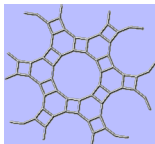


# IAPR TC 18 “Discrete Geometry”



DGCI 2014, September 10-12, 2014

# Facts

## Team

- ▶ Isabelle Sivignon  
Researcher, GIPSA-lab, Grenoble, France  
Chair, in charge of the relationship with DGCI
- ▶ Partha Bhowmick  
Ass. Professor, Indian Institute of Technology, Kharagpur, India  
Vice-chair, in charge of code repository and databases management
- ▶ Rocio Gonzalez-Diaz  
Ass. Professor, School of Computer Engineering, University of Seville, Spain  
Vice-chair, in charge of educational material, tutorials, challenges (open problems)

## Members

84 on the mailing list (+7 compared to 2013)

# What happened since DGCI 2013 ?

## Research initiatives

- ▶ Special Issues after DGCI 2013
  - ▶ **Discrete Applied Mathematics**: 24 submitted papers, 8 accepted, 9 rejected, 5 out of scope, 2 still under review.
  - ▶ **Computer Vision and Image Understanding**: 14 submitted papers, 6 accepted, 7 rejected, 1 out of scope.
- ▶ Special Issues after DGCI 2011
  - ▶ **Discrete Applied Mathematics**, Volume 161, Issue 15, October 2013, 9 papers.
  - ▶ (**Computer Vision and Image Understanding**, Vol 117, Issue 4, April 2013, 12 papers)
  - ▶ **Image Processing Online**: 6 demos are now online - between 50 and 100 archived tests in 6 months for each demo.
- ▶ Special Issue after IWCIA 2013
  - ▶ **International Journal of Computer Mathematics**, Volume 90, Issue 8, 2013, 6 papers.

# TC18 initiatives

## New services

- ▶ relooked website [▶ webpage](#)
- ▶ list of major journal papers published in 2013: sent in the newsletter
- ▶ alert on PhD defenses
- ▶ image gallery [▶ gallery](#)

## We need your contributions

- ▶ PhD defenses alerts
- ▶ images for the gallery

Feel free to give your feedback on our actions !

# Report from ICPR 2014 - TC chair meeting

## Technical Committees

### General comments for all TCs

- ▶ mention key challenges
- ▶ mention major projects or initiatives
- ▶ provide datasets and evaluation methodology
- ▶ IAPR budget to support collaborations with other TCs

EXCO INITIATIVE ON TECHNICAL COMMITTEE ACTIVITIES: [SUMMER SCHOOLS](#)

[01 - Statistical Pattern Recognition Techniques](#)

[02 - Structural & Syntactical Pattern Recognition](#)

[03 - Neural Networks & Computational Intelligence](#)

[04 - Biometrics](#)

[06 - Computational Forensics](#)

[07 - Remote Sensing and Mapping](#)

[08 - Machine Vision Applications](#)

[10 - Graphics Recognition](#)

[11 - Reading Systems](#)

[12 - Multimedia and Visual Information Systems](#)

[14 - Signal Analysis for Machine Intelligence](#)

[15 - Graph Based Representations](#)

[16 - Algebraic and Discrete Mathematical Techniques in Pattern Recognition & Image Analysis](#)

[18 - Discrete Geometry](#)

[19 - Computer Vision for Cultural Heritage Applications](#)

[20 - Pattern Recognition for Bioinformatics](#)

# Future directions of TC18

## Administrative

Chairs for next term (Aug. 2014 - Aug. 2016)

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## Administrative

Chairs for next term (Aug. 2014 - Aug. 2016)

## Website

- Renew the list of open problems

### Open Problems in Digital Geometry and Topology

A web site on open problems in digital and image geometry has been suggested during the Winterschool 09/2000 at Dagstuhl/Germany.

Problems to be published on this web site may be posted to [ol-winter@cs.uni-kloster.ac.at](mailto:ol-winter@cs.uni-kloster.ac.at) in pdf format. Please limit your file submissions to just (about) 2 pages and use the format shown in this template file. They will be published in the list below together with the date when received, your name (with a link to your email address), and links provided by you for related publications, test data, web sites etc.

Responses to the published problems will be inserted into the table, next to the related problem. A response should also be in pdf format (about 2 pages) and may include links to further material.

Date	Problem/Response	(First) Author	Links
9, May 2001	1 Surface Area Estimation	Reinhard Klette	CITR-TR-87
11, September 2001	1.1 Estimation algorithm and multigrid convergence proof	David Coeurjoly	Technical Report
10, May 2001	2 Superlinear Convergence for Length Estimation	Reinhard Klette	CITR-TR-87
22, June 2001	3 Axiomatic 3-D Digital Topology	T. Yung Kong	
21, August 2001	4 Binary Codes for Counting Digital Topologies	Atsushi Iniya	
11, September 2001	5 Minimal-Number DSS and DPS Segmentations	Azriel Rosenfeld	CITR-TR-93
27, January 2005	5.1 On the min DSS problem of closed discrete curves	Fabien Feschet	
4, May 2009	5.2 Minimum decomposition of a digital surface into digital plane segments is NP-hard	David Coeurjoly	
16, April 2002	6 MLP Linear-time 3D Length Estimation	Thomas Buelow	CITR-TR-55
17, February 2003	7 Connectivity Number	Valentin Brimkov	CITR-TR-125
23, April 2004	8 List collected on a 2004 Dagstuhl seminar	Reinhard Klette	
01, November 2004	8.1 Vertices of the digital line/hyperplane segment polytope	Valentin E. Brimkov	
	8.2		
01, November 2004	9 Convex digital curve segmentation	Valentin E. Brimkov	
13, December 2004	10 The convex skull problem	Jean-Marc Chassery	
15, January 2005	11 Animal and B-Problems	Akira Nakamura	
17, September 2007	11 Surface Area Estimation with Non-Cubic Voxels	Nahum Knyaz	

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## Website

- ▶ Renew the list of open problems
- ▶ List major projects
- ▶ Enrich the gallery



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## Links with other TCs

DGCI invited speakers, collaborations between teams, summer school.

IAPR sponsorship possible.

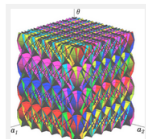


### Gallery



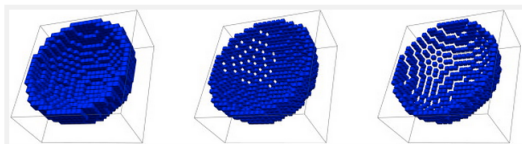
P. Ngi, V. Klemochi, N. Dzasak, H. Talbot, Compensational structure of rigid transformations in 2D digital images, *Computer Vision and Image Understanding*, 117(4):393-408 (2013).

Binary object obtained from retina image segmentation. The non-processed image suffers from topological alterations during rotation, due to the small size of linear structures. The "regularized" image, generated by a suprlin Khavitskiy grid embedding, is no longer affected by topological changes.



P. Ngi, N. Dzasak, V. Klemochi, H. Talbot, Topology-preserving rigid transformation of 2D digital images, *IEEE Transactions on Image Processing*, 25(2):886-897 (2014).

Parameter space of 3-dimensional continuous rigid transformations ( $\alpha_1, \alpha_2$ : translation;  $\theta$ : rotation), subdivided with into cells that represent the associated discrete rigid transformations. The visualized surfaces correspond to level cases at the frontier between to pixels.



J.-L. Touzart, E. Andrieu, T. Roussillon, Digital circles, spheres and hyperspheres: From morphological models to analytical characterizations and topological properties, *Discrete Applied Mathematics*, Volume 161, Issues 16-17, November 2013, Pages 3852-3877



D. Courty, J.-D. Lachout, J. Leventis, Multigrid convergent principal curvature estimators in digital geometry, *Computer Vision and Image Understanding*, 2014.



C. Carteau, C. Marot, R. Malgouyres, C. Barin, Mesh-Parameterization with Generalized Discrete Conformal Maps, *Journal of Mathematical Imaging and Vision*, May 2013, Volume 46,