



Extraction robuste des cases et du texte de bandes dessinées

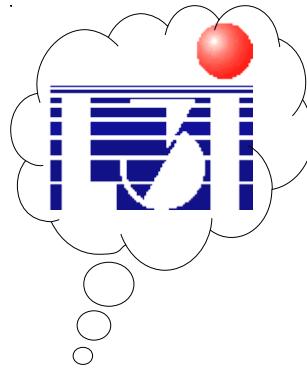
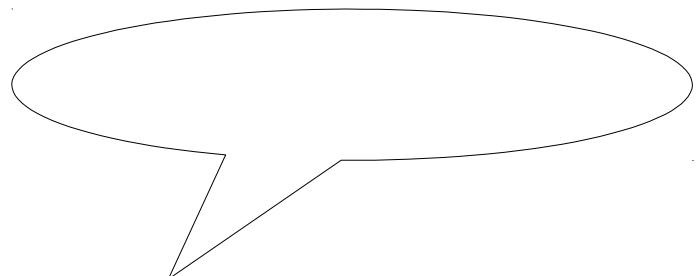
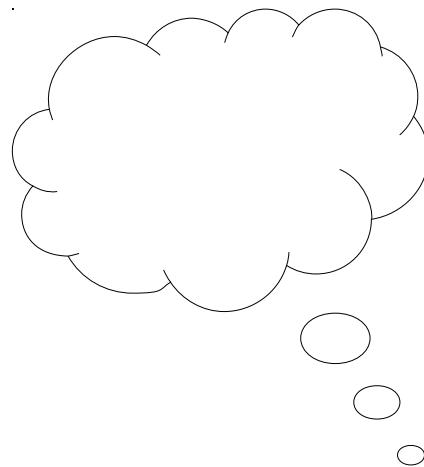
Christophe Rigaud, Norbert Tsopze, J. C. Burie, J. M. Ogier

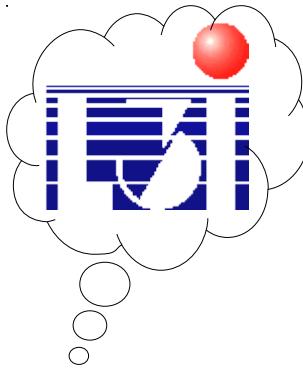
Laboratoire Informatique, Image et Interaction (L3i)



SUMMARY

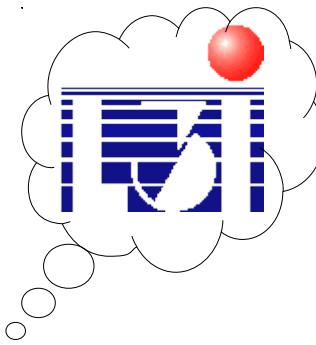
- Project eBDtheque
- Proposed work
- Experiments
- Conclusion





SUMMARY

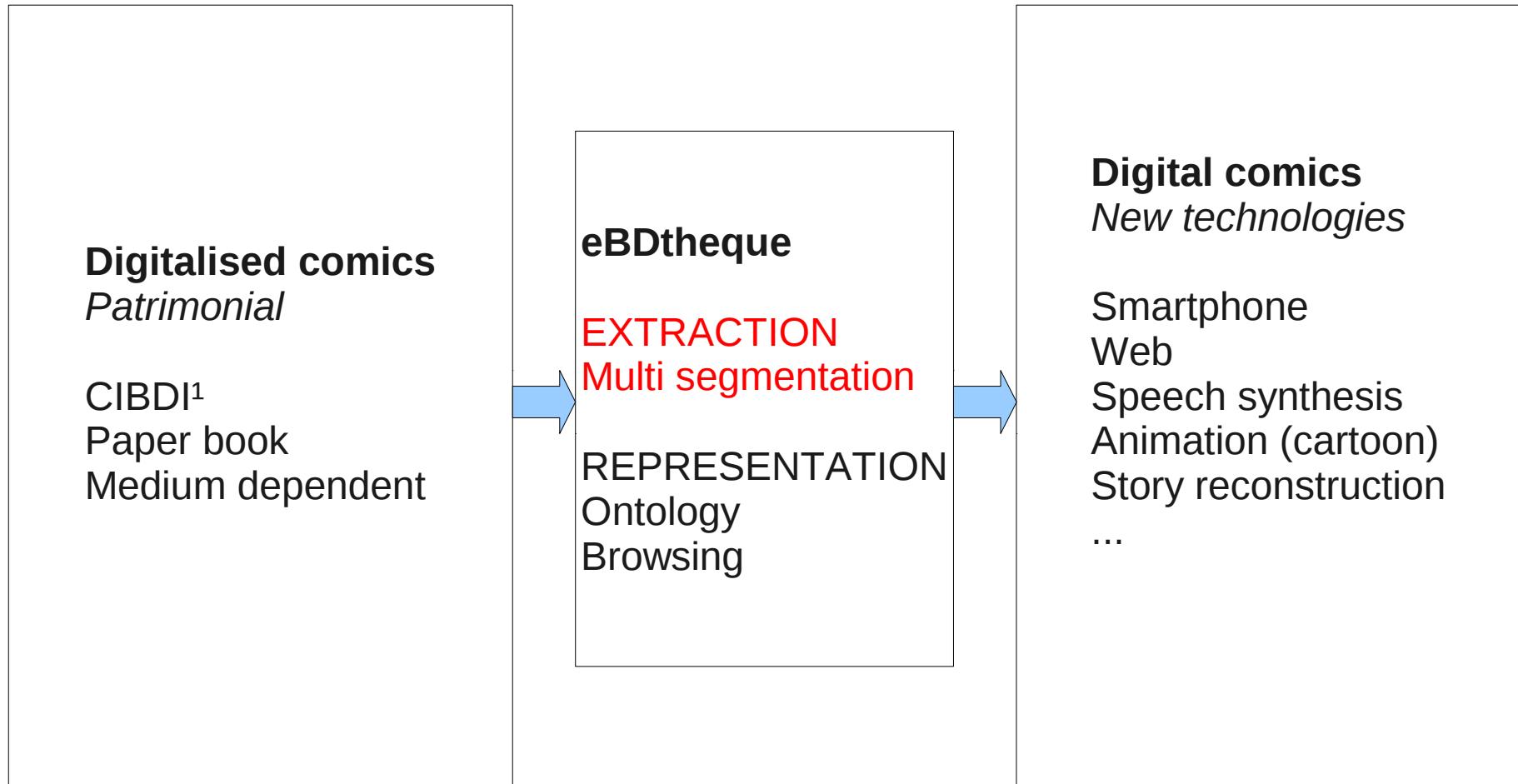
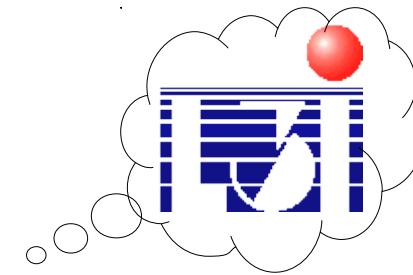
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Project eBDtheque

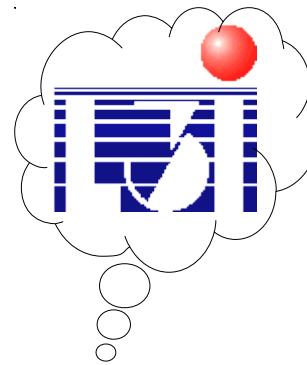
- Project CPER
 - European Regional Development Fund, the region Poitou-Charentes, the General Council of Charente Maritime and the town of La Rochelle.
 - Team of 12 people
 - 2011-2013
 - <http://l3i.univ-larochelle.fr/eBDtheque.html>
- Comics :
 - Important heritage to develop with new technologies
- Target:
 - Help to automatically convert digitalized comics into digital comics.
 - « Find all the panels containing the Eiffel Tower »...
 - User and author interactions

Project eBDtheque > Context



¹ CIBDI: Centre International de la Bande Dessinées et de l'Image

Project eBDtheque > Multi-segmentation



Page



Panels



Text

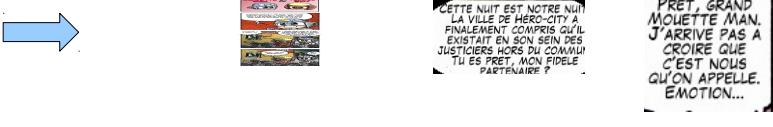
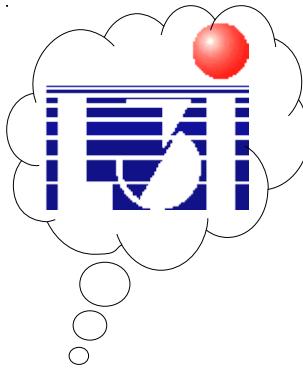
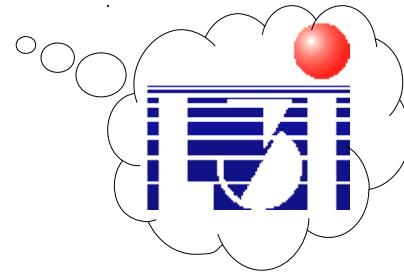


Image credit: Cyb, Cosmozone, Studio Cyborga, Goven, France, 2009



SUMMARY

- Project eBDtheque
- Proposed work
 - Related works
 - Contribution
 - Limitations
- Experiments
- Conclusion



Proposed work > Related works

- Panel segmentation
 - Hough line
 - X-Y cut algorithm¹
 - Gradient²
 - Connected component³
- Text segmentation
 - Connected component
 - Speech balloon > text⁴
 - Text > speech balloon³

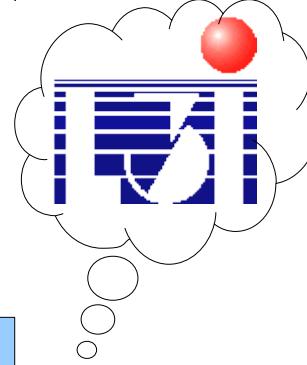
¹ Han E., Kim K., Yang H., Jung K., « Frame segmentation used MLP-based X-Y recursive for mobile cartoon content », Proceedings of the 12th, HCI'07, Springer-Verlag, Berlin, Heidelberg, p. 872-881, 2007.

² Tanaka T., Shoji K., Toyama F., Miyamichi J., « Layout Analysis of Tree-Structured Scene Frames in Comic Images. », IJCAI'07, p. 2885-2890, 2007.

³ Ho A. K. N., Burie J.-C., Ogier J.-M., « Comics page structure analysis based on automatic panel extraction », GREC 2011, Ninth IAPR International Workshop on Graphics Recognition, Seoul, Korea, September, 15-16, 2011

⁴ Arai K., Tolle H., « Method for Automatic E-Comic Scene Frame Extraction for Reading Comic on Mobile Devices », ITNG '10, IEEE Computer Society, Washington, DC, USA, p. 370-375, 2010.

Proposed work > Contribution



Simultaneous panel + text extraction (CC) => time saving

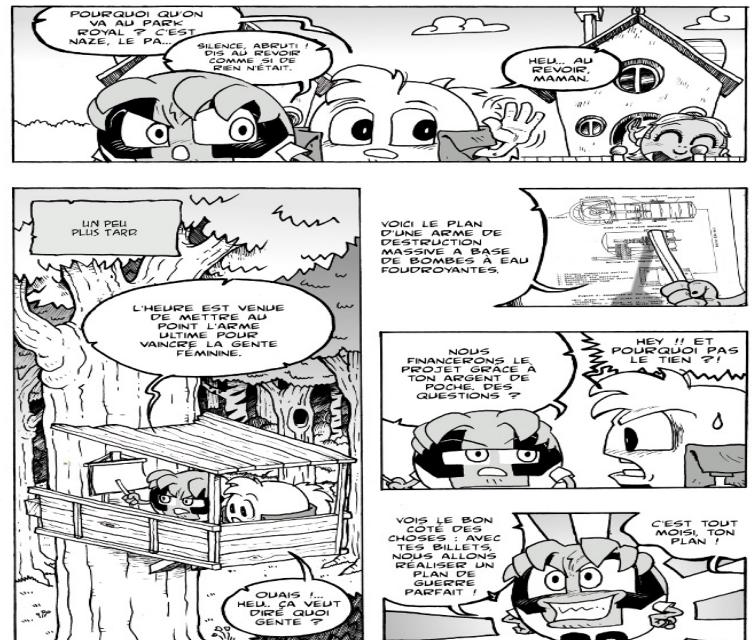
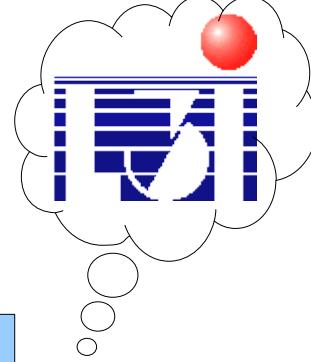
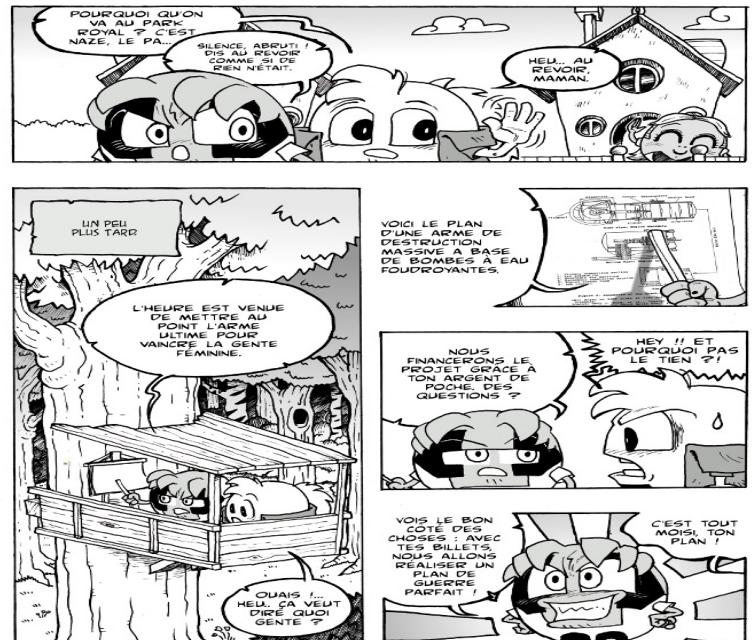
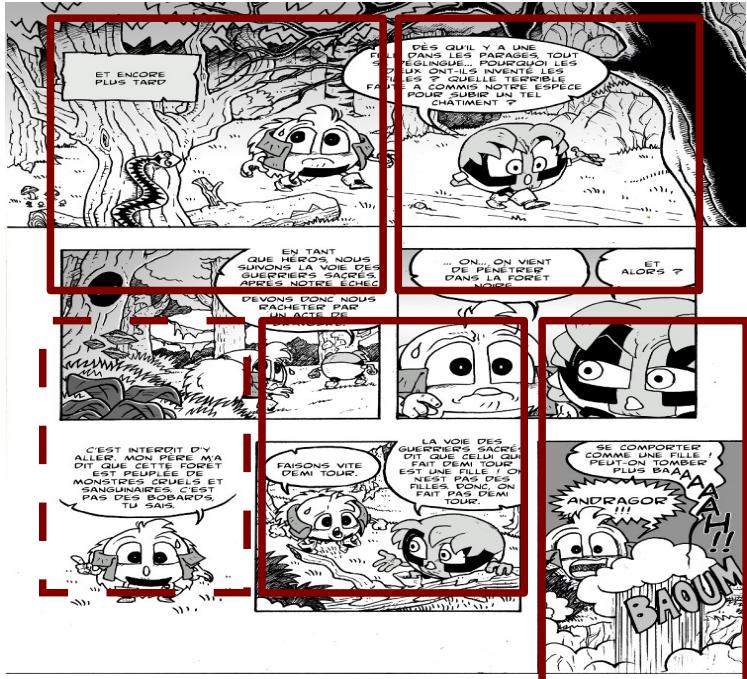


Image credit: Cyb, Bubblegôm, Studio Cyborga, Goven, France, 2009

Proposed work > Contribution



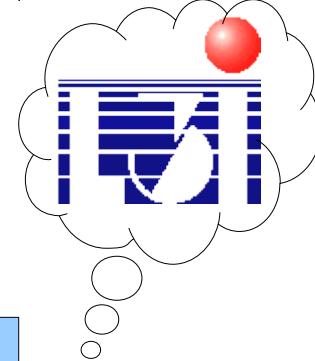
Simultaneous panel + text extraction (CC) => time saving



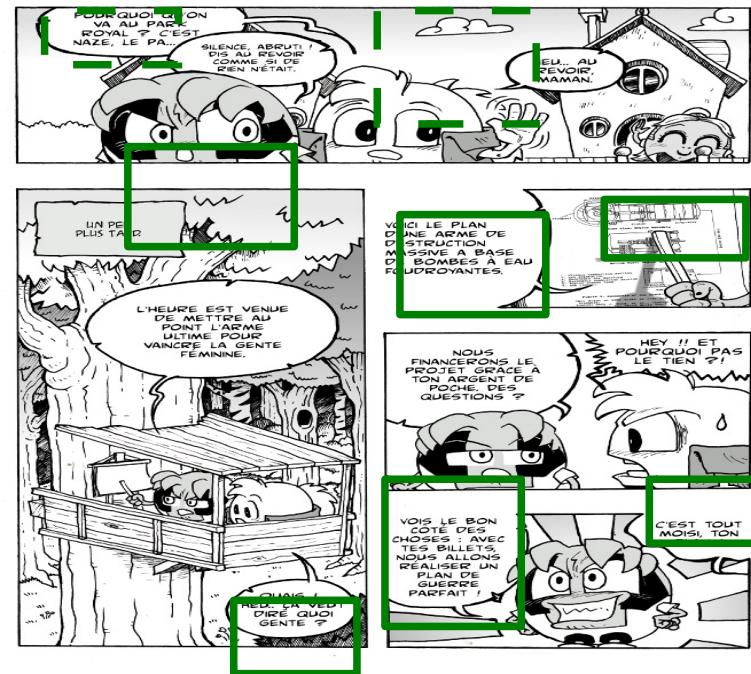
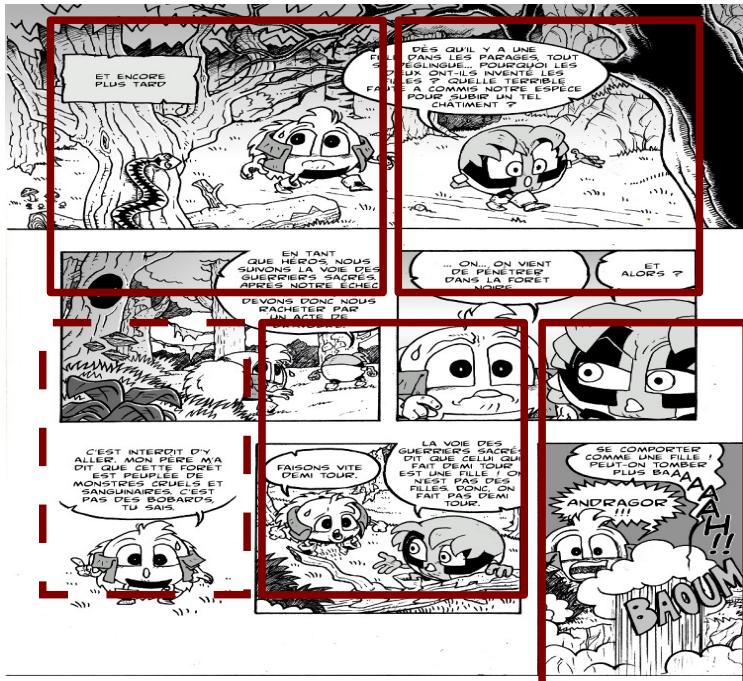
Panels without frame

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

Proposed work > Contribution



Simultaneous panel + text extraction (CC) => time saving

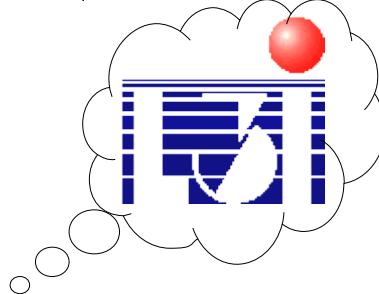


Panels without frame

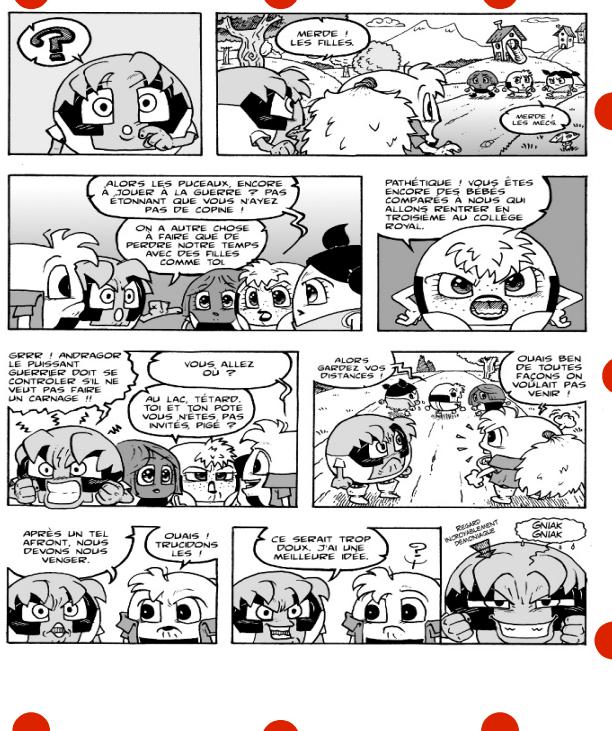
Out of balloon text

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

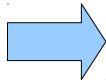
Proposed work > Content extraction



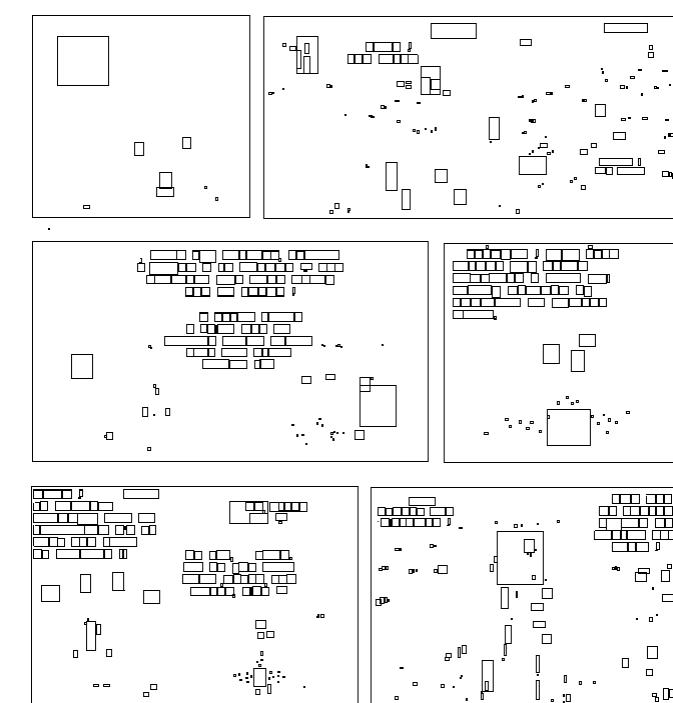
Median level = binarisation threshold



Grayscale

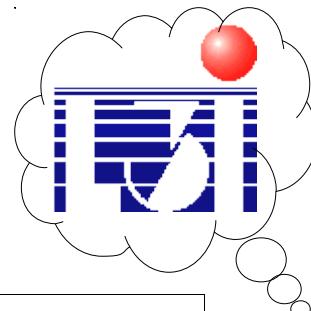


Binarised

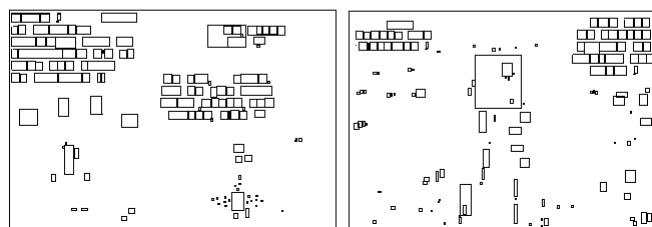
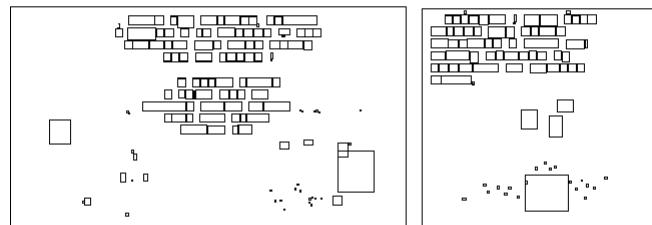
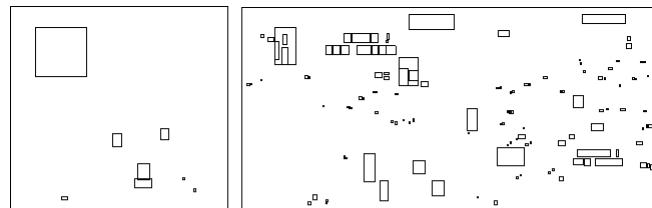


CC bounding boxes

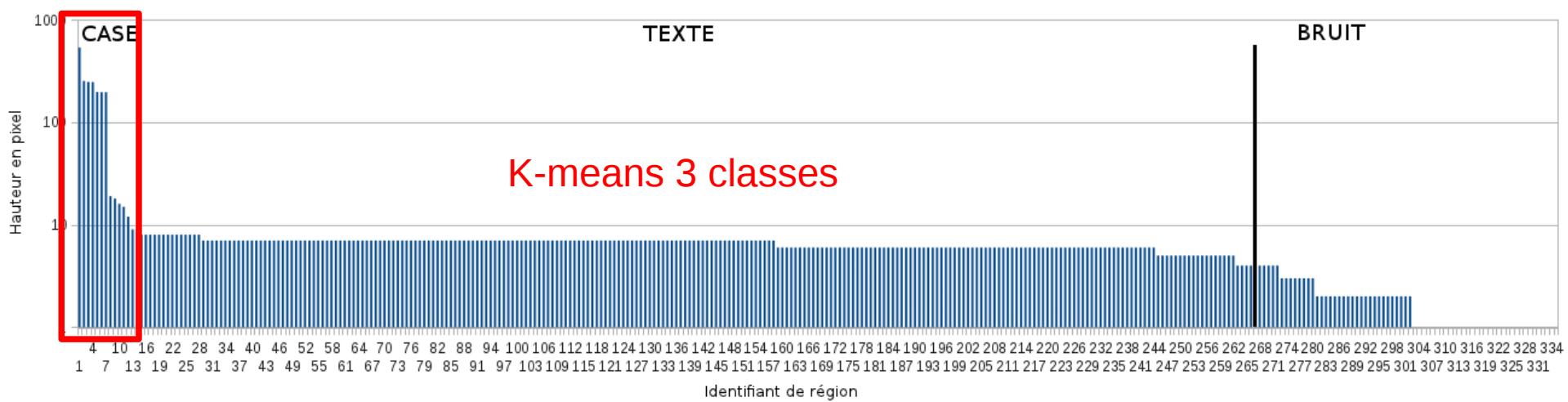
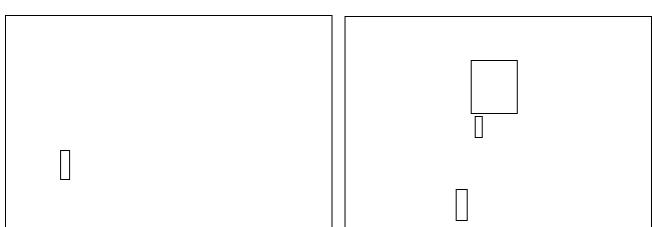
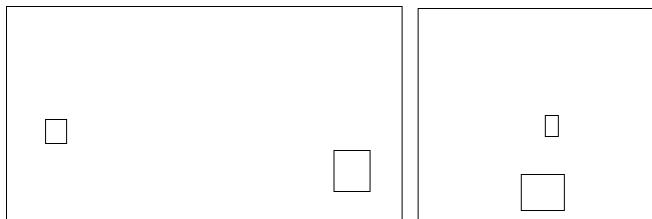
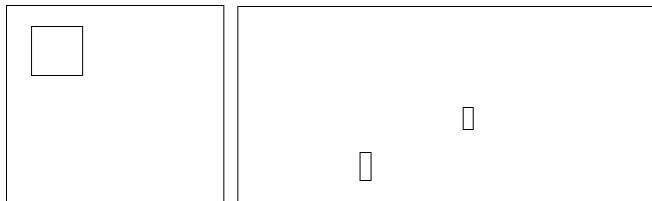
Image credit: Cyb, Bubblegôm, Studio Cyborga, Goven, France, 2009

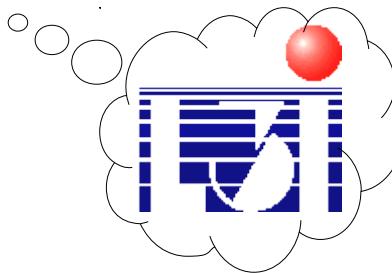


Proposed work > Panel classification

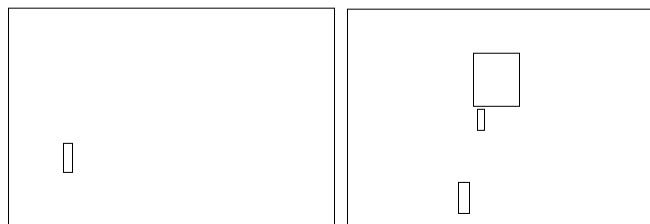
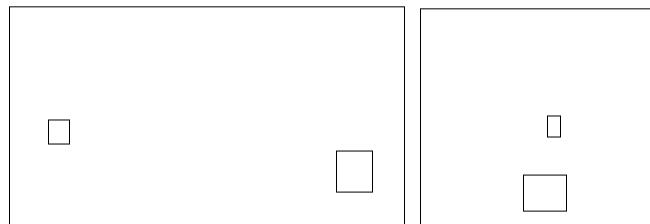
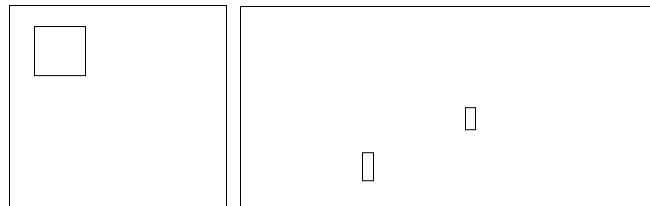


Class “CASE”

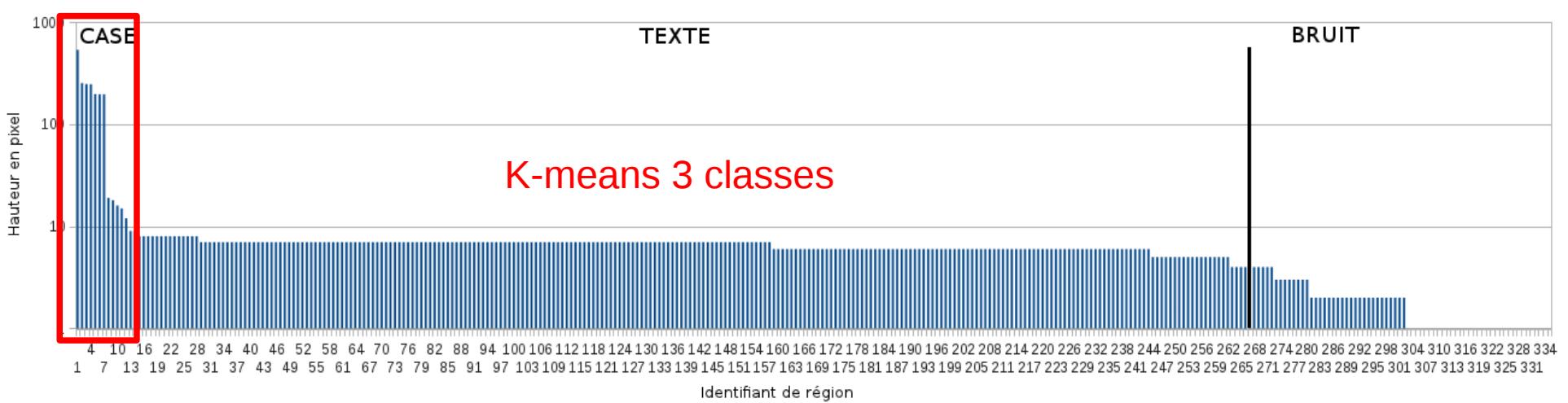
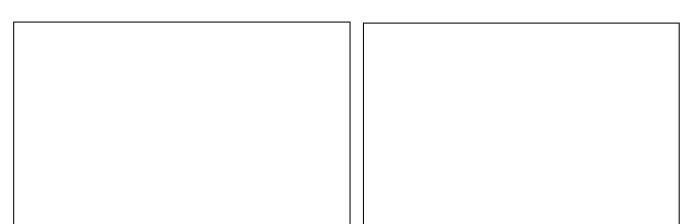




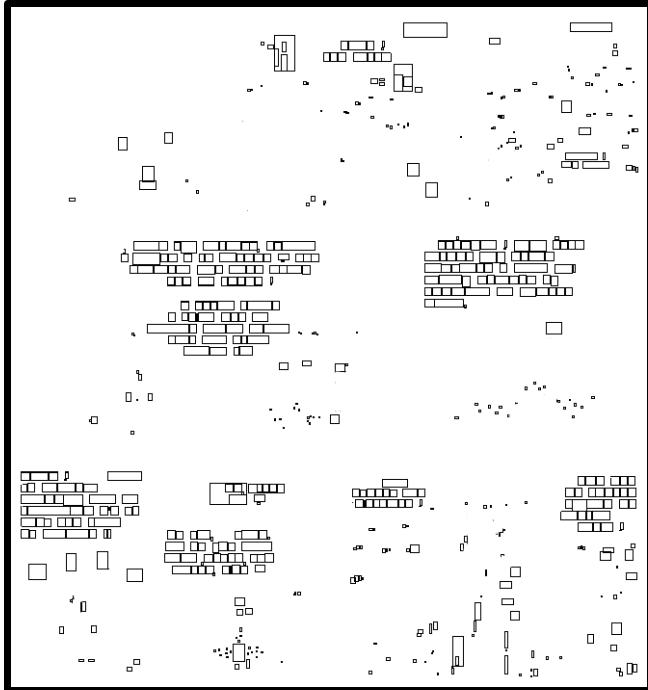
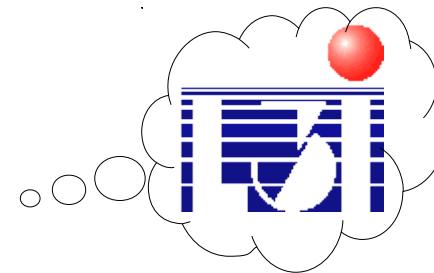
Proposed work > Topological filtering



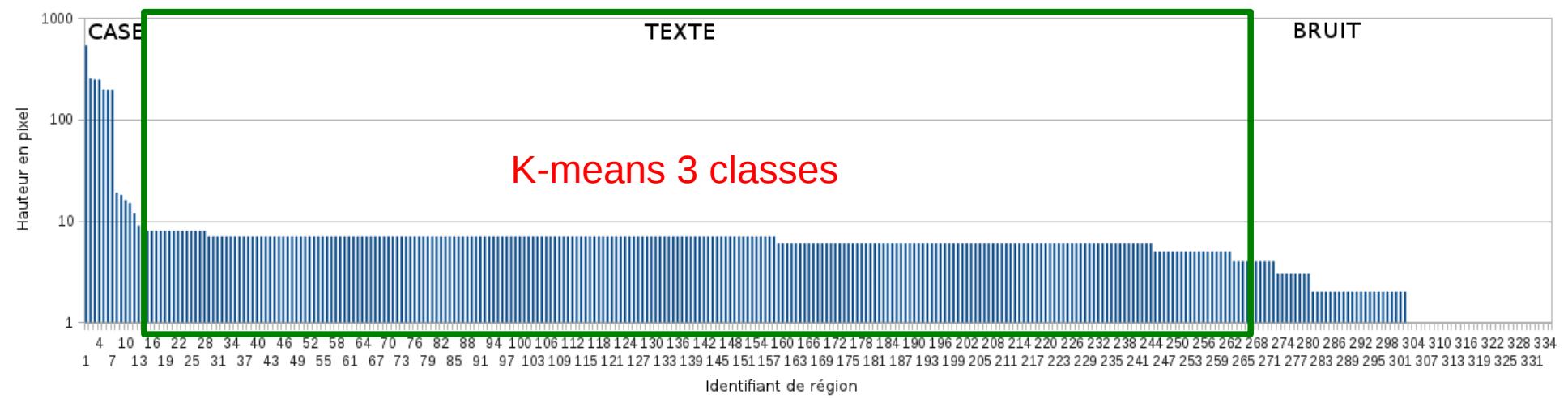
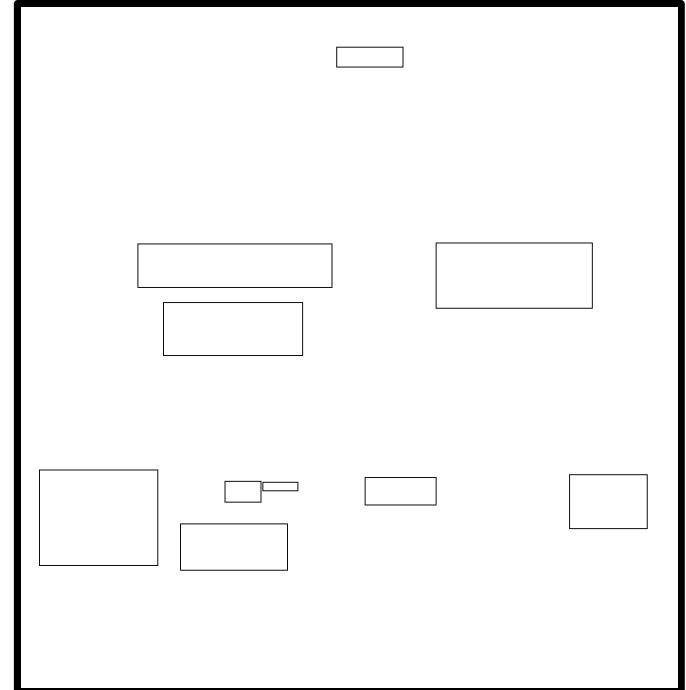
Filtering

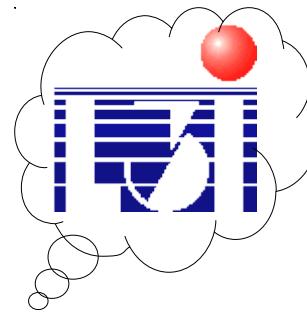


Proposed work > Text extraction



Grouping+filtering
(Distance $< 2*mH$)





Proposed work > Limitations

- 3 classes (panel, text, noise)
- Page/text background grey level
- Overlapping elements

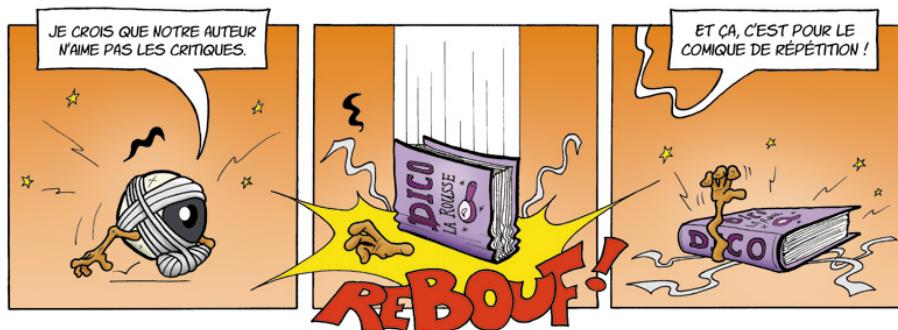
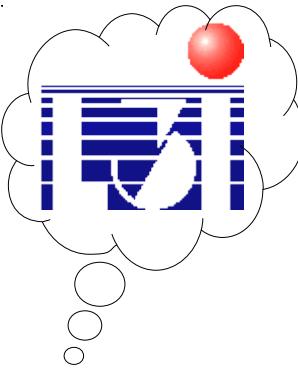
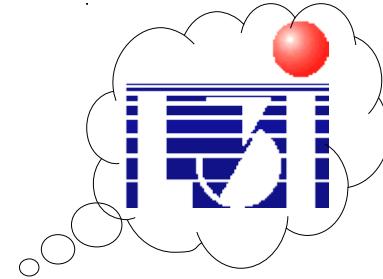


Image credit: Lamisseeb, Les noeils Tome 1, Bac@BD, Valence, France, 2011.



SUMMARY

- Project eBDtheque
- Proposed work
- Experiments
 - Dataset
 - Extraction
- Conclusion

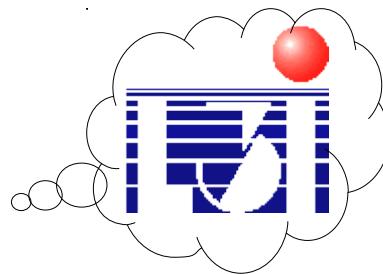


Experiments > Dataset

- Same as Ho et al.¹ for comparison
- 7 albums => 355 panels (42 pages A4, 300dpi)
- 435 speech balloons + 79 narrative text areas



¹ Ho A. K. N., Burie J.-C., Ogier J.-M., « Comics page structure analysis based on automatic panel extraction », GREC 2011, Ninth IAPR International Workshop on Graphics Recognition, Seoul, Korea, September, 15-16, 2011



Experiments > Panel extraction

CONDITION:
Panel OK if “properly” detected
Page OK if all panels OK

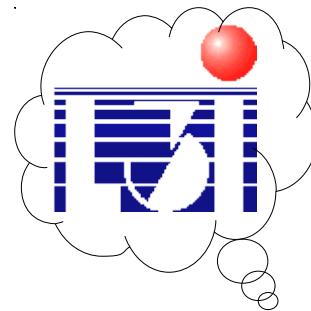
Method	Tanaka ¹	Arai ²	Ngo Ho ³	Proposed	Gain
Panel (%)	63.9	75.6	87.3	88.2	+0.9%
Page (%)	42.8	47.6	64.3	66.7	+2.4%

=> panels without frame are extracted

¹ Tanaka, T., Shoji, K., Toyama, F., Miyamichi, J.: *Layout analysis of tree-structured scene frames in comic images*. In: IJCAI'07. pp. 2885–2890 (2007)

² Arai, K., Tolle, H.: *Method for automatic e-comic scene frame extraction for reading comic on mobile devices*. In: *Seventh International Conference on Information Technology: NewGenerations*. pp. 370–375. ITNG, IEEE Computer Society, Washington, DC, USA (2010)

³ Ngo Ho A. K. N., Burie J.-C., Ogier J.-M., « *Comics page structure analysis based on automatic panel extraction* », GREC 2011, Nineth IAPR International Workshop on Graphics Recognition, Seoul, Korea, September, 15-16 (2011)



Experiments > Text extraction

TP



FP



TN



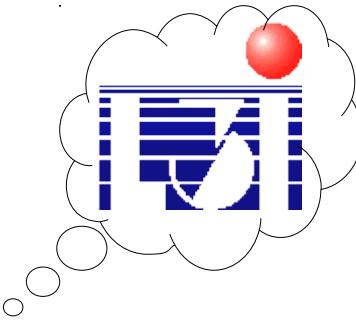
FN



CONDITION:

TP: text area detected correctly
FN: text area not detected

Text type	TP	FN
Speech	78	22
Narrative	53	47



Conclusion

- Simultaneous comics panel and text extraction
 - Robust to page size and resolution variations
 - All text areas (no panel dependent)
 - Assume 3 classes and few overlapping elements
- Coming soon: panel content extraction...



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Christophe Rigaud - CIFED 2012, pp.349-360

