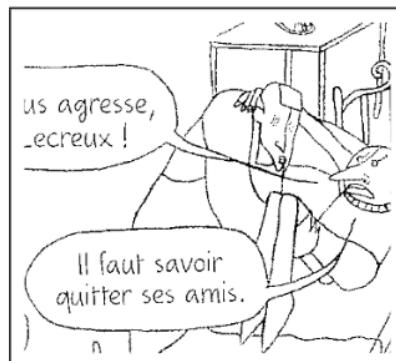
- Frame detection
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# Text localization [2]

- Minimum Connected Component Thresholding

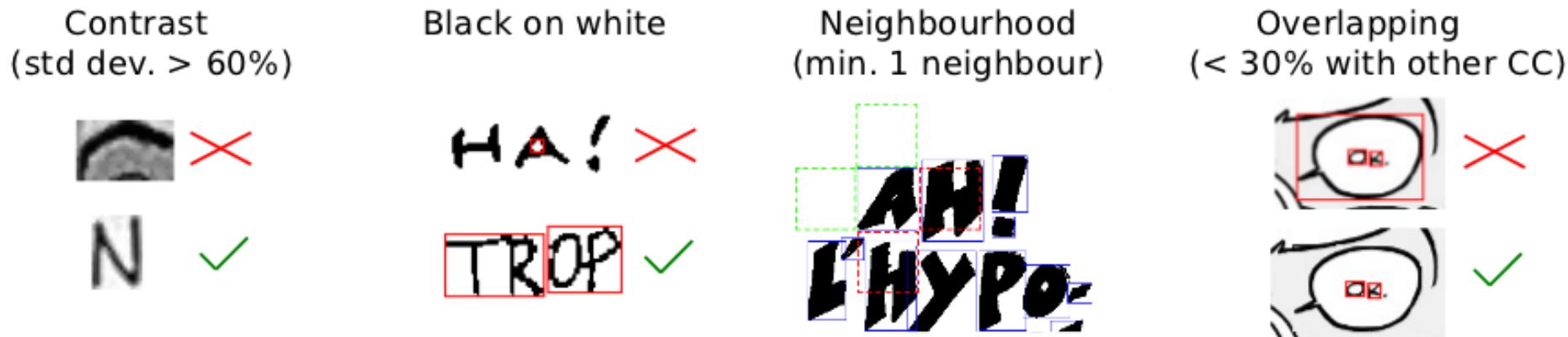


## [2] Automatic Text Localisation in Scanned Comic Books

Rigaud, Christophe and Karatzas, Dimosthenis and Van de Weijer, Joost and Burie, Jean-Christophe and Ogier, Jean-Marc  
Proceedings of the 8th International Conference on Computer Vision Theory and Applications (VISAPP), 2013

# Text localization [2]

- Text/graphic segmentation

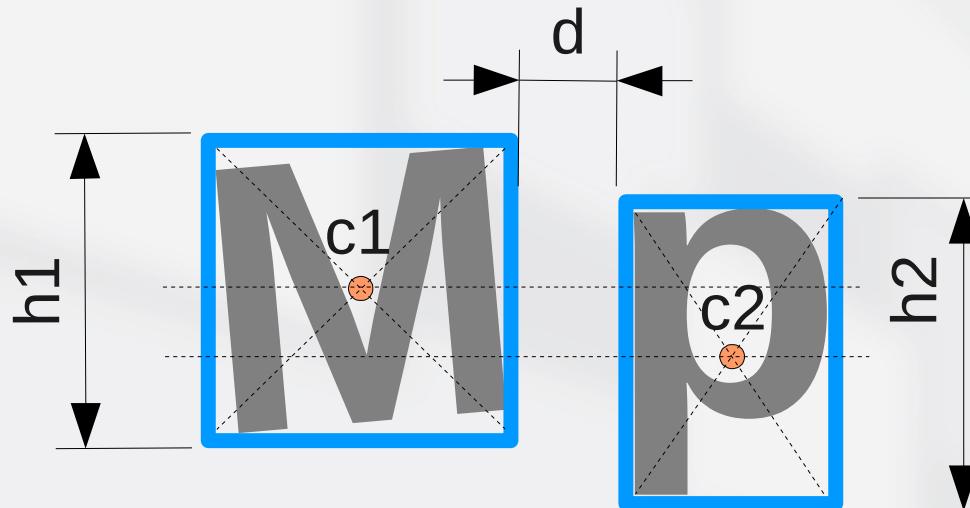


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# Text localization [2]

- Text line localization (letter alignment)

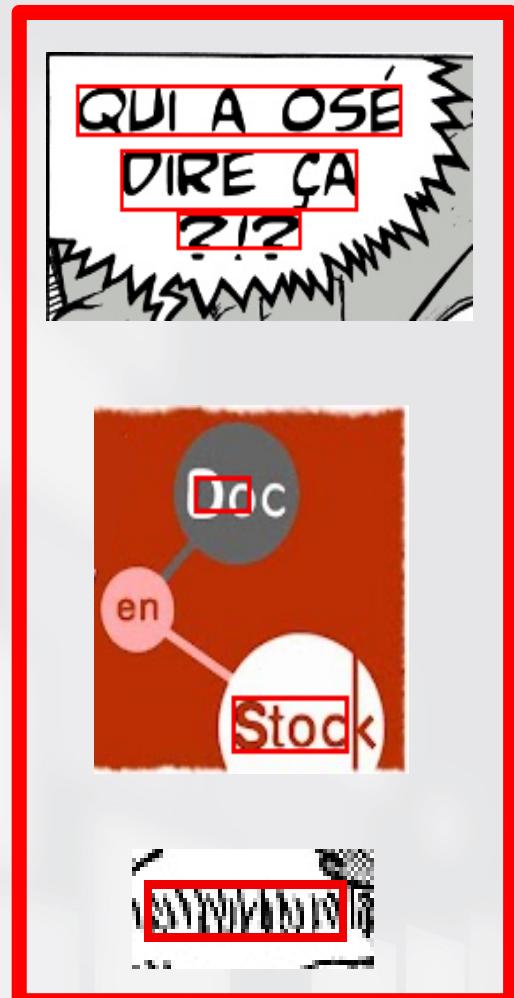
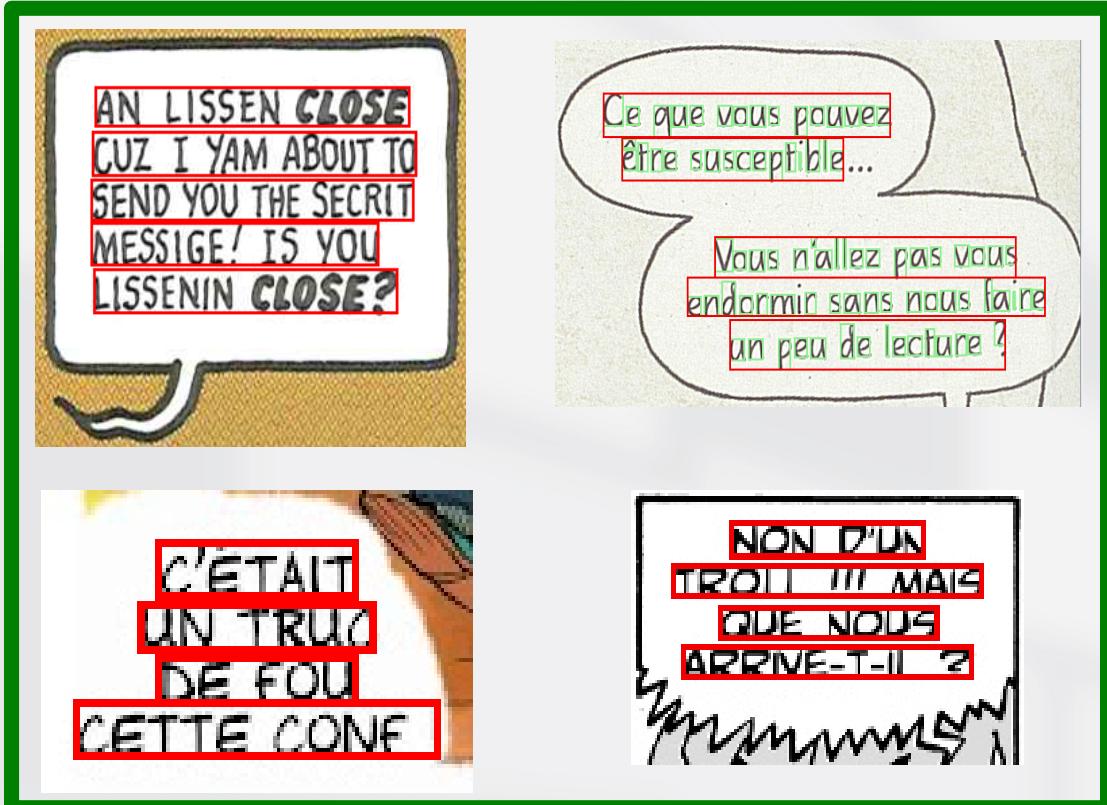


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# Text localization [2]

- 75% recall and precision

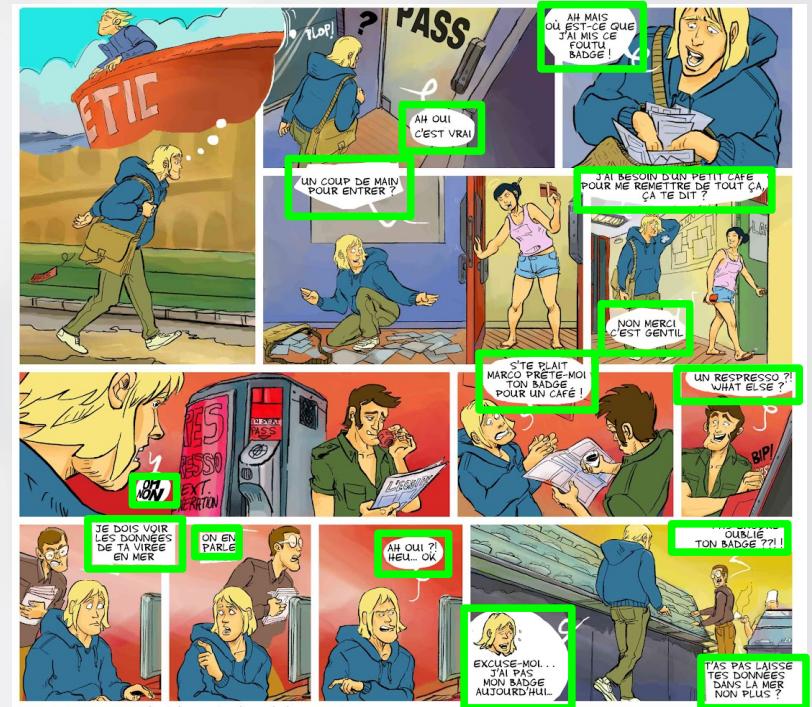


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# Segmentation and indexation of complex objects from comic books

- Frame detection
- Text localization
- **Speech balloon detection**
- Object detection



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# Speech balloon detection [3]

- Closed and suggested balloon



## [3] An active contour model for speech balloon detection in comics

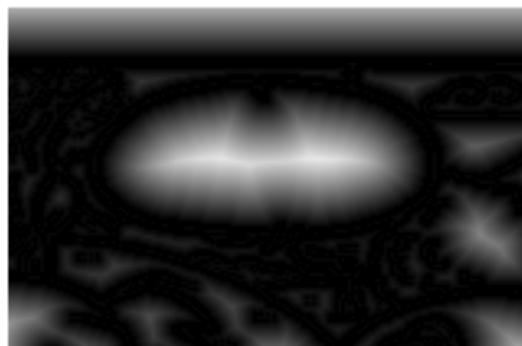
Rigaud, Christophe and Karatzas, Dimosthenis and Van de Weijer, Joost and Burie, Jean-Christophe and Ogier, Jean-Marc  
Pending acceptance...

# Speech balloon detection [3]

- Active contour from text area



...

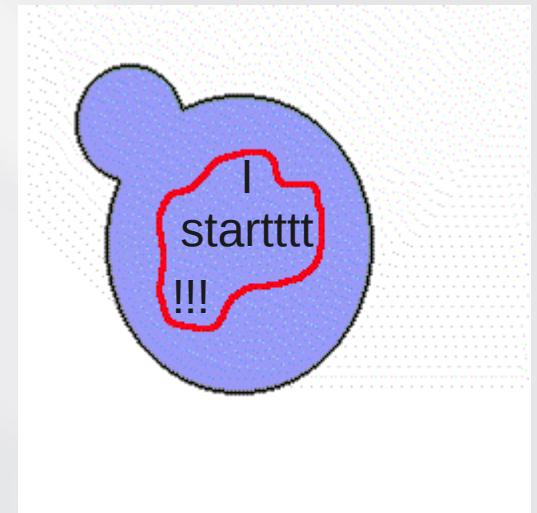
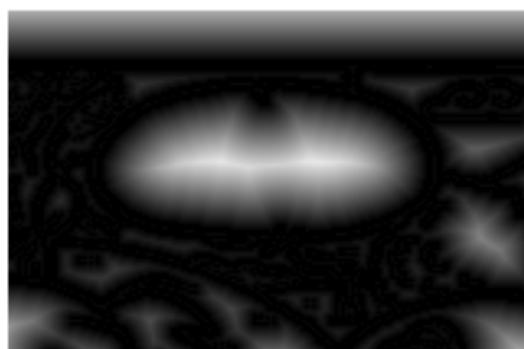


## [3] An active contour model for speech balloon detection in comics

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- Active contour from text area



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Rigaud, Christophe and Karatzas, Dimosthenis and Van de Weijer, Joost and Burie, Jean-Christophe and Ogier, Jean-Marc  
Pending acceptance...

# Speech balloon detection [3]

- 92% recall and precision

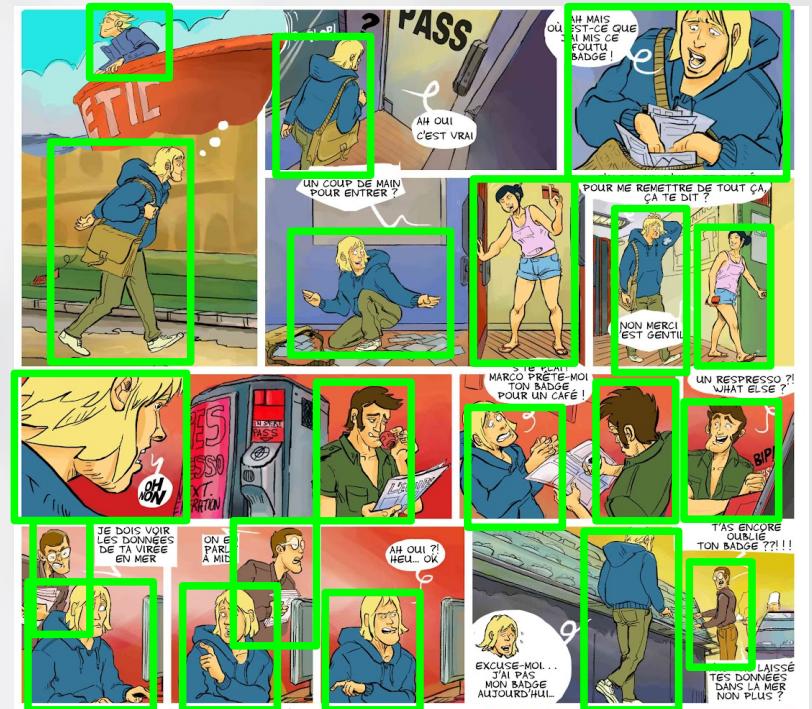


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# Object detection

- Aim: localize important character in comic books
- Ideas of research
  - Frequent keypoint (e.g. SIFT, HOG)
  - Adjacency/topology frame description
  - Subgraph matching



# Object detection

- Pre-processing



ありがとうございました  
*Thank You Very Much*