Dear TC15 members,

Welcome to the October edition of our newsletter. This edition brings to you a very interesting report proposed by Walter G. Kropatsch about papers and invited talk from CAIP 2015 linked to Graphs Representation and Matching. Some updated Calls for Papers are also included below.

In future edition of the newsletter, we would like to include information about recent PhD or project dealing with Graphs. So, do not hesitate to send us (ramel@univ-tours.fr) brief abstracts, we will be pleased to include them in the next TC15 newsletter planned for beginning of 2016.

Remember that you can also find up-to-date information about our community on our web site (https://iapr-tc15.greyc.fr/index.php) or use our rss feed (https://iapr-tc15.greyc.fr/rss.php).

Best regards
Jean-Yves Ramel & Donatello Conte
TC15 newsletter editors

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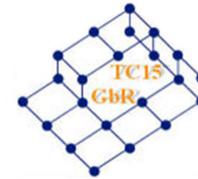
TC15

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CAIP 2015 report - Conference report by Walter G. Kropatsch

The conference on Computer Analysis of Images and Patterns (CAIP) took place at Valetta, Malta, this year (see http://caip.eu.org/caip2015/). The nice location and the excellent organization by George Azzopardi and Nicolai Petkov stimulated many interesting new and old contacts and discussions and showed an increasing interest in Graph-based Representation in pattern recognition.

CAIP has a long tradition as a biennial international conference since 1985 (http://caip.nl/archive.html lists all CAIPs) devoted to all aspects of computer vision, image analysis and processing, pattern recognition and related fields. Originally initiated as a conference to bring together researchers from Eastern and Western Europe it has become a central European trademark similar to the Scandinavian Conference on Image Analysis (SCIA). Its scientific quality is based on a rigorous peer review of the

submitted papers (not abstracts) of which each received 3-4 reviews. 136 papers were finally accepted and appear in the proceedings of Springer lecture notes in computer science, volumes LNCS 9256 and 9257.

Although the scope of CAIP covers all methods and applications of pattern recognition, six regular papers and the invited lecture of Mario Vento address graph representations.

In the following, I sketch some of the basic ideas of these papers in order to raise the interest in reading the corresponding papers.

Mario Vento's invited presentation *"How and Why Graphs are used in Pattern Recognition?"* nicely adapted its scope to the audience of CAIP by illustrating several of the basic algorithms in graph matching with very convincing examples in addition to the very profound overview of the historical development of the field.

He subdivides the 40 years of research of graphs in pattern recognition into three major periods: pure, impure and extreme. Pure methods operate directly in the graph domain, impure methods convert operations on vectors into operations on graphs; and extreme methods reconduct graphs entirely and directly to vectors.

The main representative pure methods are EGM and IGM standing for exact graph matching and inexact graph matching. The basis of impure methods is formed by defining a distance between different graphs: the GED (graph edit distance). It allows effective statistical pattern recognition (SPR) methods to be applied on graphs enabling learning and classification in the domain of graphs. The classical example are the concepts of median graph and generalized median graph as the counterpart of the statistical mean in SPR. Kernel methods enable the solution of non-linear problems by linear algorithms in the higher dimensional kernel space. Vento addresses several graph kernels that achieve this goal: diffusion, convolution and random walk graph kernels. Extreme methods perform an embedding of the graph in a vector space. This can be done in two basic ways:

a) by mapping the vertices into points of the vector space; or

b) by mapping complete graphs into a point of the vector space.

In both cases the goal is to measure similarity of the graphs by closeness in the vector space. This very recent approach has many promises but there are still some basic open questions that were addressed by Mario Vento. Following papers relate to Vento's talk: *"Thirdy years of graph matching in Pattern Recognition"* , Conte, Foggia, Sansone, Vento, IJPRAI, 2004; *"Graph matching and learning in pattern recognition in the last 10 years", Foggia, Percannella, Vento, IJPRAI, 2014; "A long trip in the charming world of graphs for PR", Vento, PatRec, 2015.*

Three papers have been contributed by the research related to Edwin Hancocks group in York: In *Bai et al "An Edge-Based Matching Kernel for Graphs Through the Directed Line Graphs"* the new graph kernel is based on the directed line graphs. Matching is realized by counting the number of matched vertices of the directed line graphs. In *Bai et al "A High-Order Depth-Based Graph Matching Method"* the h-layer depth is a vector attached to every vertex *v* measuring the entropy of the steady state random walk visiting *v* in neighborhoods of increasing sizes. The new matching strategy identifies the mis-matches in the first-order matching results and removes the incorrect matches.

The authors of *Zhang et al "Adaptive Graph Learning for Unsupervised Feature Selection"* assign the neighborhood (which constitute the edges of the graph) of the data points based on local distances or dis-similarities. This robust construction of the similarity graph characterizes the manifold structure of the data. Experimental results from unsupervised feature selection demonstrate the effectiveness of the AGLUFS framework. The costs of the individual operations in the graph-edit-distance (GED) are the parameters strongly influencing the quality of similarity and dissimilarity metrics.

Cortes et al contribution *"Ground Truth Correspondence Between Nodes to Learn Graph-Matching Edit-Costs"* learn the costs of the edit operations to achieve better correspondence accuracies.

The paper of *Cerman et al, "LBP and Irregular Graph Pyramids"*, generates a hierarchy of successively smaller graphs preserving the critical points in the grey level landscape of an image. The critical points are

identified based on the principle of local binary patterns (LBP). The top-level graph relates the spatial neighborhood of all extrema and saddle points. It allows the derivation of the minimum contrast representative (MCR), a unique image representing the equivalence class of all images with the same LBP codes.

A point cloud is the input in the paper of Kurlin, "A Homologically Persistent Skeleton is a Fast and Robust Descriptor of Interest Points in 2D Images". Growing a circular disk at every point successively generates connected regions when circles overlap. The radius of the circles is considered as the scale. When two circles touch each other a new edge between their centers is born (the union of the two circles becomes connected). It is removed ('it dies') when one circle center is contained in the other circle. Persistence measures the life time of these edges: radius (depth)-radius(birth).

The homological persistent skeleton is the graph of all points extending the classical minimal spanning tree by certain critical edges together with their persistence. The resulting skeleton is efficient to compute, invariant to rotation and scale and stable under perturbations of the point set.

The proceedings of GbR2015 were published by Springer in Lecture Notes in Computer Sciences, Vol.9069, http://link.springer.com/book/10.1007%2F978-3-319-18224-7.

Call for Dataset and Toolkit Submissions

We would like to remind you that the TC15 welcome contributions of new datasets or other resources related to the community. We would like to particularly encourage authors of articles that introduce new datasets, software or other material to submit such material to TC15 for hosting. Please check the TC15 site (https://iapr-tc15.greyc.fr/links.html) on information about how to submit datasets for archiving also feel free to contact Luc Brun, for any doubts you might have on the process.

Call for papers

Special issue on Graph-based Pattern Recognition

Connected with GbR2015 workshop, a special issue on Graph-based Pattern Recognition will be published at Pattern Recognition Letters. The Call for Papers is now available at
http://www.journals.elsevier.com/pattern-recognition-letters/call-for-papers/special-issue-on-advances-in-graph-based-pattern-recognition/

You are warmly welcome to submit your work to this special issue.
Best regards,
Cheng-Lin Liu
Bin Luo
Walter Kropatsch
Guest Editors, Special Issue
General Chairs, GbR2015

Important dates
- Paper Submission due: November 15, 2015
- Tentative first review notification: February 15, 2016
- Tentative revision submission: April 28, 2016
- Tentative acceptance notification: June 15, 2016

CTIC 2016

6th International Workshop on Computational Topology in Image Context
June 15-17, 2016 - Marseille, France
Co-Chairs : Alexandra Bac - Jean-Luc Mari
Organizing Committee
Aldo Gonzalez Lorenzo - Eric Remy
Edouard Thiel - Ricardo Uribe Lobello

Topics	
▪ Topological invariants and their computation, homology cohomology, linking number, fundamental groups; ▪ Algorithm optimization in discrete geometry, transfer of mathematical tools, parallel computation in multi-dimensional volume context, hierarchical approaches; ▪ Experimental evaluation of algorithms and heuristics; ▪ Combinatorial or multi-resolution models; ▪ Use of topological information in discrete geometry applications.	▪ Discrete or computational topology; ▪ Geometrical modeling guided by topological constraints; *Important dates* - Abstract submission: January 10th, 2016 - Paper submission: January 17th, 2016 - Paper notification: March 18th, 2016 - Registration: from March 18th to June 14th, 2016 - Conference: June 15th-17th

Web site : http://www.lsis.org/ctic2016

GraphSM 2016

Third International Workshop on Large-scale Graph Storage and Management
June 26 - 30, 2016 - Lisbon, Portugal

Topics	
• Search in graph databases; Algebra and logic of graphs; • Expressive power of graph query languages; • Formalizations of graph databases • Graph data modelling • Indexing methods for graph processing • Storage systems for large-scale graph databases • Flexible query answering on graph-structured data • Graph pattern matching; Knowledge discovery from graphs	• Algorithms for graph database processing • Biological and medical graph databases; • Graph processing for Social Networks • Visualizing *Important dates* Submission (full paper) : February 9, 2016 Notification : April 2, 2016 Registration : April 17, 2016 Camera ready : May 17, 2016

Web site : *http://www.iaria.org/conferences2016/GraphSM.html*

ICPR 2016

23rd International conference on Pattern Recognition
Dec 4-8, 2016, Cancun, Mexico
Organizing Committee
General Chair: Prof. Eduardo Bayro-Corrochano (CINVESTAV, Mexico)
Co-Chairs: Prof. Gerard Medioni (USC, USA), Prof. Gabriella Sanniti di Baja (CNR, Italy)

Tracks	Important Dates	
Track 1: Pattern Recognition and Machine Learning Track 2: Computer Vision and Robot Vision Track 3: Image, Speech, Signal and Video Processing Track 4: Document Analysis, Biometrics and Pattern Track 5: Biomedical Image Analysis and Applications	• Deadline for submissions • Notification of acceptance • Camera-Ready • Tutorial/workshop proposal • Contest proposal	May 2, 2016 Jul 11, 2016 Sep 5, 2016 Apr 1, 2016 Sep 5, 2016

Website : www.icpr2016.org