THE INTERNATIONAL ASSOCIATION FOR PATTERN RECOGNITION

IAPR Newsletter

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IN THIS Issue

From the Editor's Desk

Unsolved Problems...

by Arjan Kuijper
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Well, that sounds like a pleonasm (*http://en.wikipedia.org/wiki/Pleonasm*): a problem that's solved isn't a problem anymore, is it? Solving solved problems isn't much of interest – although every now and then I get papers for review that do exactly this... For most of us active researchers, a challenging aspect of science is to figure out if a new problem we face is solved or not. Focusing our research to this detailed level and extending the state of the art with 'yet another' epsilon improvement may become boring at some moment. What about tackling the real, serious problems?

With this in mind, the German section of the IAPR hosted a workshop on *Unsolved Problems in Pattern Recognition and Computer Vision* *http://www.mpi-inf.mpg.de/conferences/up2013/* at its annual conference GCPR – also known as DAGM (*http://www.gcpr2013.uni-saarland.de/*).

The aim of the workshop was to provide a platform for discussing the major challenges of pattern recognition and computer vision in the next years. Basically: take a step back from the daily business and debate about the most relevant current problems in the field and emphasize the most promising future research directions.

Nine topics were selected that sketched open problems by describing

- a specification of the problem and a characterization of its relevance for research in the field of interest and its application areas, and – if applicable – its societal or economic implications
- the cause of the problem; what deficits in our field are causing this problem
- the relation to the state-of-the-art in our field; which research initiatives would be necessary to devise a solution

In this and in coming newsletters, we will present some of these topics. We welcome your comments and thoughts! They

CALLS for PAPERS & NOMINATIONS

For the most up-to-date information on IAPR-supported conferences, workshops and summer schools, please visit the IAPR web site: *www.iapr.org/conferences/*

ICPR 2014
22nd International Conference on Pattern Recognition
Stockholm, Sweden
Dates: Aug. 24-28, 2014
Deadline: Dec. 20, 2013

IAPR Fellow Award
to be presented at ICPR 2014
Deadline: Jan. 31, 2014

ICFHR 2014
14th International Conference on Frontiers in Handwriting Recognition
Crete, Greece
Dates: Sep.1-4, 2014
Deadline: Feb. 10, 2014

K. S. Fu Prize
to be presented at ICPR 2014
Deadline: Jan. 15, 2014

DGCI 2014
18th IAPR International Conference on Discrete Geometry for Computer Imagery
Siena, Italy
Dates: Sep. 10-12, 2014
Deadline: Feb. 3, 2014

S+SSPR 2014
Joint Workshops on Statistical Techniques in Pattern Recognition (SPR 2014) and Structural and Syntactic Pattern Recognition (SSPR 2014)
Joensuu, Finland
Dates: Aug. 20-22, 2014
Deadline: Mar. 1, 2014

J. K. Aggarwal Prize
to be presented at ICPR 2014
Deadline: Jan. 15, 2014

ICISP 2014
6th International Conference on Image and Signal Processing
Cherbourg, Normandy, France
Dates: Jun. 30-Jul. 2, 2014
Deadline: Feb. 8, 2014

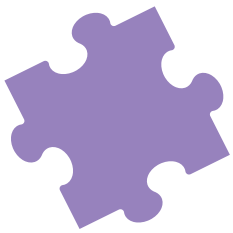
IJCB 2014
International Joint Conference on Biometrics
Clearwater, Florida, USA
Dates: Sep. 29-Oct. 2, 2014
Deadline: Apr. 10, 2014

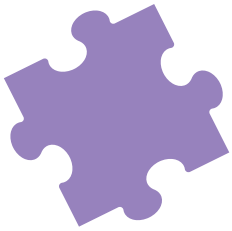
can be submitted via email to *unsolved@iapr.org*.

For this issue, I selected two topics:

- Ground Truth Generation by Daniel Kondermann from the University of Heidelberg. His slides are available via *http://www.mpi-inf.mpg.de/conferences/up2013/up2013_files/up2013-abstracts/kondermann/Daniel_Kondermann_Unsolved_Problems_Workshop.pdf*
- What matters more for image matching and the comparison of descriptors: invariance and causality requirements or repeatability criteria? by Jan-Michel Morel from ENS Cachan. His slides are available via *http://www.mpi-inf.mpg.de/conferences/up2013/up2013_files/up2013-abstracts/morel/Presentation_SIFER_repeatability_version5_without_bikes.pdf*

Enjoy reading these challenges – and solving them!





Ground Truth Generation

Daniel Kondermann, Heidelberg Collaboratory for Image Processing

Problem Specification and Relevance

Low-level vision severely lacks meaningful performance evaluations. For example, optical flow estimation algorithms do not yet deliver sufficiently good results for e.g. driver assistance or medical imaging. To date, more than 1500 papers deal specifically with improving these methods. While the number of publications grows exponentially, almost none of the proposed methods could yet be evaluated. Hence, engineers are not able to select the one approach which best works for their application. A major reason for this problem is a lack of carefully measured reference data, also called ground truth.

To ultimately answer questions about the suitability of an image processing algorithm for a given application, I pose three main questions: How can we (1) cost-effectively create (2) large amounts of (3) accurate ground truth?

This entails a number of more detailed and largely unanswered questions, such as: Can we trust synthetically rendered depth or RGB sequences? How do we obtain geometry, materials, textures and animations for such datasets? Do we have good enough camera models (ToF, stereo, RGB, etc) to synthesize realistic noise? Can we trust human annotations as ground truth? Can we use measurement sciences to create ground truth for real scenes? In general, for which applications which accuracy of ground truth do we need? How can applications deal with missing and inaccurate ground truth data? Can we bootstrap ground truth with vision methods using more data? What constitutes a good ground truth dataset? When do we have enough ground truth? Given a real application, which ground truth dataset is the best for studying the performance? Can we enable anybody to quickly generate ground truth for her own application? Which ground truth do we need in addition to the existing datasets?

Application Areas and Implications

Low-level vision such as stereo, optical flow and feature-tracking is the basis for all vision-based applications. Ground truth generation for low-level vision is a challenging task but mandatory for any advances in the field. Applications are security-relevant fields such as driver assistance systems, medical imaging, robotics, surveillance and more. Under ideal conditions an engineer of a vision system should be able to read a specification sheet with a number of key performance measures indicating under which constraints a method can be applied to which kind of data. Appropriate ground truth would enable meaningful performance evaluations which in turn would give guarantees with respect to applicability, quality of results, graceful degradation, time, energy consumption and more.

Speculative Cause of the Problem

An unambiguous cause of the problem of ground truth generation cannot easily be found. In a recent book draft [1], Burfoot picks up on the points of [3]. According to the author, *"The weakness of evaluation in computer vision is strongly related to the fact that the field does not conceive of itself as an empirical science. [...] Instead [...], vision researchers see themselves as producing a suite of tools."* (p.103)

He also sees similarities to historical problems in other fields of science such as physics and chemistry: *"It is almost as if, by viewing birds, researchers of an earlier age anticipated the arrival of artificial flight, and proposed to pave the way to that application by developing artificial feathers."* (p. 106)

"The argument of this book, then, is that the conceptual obstacle hindering progress in computer vision is simply a reincarnation of one that so long delayed the development of physics and chemistry." (p. 108) `*"The difference is that physicists can eventually determine which explanation is the best. One crucial aspect of the success of the field of physics is that physicists are able to build on top of their predecessors' work."* (p. 105)

I think that much truth lies in the fact that computer vision is a comparably young field of research which historically originates from

artificial intelligence and (notably) not from measurement sciences[1]. I would guess that the past 30 years can be understood as a brainstorming phase in which any method which works more or less well to solve a more or less well-defined problem was an important scientific result and therefore worth a publication.

Ground truth generation itself is clearly an engineering task which costs a lot of time and effort with relatively little scientific joy for its creators. As a result, most researchers gladly accept any type of ground truth without asking too many of the above-mentioned questions. On the other hand, the selection of relevant data worth to be annotated with ground truth clearly is a scientific task. It is time to establish a generally accepted culture of consolidation of results, even if this means that some historically well-received papers need to be re-evaluated.

State of the Art

My background mainly lies in optical flow and stereo vision. As generation of ground truth for these methods is one of the most demanding tasks, I focus on related work in this field.

A comprehensive overview of the problem of performance evaluation (including ground truth) for optical flow is given in [5]. In 2012, three new optical flow reference datasets have been published, two of them containing ground truth [6, 2, 4]. Unfortunately, none of them contains ground truth for real-world, large-scale outdoor scenes with dynamically and independently moving objects. The reason is that no measurement devices exists to record such data with sufficiently high accuracy.

To the best of my knowledge, none of these (or any previous) publications closely investigate either the relevance, cost or the accuracy of the created datasets. This is a bold statement which I would like to defend in the context of the workshop. Furthermore, workshop discussions should also other fields of research such as stereo, matting or segmentation.

Necessary Steps

I believe that the necessary steps are to rigorously answer all the questions posed above. This requires a general acceptance of the currently desolate state of affairs and the willingness to widely support actually reproducible research.

We also need to address the interdisciplinarity of the task: next to dissertation projects we need long-term technical positions along with close collaborations with industry partners and other scientific disciplines such as computer graphics, measurement sciences and systems engineering. As the described questions are so numerous and diverse I do not believe that a few labs can effectively and efficiently address the problem. I therefore argue for large long-term scientific projects.

[1] The latter field pursues a strict code of conduct when it comes to performance evaluations

References

[1] D. Burfoot. Notes on a new philosophy of empirical science. *Arxiv preprint arXiv:1104.5466*, 2011.

[2] D. J. Butler, J. Wul, G. B. Stanley, and M. J. Black. A naturalistic open source movie for optical flow evaluation. In A. Fitzgibbon et al. (Eds.), editor, *European Conf. on Computer Vision (ECCV)*, Part IV, LNCS 7577, pages 611{625. Springer-Verlag, Oct. 2012.

[3] W. Förstner. 10 pros and cons against performance characterization of vision algorithms. In *Proc. of ECCV Workshop on Performance Characteristics of Vision Algorithms*, pages 13{29, 1996.

[4] A. Geiger, P. Lenz, and R. Urtasun. Are we ready for autonomous driving? the kitti vision benchmark suite. In *Computer Vision and Pattern Recognition (CVPR)*, Providence, USA, June 2012.

[5] D. Kondermann, S. Abraham, G. Brostow, W. Förstner, S. Gehrig, A. Imiya, B. Jähne, F. Klose, M. Magnor, H. Mayer, et al. On performance analysis of optical flow algorithms. *Outdoor and Large-Scale Real-World Scene Analysis*, pages 329{355, 2012.

[6] S. Meister, B. Jähne, and D. Kondermann. Outdoor stereo camera system for the generation of real-world benchmark data sets. *Optical Engineering*, 51, 2012.

Thoughts on "Ground Truth Generation"? Send them to us:

unsolved@iapr.org

What matters more for image matching and the comparison of descriptors: invariance and causality requirements or repeatability criteria?

Jean-Michel Morel (work in progress with Vicent Caselles, Mauricio Delbracio, Ives Rey Otero, Rida Sadek)

We are trying very hard since years to understand scale invariant/affine invariant/illumination invariant pattern recognition. There is by now a variety of image matching methods combining a detector and a descriptor. The first one to have been seriously successful is the SIFT method. This method is based on a rather rigorous application of linear scale space theory and Lindeberg's ideas to detect scale invariant features. It claims to be "scale invariant" and is so to some extent, but it is not fully scale invariant. Nevertheless several more or less recent competitors (MSER, SURF, ASIFT, SIFER,) claim better results while several of them are being "less invariant" or "less causal" than SIFT.

Better from which viewpoint? Using coupled repeatability/detection rates on datasets. In short, theory lets one hope or surmise that a method should be better when it is more invariant, all things equal, and practice tells that a pragmatical not-invariant method performs better!

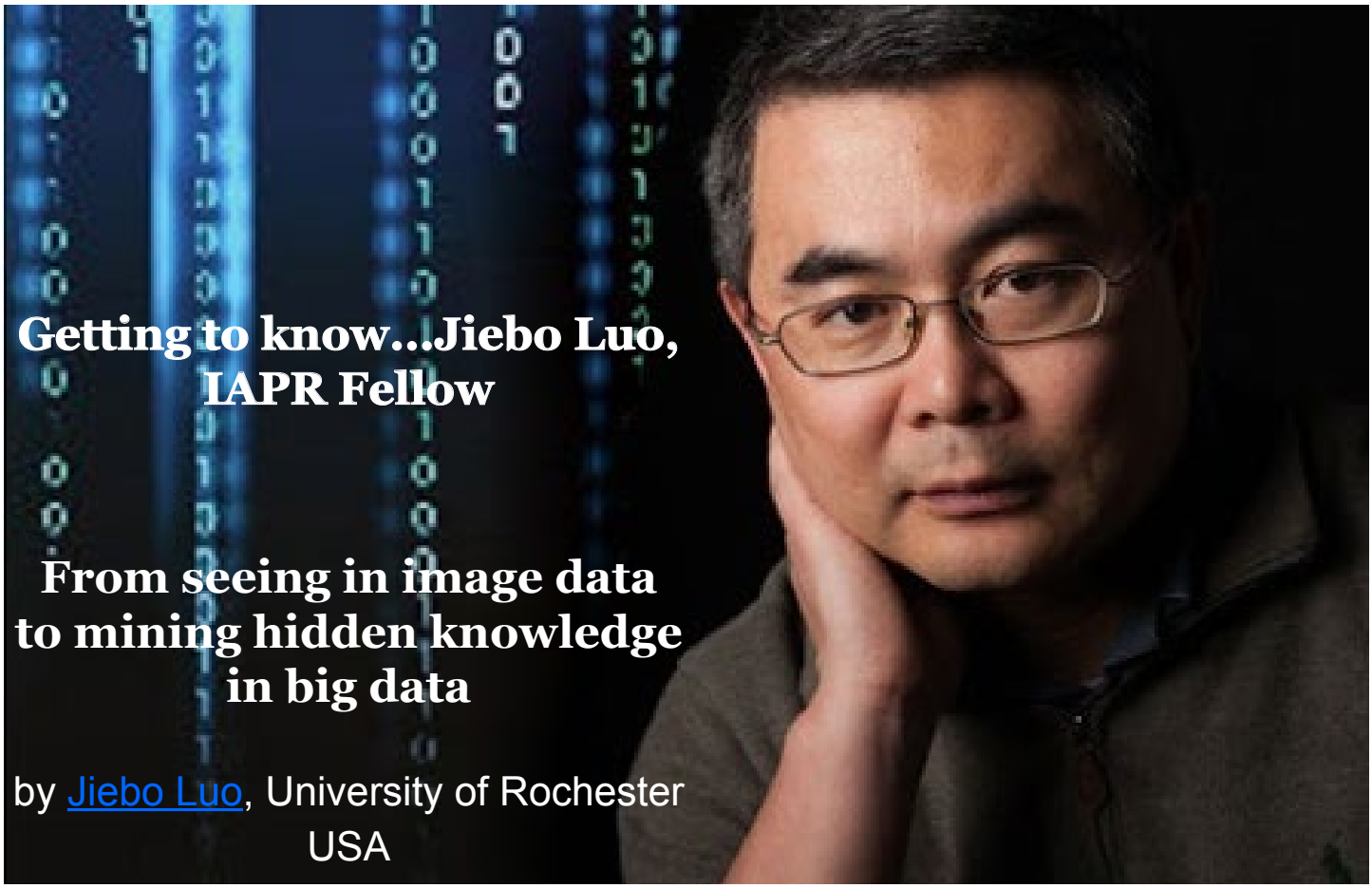
At the state of our inquiry, we found that the repeatability criteria are provably biased, and that the non-invariant methods are in no way "better" than the invariant ones. Their bias is very simple: using their lack of causality they create new features and a plethore of matching descriptors that overlap. In short, they create redundant descriptors. Thus they seem to win for simplistic repeatability criteria, but an examination of simple examples shows that this is rather an illusion. This leads me to regret that mathematical analysis and invariance requirements are so neglected while the community is more and more adept to blind pragmatism and benchmark data. I would like to oppose to biased benchmarks made of plenty of uncontrolled material the elaborate choice of test patterns, and restore a role to theoretical invariance analysis.

Related links:

MSER: *http://en.wikipedia.org/wiki/MSER*
SURF: *http://en.wikipedia.org/wiki/SURF*
SIFT: *http://en.wikipedia.org/wiki/Scale-invariant_feature_transform*
ASIFT: *http://www.ipol.im/pub/art/2011/my-asift/*
SIFER: *http://link.springer.com/article/10.1007/s11263-013-0622-3*

Thoughts on "invariance and causality requirements vs. repeatability criteria"? Send them to us:

unsolved@iapr.org



Getting to know...Jiebo Luo, IAPR Fellow

From seeing in image data to mining hidden knowledge in big data

by Jiebo Luo, University of Rochester USA

Jiebo Luo, IAPR Fellow

ICPR 2010, Istanbul, Turkey

For contributions to contextual inference in semantic understanding of images and video

In the early 1980s, I was a high school student getting ready to go to college. At that time, China was in the middle of opening up to the outside world and pursuing an open economy. Science and technology were largely considered the keys to the modernization of China. For many science-inclined students, the ultimate dream was to become a "scientist", whatever that means. My parents were both electric and electrical architects working at a power plant design institute. They effectively chose my undergraduate major in electrical engineering for me. Unlike the teenagers today, I obliged without any second thought.

I went to the then most selective university in China—the University of Science and Technology of China (USTC). It was a young university with the backing of Academica Sinica. Where else could be more attractive in fulfilling my scientist dream? There I met my matches in all the top students from around the vast nation. With some tenacity that would stay with me through my career, I

Jiebo Luo joined the University of Rochester in Fall 2011 after over fifteen years at Kodak Research Laboratories, where he was a Senior Principal Scientist leading research and advanced development. He has been involved in numerous technical conferences, including serving as the program co-chair of ACM Multimedia 2010 and IEEE CVPR 2012. He is the Editor-in-Chief of the Journal of Multimedia, and has served on the editorial boards of the IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Multimedia, IEEE Transactions on Circuits and Systems for Video Technology, Pattern Recognition, Machine Vision and Applications, and Journal of Electronic Imaging. He has authored over 200 technical papers and 70 US patents. Dr. Luo is a Fellow of the SPIE, IEEE, and IAPR.

His research spans image processing, computer vision, machine learning, data mining, medical imaging, and ubiquitous computing. He has been an advocate for contextual inference in semantic understanding of visual data, and continues to push the frontiers in this area by incorporating geo-location context and social context. A recent research thrust focuses on exploiting social media for machine learning, data mining, and human-computer interaction, for example, mining the wisdom of crowds for social, political, and economic prediction and forecasting. He has published extensively in these fields with over 200 papers and 70 US patents.

managed to stay in the top of the class of 100+ students, many of whom came in with higher scores on the tough national college entrance exam, because they were from more developed provinces. Looking back, one particular event was probably instrumental in my selection of pattern recognition as my career profession—I made the call myself this time. In my junior year, every student was required to assemble a TV from scratch as a two-week intensive project. There were three types of people: the good, the lucky, and the ugly. There were those who were handy and experienced with radio and did it like a piece of cake; there were also those who did not succeed right away, but pictures emerged on the TV screen with one pat or kick of the TV box; and there were those who just could not get pictures on the screen, or worse heard an explosion when the TV was turned on the first time. I was in the last category. Although I eventually fixed the TV and passed the project, there and then I made a self determination—hardware is not for me. In the ensuing months, I decided to choose digital image processing as my senior project, because it did not require messing around with circuits and hardware, and you could always "see" the results of your work. I am a "visual" person who always loves images. Twenty five years later, I am still working with images and still trying to make computers see through images. I cannot say that for 90% of my college classmates.

In the past quarter of a century, I have worked on image processing, pattern recognition, computer vision, computational photography and now social media data mining. I had spent 15 of those year working at Kodak Research Labs until 2011. I was lucky enough to become involved in both applied development and advanced research, all the time dealing with image and video data from the real world, or image data "in the wild". I was a principal contributor to the Kodak Digital Radiography System, at the core of which is a suite of innovative image segmentation, classification, and rendering technologies detailed by a family of US patents. These algorithms were critical differentiators relative to the competitor's products and played a crucial role in helping grow Kodak's market share by an order of magnitude over 4 years into the market share leader. This contribution was recognized by the 2004 Eastman Innovation Award, Kodak's highest technology prize.

Recognizing the difficulty of performing computerized high-level semantic recognition from pixels, and the fact that humans frequently employ context information in recognition, I was an early advocate for using contextual inference in semantic understanding of images, videos and other multimedia. My 2003 IEEE CVPR paper on probabilistic spatial context models for scene understanding and 2004 IEEE CVPR paper on fusion of metadata context and image content for image classification were among the first of this now popular approach in computer vision, inspiring subsequent works by many other researchers. My 2006 IEEE Signal Processing Magazine overview paper on exploiting context for semantic scene content understanding was among the Reader's Choices in IEEE Xplore. I was a pioneer in the use of geotags as location context in visual recognition and media mining. I published a series of works on this subject in the past few years, which have been noted and followed by the research community. My current research in this area continues to push the frontiers of incorporating social context in semantic understanding.

With a knack for making computer vision work for the real data, I was among the trail blazers in action and activity recognition for videos "in the wild". In 2007, I initiated research on large-scale multimodal semantic concept detection for consumer videos, leading a research focus shift away from the structured news and broadcast sports videos that the community had been limited to. I also initiated action recognition aimed at YouTube videos through a widely cited paper in CVPR 2009, and the resulting public dataset that is the first and largest of its kind available for vision research (hosted at the University of Central Florida).

In 2011, I made a career move from industry back to academia. I found my research interest shift to social media and big data. The introduction and proliferation of social media in a few short years has transformed and revolutionized people's lives thanks to the advances in social networks, multimedia and mobile technologies. Social media can help people and businesses stay better informed and has proven to be a valuable source for timely insights, emergent behaviors and patterns, and other types of intelligence. Despite of the initial successes based on web searches and Tweets, visual information, which is ubiquitous in social media and graphically captures consumer activities, has been vastly underutilized for prediction and forecast. A new research thrust of mine is the exploitation of social multimedia for machine learning, data mining, and human-computer interaction. Several representative works by my collaborators and I have demonstrated the power of this approach. In the 2010 CVPR Best Student Paper, visual event

recognition in personal videos is accomplished by learning from web data with only a small amount of labeled training data. A couple recent papers focus on mining the wisdom of social multimedia for social and economical prediction and forecasting.

We are in the most exciting age of artificial intelligence in history, aided by the power of computing technologies and unprecedented availability of data. I'm still fond of working with image data, but I have recently become involved in a technical area that I think has the potential to bring about great positive changes in the world. That is, how can we "see" the hidden patterns and knowledge from the massive amount of big data available today? I'm still happily working on finding answers to this kind of research question.

IAPR...The Next Generation

In this series of Feature Articles, the IAPR Newsletter asks young researchers to respond to three questions:

- *Briefly: How did you get involved in pattern recognition and what technical work have you done?*
- *In more detail: What is/are your current research interest(s)?*
- *How can the IAPR help young researchers?*

~Arjan Kuijper, Editor -in-Chief

by Meng (Moe) Fang

Centre for Quantum Computation and Intelligent Systems (QCIS)
University of Technology, Sydney (UTS)

1. Briefly: How did you get involved in pattern recognition and what technical work have you done?

I was exposed to pattern recognition and its applications since the first year of my graduate study. In 2010, I worked as an intern in the Mcom Group at Microsoft Research Asia, and my research topic was to carry out system diagnosis by using machine learning and statistical methods. It was my very first experience of using pattern recognition and learning techniques to solve real-world challenges. Since then, I became very interested in this area. My experience was further strengthened after I became a PhD student in the Centre for Quantum Computation & Intelligent Systems (QCIS), which is under the leadership of Professor Chengqi Zhang. QCIS is a research strength centre within the University of Technology, Sydney (UTS) that focuses on developing innovative technologies for quantum computation and intelligence systems. I joined in the Data Sciences and Knowledge Discovery Laboratory (DSKD Lab), which is part of QCIS, and studied data mining, machine learning and knowledge discovery. Following Professor Xingquan

Meng Fang is a Research Student at Faculty of Engineering and Information Technology, University of Technology Sydney (UTS). His research focuses on Data Mining and Machine Learning. He received an ICPR2012 Best Student Paper Award in the Pattern Recognition and Applications Track at the 21st International Conference on Pattern Recognition for the paper entitled, "I Don't Know the Label: Active Learning with Blind Knowledge".` He is currently part of the Centre for Quantum Computation & Intelligent Systems (QCIS) and also works for CSIRO. Before joining QCIS, he obtained B.Eng. and M.Eng degrees in Software Engineering from Wuhan Univerisity, China. After graduation, he worked as an intern in the Mcom Group at Microsoft Research Asia (Beijing) in 2010.

Zhu's guidance and suggestions, I started to work on active learning—a very specific problem in the pattern recognition and machine learning field.

For most data mining problems, obtaining label information for training instances is a necessary but time consuming process subject to expensive costs. Instead of labeling all instances or randomly selecting instances to label, active learning selectively chooses the most informative instances for an oracle to label. An active learner aims to reduce the labeling cost with maximum performance gain. It has been extensively studied for nearly two decades and has become a very useful tool for many real-world applications.

2. In more detail: What is/ are your current research interest(s)?

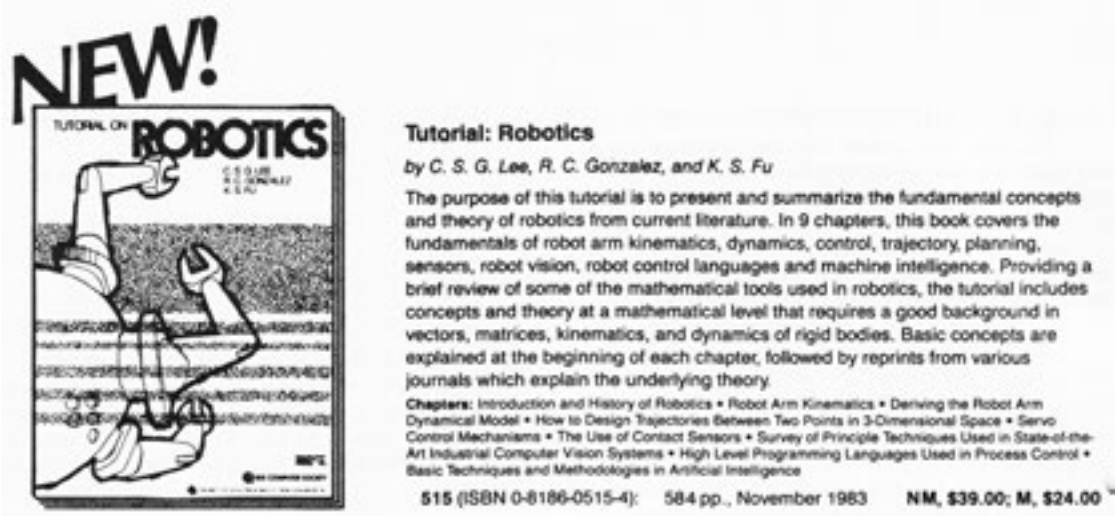
My main research interest is to enable active learning for multiple noisy labelers. In traditional active learning settings, an omniscient oracle is required to provide correct answers for every query. This problem setting is, unfortunately, hardly the case for many applications, such as social tagging and crowdsourcing systems, where plenty of users can form abundant weak labeling resources. These emerging applications raise a new active learning problem which involves multiple, nonexpert labelers who may provide imperfect labels to the same set of queried instances. Existing omniscient oracle based active learning methods cannot fully utilize the imperfect information provided by weak labelers. Although researchers have observed this interesting problem and proposed extracting useful labeling information from multiple imperfect labelers, for all existing multiple weak labeler based methods, they assume that imperfect labelers' knowledge sets are fixed and that they are unable to learn complementary knowledge from one another. This has motivated us to study a new active learning challenge: enabling imperfect labelers to learn labeling knowledge from one another to refine their knowledge sets during the active learning process.

In my research, we focus on active learning strategy for crowdsourcing systems. We are particularly interesting in developing an active learning framework which allows a crowd of imperfect labelers to form a self-taught learning system and learn complementary knowledge from one another to expand their knowledge sets. To implement such a self-taught active learning framework, we have to face three key challenges:

- 1) Instance Selection: Identifying the most informative instance for labeling is difficult, mainly because each weak labeler may provide incorrect/ noisy labels for the query. We need to identify the mostly needed instance by taking all labelers as a whole instead of treating them separately;
- 2) Labeler Selection: For each selected query instance, identifying the most reliable labeler is difficult. We need to properly characterize the strength/weakness of each labeler so we can identify the labeler with the most reliable knowledge for the queried instance;

IAPR Then and Now: 20 Years Ago

From the October 1983 (Vol 6 Nos. 2 and 3) issue of the *IAPR Newsletter*.



Tutorial: Robotics

by C. S. G. Lee, R. C. Gonzalez, and K. S. Fu

The purpose of this tutorial is to present and summarize the fundamental concepts and theory of robotics from current literature. In 9 chapters, this book covers the fundamentals of robot arm kinematics, dynamics, control, trajectory planning, sensors, robot vision, robot control languages and machine intelligence. Providing a brief review of some of the mathematical tools used in robotics, the tutorial includes concepts and theory at a mathematical level that requires a good background in vectors, matrices, kinematics, and dynamics of rigid bodies. Basic concepts are explained at the beginning of each chapter, followed by reprints from various journals which explain the underlying theory.

Chapters: Introduction and History of Robotics • Robot Arm Kinematics • Deriving the Robot Arm Dynamical Model • How to Design Trajectories Between Two Points in 3-Dimensional Space • Servo Control Mechanisms • The Use of Contact Sensors • Survey of Principle Techniques Used in State-of-the-Art Industrial Computer Vision Systems • High Level Programming Languages Used in Process Control • Basic Techniques and Methodologies in Artificial Intelligence

515 (ISBN 0-8186-0515-4): 584 pp., November 1983 **NM, $39.00; M, $24.00**

- 3) Self-Taught Learning: While existing methods assume weak labelers are independent of each other, my research intends to advocate self-taught learning among labelers. For specified knowledge or concept, we should know which labeler is good at it and which labeler needs to learn the knowledge to further strengthen its capability.

To tackle the research challenges, I employ a probabilistic knowledge-concept model to explicitly characterize the knowledge of different labelers. In our design, we consider that making a query, in a multiple labeler setting, is subject to a certain cost, so instead of asking all labelers to provide labels for the queried instance, an ideal solution is to involve answer from one selected labeler only. To properly select the instance-labeler pair in each active learning iteration, we use four random variables to represent unlabeled instances, the knowledge of the labelers, the observed labels from the labelers, and the genuine labels of the instances. As a result, we can properly select the most informative unlabeled instance for labeling, and also use a query instance's label obtained from the most reliable labeler to teach the most unreliable labeler(s).

3. How can the IAPR help young researchers?

As a PhD student, I think it is important to enrich our knowledge and expand our sight to further encompass the relevant research fields. Many research students, like me, spend majority time in learning background knowledge for specific research tasks. We seldom pay attention to excellent research works that are in different fields and have very limited opportunities to directly communicate with other good researchers in the relevant areas. An academic association can help promote research talks on how to start a successful research career for young students and provide a platform for senior researchers to share their expertise and experiences of doing high quality research.

I also think that it would be beneficial to provide a short academic course for young researchers to enhance their background knowledge. The short course would also provide a chance for young researchers to communicate with others and gain mutual benefits.

From the ExCo

Uppsala September 20, 2013

The students have returned to Uppsala after the Summer break in Sweden. This means that on the roads, we now have 40,000 bikers moving to and from lectures, which is quite an impact on a city with a population of only 200,000. I enjoy the fascinating task of teaching the students what I have learned myself. I enjoy the task of supervising PhD students so they become full-fledged researchers in our community. The other morning I came to think that some of these bikers passing me at full speed may well be the future of our association. What a pleasant thought!

Between ICPRs the Executive Committee has one physical meeting. According to the tradition, this meeting is hosted by the Past President. We were invited by Professor Denis Laurendeau to meet on August 20-21 at his lab in Québec City, Canada. On our agenda was to check the status of the Standing and Technical Committees by acting on interim reports that the respective Chairs had sent us and to review the financial situation, e.g., by checking the membership dues. We had a busy two-day meeting in order to cover all the items.

Some of the things we discussed thoroughly were: the forming of the Maria Petrou Prize suggested at the GB meeting in Tsukuba (the Advisory Committee is preparing a proposal); potential new member societies of IAPR (the Membership Committee is very active); and the status of the upcoming ICPRs in Stockholm and Cancun in 2014 and 2016, respectively.

I would like to take this opportunity to remind you and your colleagues to plan for the 22nd International Conference on Pattern Recognition (ICPR 2014) in Stockholm on August 24-28, next year. The call for full papers has the firm deadline December 20. See http://www.icpr2014.org/ for details, such as, the five invited speakers (one per track). Note that the ExCo has decided to announce 50 stipends of US$1000 for attending ICPR 2014.

In addition to the regular features of "Getting to Know" an IAPR Fellow and introducing readers to IAPR's "Next Generation", this edition of the *IAPR Newsletter* has the first installment of a new series on Unsolved Problems in Pattern Recognition. The editors welcome your feedback on this new series. Send your comments to unsolved@iapr.org.

Please, visit the IAPR webpage http://www.iapr.org/ regularly for information on IAPR matters.

Ingela Nyström
IAPR Secretary

GbR 2013

9th IAPR - TC15 Workshop on Graph-based Representations in Pattern Recognition

Vienna, Austria
May 15-17, 2013
http://gbr2013.prip.tuwien.ac.at

Co-Chairs:
Walter Kropatsch (Vienna University of Technology, Austria)
Nicole Artner (Vienna University of Technology, Austria)
Yll Haxhimusa (Vienna University of Technology, Austria)
Xiaoyi Jiang (University of Münster, Germany)

by Andrea Torsello

GbR is a biennial workshop, organized by IAPR Technical Committee 15 (TC-15) on Graph-based Representations, that aims to encourage research works in Pattern Recognition and Image Analysis within the graph theory framework.

GbR 2013 was a successful and smoothly run workshop held in Vienna, Austria. The workshop received 27 submissions from 10 countries from which the Program committee selected 24, including the contributions of the invited speakers, for oral presentation and publication in the proceedings, Springer LNCS Volume 7877. A few selected contributions where also selected for publication in an extended form in a special issue of the Pattern Recognition journal.

The papers presented in the workshop covered the use of graphs at all levels of representation, providing novel contributions on a wide range of topics related to graphs from theoretical contributions to applications; from discovering the new properties of a single graph (graph edit distance, maximum cut, graph characteristics derived

Click above to go the publisher's web site.

from Schroedinger equation) to developing algorithms for sets of graphs, maximum subgraph problems and graph matching. A great interest was shown in the problems of graph kernels and topology.

The workshop included two IAPR keynote addresses. The fist keynote speech was presented by Mario Vento (Università di Salerno, Italy) who, in a talk entitled "Graphs in Pattern Recognition: a one hour trip in the history", summarized the development of graph-based

representations starting with the original motivation. It allowed the younger generation of our community to compare the goals and expectations of the early years with the current state.

The second invited talk, "Persistent Hology in Image Processing" delivered by Herbert Edelsbrunner (Institute of Science and Technology, Austria), created a new bridge from TC15 to the area of topology and persistence.

The workshop was run over three days, with 36 registered attendees, and was well populated right through to the end, providing an excellent forum for discussion and feedback.

MCS 2013
11th International Workshop on Multiple Classifier Systems

Nanjing, China
May 15-17, 2013
http://www.diee.unica.it/mcs/

Workshop Chairs:
Zhi-Hua Zhou (Nanjing University, China)
Josef Kittler (University of Surrey, United Kingdom)
Fabio Roli (University of Cagliari, Italy)

by workshop committee members Yang Yu (China) Fabio Roli, Josef Kittler and Zhi-Hua Zhou

The 11th International Workshop on Multiple Classifier Systems (MCS 2013), chaired by Zhi-Hua Zhou (Nanjing University, China), Fabio Roli (University of Cagliari, Italy) and Josef Kittler (University of Surrey, UK), was held in Nanjing, China, during May 15–17, 2013.

MCS 2013 received 59 full submissions. The Program Committee consisting of 45 experts carefully reviewed the submissions, with the help of some external reviewers. Based on the reviews, 34 papers have been selected for presentation at the workshop and inclusion in the proceedings published by Springer as the volume 7872 of Lecture Notes in Computer Science. The workshop program was significantly enhanced by three invited talks given by world renowned experts: Bin Yu (UC Berkeley, USA), Marco Loog (Delft University of Technology, The Netherlands), and Xin Yao (University of Birmingham, UK). The slides of the keynote talks are available online on the MCS 2013 web site (*http://www.diee.unica.it/mcs*). Fifty-five participants attended the workshop.

This workshop was organized by the LAMDA Group of the National Key Laboratory for Novel Software Technology, Nanjing University, China, the Center for Vision, Speech and Signal Processing of the University of Surrey, UK, and the Department of Electrical and Electronic Engineering of the University of Cagliari, Italy. It was sponsored by IAPR and the IEEE Computer Society Nanjing Chapter.

The Proceedings of MCS2013 has been published as:
Zhi-Hua Zhou, Fabio Roli, Josef Kittler, eds., Multiple Classifier Systems, Lecture Notes in Computer Science Vol. 7872, Springer, 2013

MVA 2013
13th IAPR International Conference on Machine Vision Applications

Kyoto, Japan
May 20-23, 2013
http://www.mva-org.jp/mva2013/

General Chair:
Yoichi Sato (University of Tokyo, Japan)

by Yoichi Sato, General Chair

The Thirteenth IAPR International Conference on Machine Vision Applications (MVA 2013) was co-sponsored by the MVA Organization, IAPR TC-8 and Ritsumeikan University. The venue was the Suzaku Campus of Ritsumeikan University located in the heart of Kyoto, the ancient capital of Japan. MVA 2013 attracted 208 researchers and practitioners working in the field of machine vision from many countries.

We received 156 full-paper submissions from 24 countries. Among those submissions, 32 papers were selected for single-track oral presentation, together with 80 papers for poster presentation, through rigorous peer-reviewing process carried out by the program committee composed of active and up-and-coming researchers/engineers around the world. The conference proceedings will be made accessible via MVA Organization web page (*http://www.mva-org.jp/proceedings.php*) along with all proceedings of the past MVA conferences.

During the conference, three IAPR invited talks were given by distinguished researchers from academia and industry:

- "Towards open-universe image parsing with broad coverage" by Prof. Svetlana Lazebnik (University of Illinois at Urbana-Champaign),
- "Development of ultrahigh-sensitivity HARP pickup tube" by Dr. Keikichi Tanioka (Ex-Director General, NHK STRL), and
- "3D vision sensing technologies in factory automation and robotics" by Dr. Mattias Johannesson (SICK).

MVA 2013 also offered technical demonstrations and two tutorial sessions given by top computer vision researchers: "randomized forest and tree-structured algorithms in computer vision" by Prof. Tae-Kyun Kim (Imperial College London) and "large scale structure from motion and localization" by Dr. Akihiro Torii (Tokyo Institute of Technology).

Following the MVA tradition, the following four awards were presented at the conference.

Most Influential Paper over the Decade Award (selected from the papers presented at MVA 2002)

- "Adaptive Background Estimation" by Mickael Pic, Luc Berthouze and Takio Kurita
- "Robust and Fast Stereovision Based Road Obstacles Detection for Driving Safety Assistance" by Raphael Labayrade and Didier Aubert
- "A 51.2 GOPS Programmable Video Recognition Processor for Vision-Based Intelligent Cruise Control Applications" by Shorin Kyo

Best Paper Award

- "An Image-Based System for Change Detection on Tunnel Linings" by Simon Stent, Riccardo Gherardi, Björn Stenger, Kenichi Soga, and Roberto Cipolla

Best Practical Paper Award

- "Perspective Click-and-drag Area Selections in Pictures" by Frank Nielsen

Best Poster Presentation Award

- "Gradient Histogram Background Modeling for People Detection in Stationary Camera Environments" by Victor Borjas, Jordi Vitrià, and Petia Radeva
- "Vehicles Detection and Tracking in Videos for Very Crowded Scenes" by Sara Atito Aly, Ahmed Mamdouh, and Moatz Abdelwahab
- "Scattering Tomography by Monte Carlo Voting" by Yasunori Ishii, Toshiya Arai, Yasuhiro Mukaigawa, Junichi Tagawa, and Yasushi Yagi

The next MVA will be organized by a team lead by Yasuyo Kita (AIST, Japan) as General Chair and Takeshi Masuda (AIST, Japan) and Björn Stenger (Toshiba Research Europe, UK) as Program Co-Chairs, and it will be held in Tokyo around the same time of the year in 2015.

ISMM 2013
11th International Symposium on Mathematical Morphology

Uppsala, Sweden
May 27-29, 2013
http://ismm.cb.uu.se/

Organisers:

Gunilla Borgefors, General Chair (Uppsala University, Sweden)
Cris Luengo Hendriks, Programme Chair (Uppsala University, Sweden)
Robin Strand, Local Organisation Chair (Uppsala University, Sweden)
Christer Kiselman, Invited Speakers' Chair and Advisor (Uppsala University, Sweden)
Vladimir Ćurić, Assistant (Uppsala University, Sweden)

by Gunilla Borgefors

First we would like to thank the Steering Committee of the ISMM for giving us the confidence to organise this meeting. It was a lot of work, but it was also great fun. And we hope the participants were as satisfied with the result as we are.

ISMM presents new research on theory and applications of mathematical morphology and has taken place about every two years since 1993. This was the first time in Sweden and the northernmost edition so far. The venue was the Ångström laboratory of Uppsala University, named after Anders Ångström, the Professor in Uppsala who defined the tiny unit bearing his name.

We received 52 submissions, each of which was sent to at least three Programme Committee members for review. Based on 153 detailed reviews, we accepted 33 papers and conditionally accepted another eight. These eight papers were accepted after substantial revision by the authors in response to reviewer concerns. We decided to conditionally accept papers that needed an important change, because each of us has listened to the presentation of a paper we reviewed, only to realize that the authors did nothing with our comments. In this case, however, and to our delight, even papers we accepted without conditions were in most cases extensively rewritten in response to reviewer comments. For small conferences we highly recommend conditional acceptance, as we found it will considerably increase the quality of the proceedings. Of course, the most important people for a high-quality meeting – apart from the authors – are the reviewers. Thank you all for doing dedicated and excellent work!

In addition to the 41 reviewed papers, the ISMM proceedings contain three papers authored by our invited speakers. The proceedings are available on-line from Springer, LNCS 7883 (*http://link.springer.com/book/10.1007/978-3-642-38294-9/page/1*).

The IAPR invited speaker was Prof. Ron Kimmel from Technion in Haifa, Israel, who gave the talk "The Laplace–Beltrami operator: a ubiquitous tool for image and shape processing," that was co-authored by Aaron Wetzler, Yonathan Aflalo, and Anastasia Dubrovina. The ubiquity of the Laplace-Beltrami operator in shape analysis can be seen by observing the wide variety of applications where it has been found to be useful. Here we demonstrate a small subset of such uses with their latest developments including a scale invariant transform for general triangulated meshes, an effective and efficient method for denoising meshes using Beltrami flows via high dimensional embeddings of 2D manifolds and finally the possibility of viewing the framework of geodesic active contours as a surface minimization having the Laplace-Beltrami operator as its main ingredient.

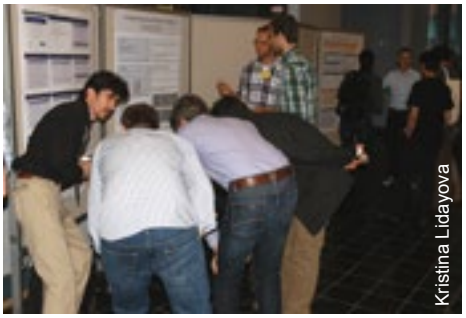
Click above to go the publisher's web site.

The Swedish Research Council sponsored the two other invited speakers, Christine Voiron-Canicio and Bhabatosh Chanda.

Prof. Voiron-Canicio from the University of Nice Sophia Antipolis and the CNRS Laboratory ESPACE, France, represented applications of mathematical morphology and gave the talk "Geography, mathematics and mathematical morphology." Mathematical Morphology (MM) was introduced in geographical sciences during the years 1970-1980. However it did not find the same echo in the geographer community according the areas of research. Unlike remote sensing where MM tools have been used as early as in the eighties and are nowadays widespread, in the research works resorting to spatial analysis and modelling, MM is much rarer. And yet morphological analyses exactly match the purpose of spatial analysis. This talk aims to demonstrate the relevance of MM in geography and more precisely in spatial analysis. The three applications proposed focus on socio-economic issues: urban zones of influence detection, regional differentiations analysis and spatial modelling. Finally, are highlighted and discussed the major shortcomings which hold up the spread of MM in geography, planning and geomatics.

Prof. Chanda from the Indian Statistical Institute in Kolkata gave the talk "Adaptive Morphologic Regularizations for inverse problems" co-authored by Pulak Purkait. Regularization is a well-known technique for obtaining stable solution of ill-posed inverse problems. In this paper we establish a key relationship among the regularization methods with edge-preserving noise filtering method which leads to an efficient adaptive regularization methods. We show experimentally the efficiency and superiority of the proposed regularization methods for some inverse problems, e.g. deblurring and super-resolution (SR) image reconstruction.

The total number of participants was 69 and the dominant nation was France. Of the 41 papers accepted after review, 26 where selected for oral presentations in a single track and 15 where selected for one of two small, lively



Lively discussions during one of the poster sessions.

poster sessions. The papers were generally of high quality and the presentations very interesting. We were especially pleased and honoured that two of the reviewed papers were co-authored, and one presented, by Prof. Jean Serra, who, together with George Matheron, invented mathematical morphology in the 1960s. His papers were entitled "Optima on Hierarchies of Partitions" and "Ground Truth Energies for Hierarchies of Segmentations", both co-authored with Bangalore Ravi Kiran.

Thirteen authors of ISMM 2013 papers have been invited to submit manuscripts to a special issue of Pattern Recognition Letters on mathematical morphology, together with anybody that wants to submit a paper on theory or applications of the subject. The special issue is expected to appear next year.

The social program started with a simple get-together the day before the symposium started. The first conference day ended with a Gala dinner at the "Nation of Ostrogothia." Uppsala University was founded in 1477 and in the old days students from the same region in Sweden got together for mutual support in "nations" in Uppsala. Many nations have nice old houses, were various festivities occur. To keep the participants to the end, the conference ended with a late Farewell lunch.

We are very grateful to our many sponsors: the IAPR, the Swedish Research Council, and the Centre for Interdisciplinary Mathematics at Uppsala University for sponsoring the invited speakers, the City of Uppsala for sponsoring the conference dinner, and Uppsala University and the Swedish University of Agricultural Sciences for financial support. We would also like to acknowledge Springer for doing most of the work involved in putting the proceedings together from all the manuscripts

The 12th ISMM will take place in Reykjavik, Iceland, May 27-29 2015. *http://mathematicalmorphology.org/ismm2015/*.

Biometrics 2013
10th International Summer School for Advances in Biometric Authentication: Understanding Man-Machine Interactions in Forensics and Security Applications

Alghero, Italy
June 10-15, 2013

by Massimo Tistarelli

This was the 10th edition of a strongly established training course started in 2003 to promote knowledge dissemination and research in Biometrics and related fields. The school's main theme was related to the application of multimodal biometric systems in forensics and security. The school particularly addressed the impact of biometric technologies in forensic applications and the algorithmic solutions to facilitate the understanding of human behaviours.

Several subjects were taught at the summer school forming a total of 32 hours of lectures from 21 different lecturers. The subjects ranged from fundamentals such as machine learning and pattern recognition techniques as applied to biometrics to more advanced topics—such as human-computer interaction and facial expression/ emotion understanding—and applied subjects—such as the large scale evaluation of biometric systems and the development of biometrics technologies in forensics.

This 10th commemorative edition of the summer school, saw a lineup of exceptional lecturers, selected from the editorial boards of top-level scientific journals and conferences. Two outstanding neuroscientists presented a comprehensive overview of the state of the art in the mapping of the brain activities, through FMRI studies, as related to visual perception and face recognition. A practical session was devoted to the recording and operational usage of biometric traces in law enforcement.

53 participants attended the school lectures. The class was formed by students coming from different universities, industries and research centres in the following 19 different countries (in brackets are the number of participants from this country, if greater then one):

Algeria, Australia (3), Austria (2), Brazil (3), Cuba, Denmark (2), Finland (3), Germany, India, Israel, Italy (10), Mexico (2), Netherlands (4), Norway (3), Russia, South Africa, Spain (2), United Kingdom (9), United States (3).

This year's students demonstrated a quite deep knowledge of both application and theory of biometrics. Most of them are either working directly in the design of biometric systems or are pursuing high level scientific research in the field. This not only facilitated a very good interaction between students and lecturers, even within the more theoretical lectures, but also stimulated and challenged even the most experienced lecturers with questions and requests for explanations in the course of almost all presentations. As a result, both the students and lecturers have been much involved in technical discussions and plans for collaborations.

Remarkably, representatives of government agencies also attended the school courses. This not only denotes the high reputation gained by the school, but also a deep interest of different government offices in the adoption and newer biometric technologies in the service of the citizens. Given this was the 10th anniversary of the Int.l Summer School on Biometrics, a special commemorative plaque was made and presented to the lecturers. The plaque, entitled to IAPR, was duly inscribed for each lecturer and signed by the IAPR president and the school director.

A total of 6 students from 3 different countries were partially supported by a grants from this IAPR sponsorship. The awarded students were selected on the basis of three criteria: public recognition of their research record; year of enrolment in the Phd program; and active participation in the IAPR activities.

The school participants were offered the possibility to display a poster on their research activity and to submit a research paper to be orally presented at two special sessions organized during the week. The participants presented 26 posters, which were available during the entire week. Seven Phd students made an oral presentation of their on-going research work.

MCPR 2013
5th Mexican Conference on Pattern Recognition

Queretaro, Mexico
June 26-29, 2013
www.mcpr.org.mx

Co-Chairs:
Jesús Ariel Carrasco-Ochoa (INAOE, Mexico)
José Francisco Martínez-Trinidad (INAOE, Mexico)
Joaquin Salas (Mexico)

by The Co-chairs

The 5th Mexican Conference on Pattern Recognition (MCPR2013) was held at the Museo Regional of Queretaro, Mexico. The conference was organized by CICATA and the Computer Science Department of the National Institute for Astrophysics Optics and Electronics (INAOE). MCPR2013 was sponsored by the Mexican Association for Computer Vision, Neural Computing and Robotics (MACVNR) and the International Association for Pattern Recognition (IAPR).

MCPR2013 received contributions from 18 countries. In total 81 papers were submitted, out of which 36 were accepted for publication in the MCPR2013 proceedings and for presentation at the conference in a single track. The review process was carried out by the Scientific Committee, composed of internationally recognized scientists (more than 70% non-Mexi can scientists), all experts in their respective fields, who prepared an excellent selection.

The 36 accepted papers were published by Springer Verlag in the volume Pattern Recognition, LNCS 7914, edited by Jesús Ariel Carrasco-Ochoa, José Francisco Martínez-Trinidad, Joaquin Salas Rodríguez, and Gabriella Sanniti Di Baja.

The oral sessions covered the topics: Computer Vision, Image Processing, Pattern Recognition and Artificial Intelligence, Neural Networks, and Document Processing.

Three professors were invited to give keynote addresses and tutorials on topics in Pattern Recognition:

- Professor Roberto Manduchi (Departament of Computer Engineering, University of California at Santa Cruz, USA) gave a talk about "Assistive Technology for People with Blindness" sharing his experiences about this topic over several real applications.
- Professor Raul Rojas (Department of Mathematics and Computer Science, Free University of Berlin, Germany) gave a talk about "First autonomous car in Mexico", discussing different open research problems related to PR.
- Professor Sai Ravela (Dept. of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, USA) gave a talk about " Earth Vision: Pattern-based Approach in Ecology and Environment", highlighting the importance of the development of PR tools for ecology and environment conservation.

The last day of the conference the invited speakers along with Robert Pless (Department of Computer Science and Engineering, Washington University in St. Louis) and Edgar F. Roman-Rangel (Computer Vision and Multimedia Lab, CUI, University of Geneva), presented enlightening tutorials on several Pattern Recognition topics at the Center on Applied Science and Advanced Technology (CICATA) of the National Polytechnic Institute (IPN) of Mexico, located in Queretaro.

This year MCPR included a PhD Students' Meeting. In addition to promoting their participation in conference events, this enabled students to discuss their research in order to receive feedback and advice on future directions from experienced researchers and learn from each other. Seven PhD. contributions were carefully selected to be presented at the Conference as posters, and these contributions were also published as a special issue of th e journal Research in Computing Science edited by the National Polytechnic Institute.

During the event, meals took place at the restaurant "San Miguelito" a nice place where traditional Mexican food is served . The conference dinner was at the restaurant "La casa de la Marqueza" a beautiful old house listed as one of UNESCO's world Heritage sites located at historic center of Queretaro.

We are sure that MCPR 2013 provided a fruitful forum that helped to enrich the collaboration between the Mexican Pattern Recognition researchers and the broader international Pattern Recognition community.

The steering committee for the MCPR decided the 6th Mexican Conference on Pattern Recognition will be held in Cancun, Mexico in the last week of June 2014, organized by the University of Puebla and the National Institute for Astrophysics Optics and Electronics.

Click above to go the publisher's web site.

ICVSS 2013

Calabria ~ 14-20 July

International Computer Vision Summer School

http://svg.dmi.unict.it/icvss2013/

SCHOOL DIRECTORS

Roberto Cipolla, University of Cambridge, United Kingdom
Sebastiano Battiato, University of Catania, Italy
Giovanni Maria Farinella, University of Catania, Italy

by Sebastiano Battiato and Givanni Maria Farinella

Le Castella, one of the marine protected areas of Calabria—considered the Caribbean of Europe thanks to its pristine beaches, stunning landscape, and rustic charms—played host to over 150 young researchers, selected from 353 applicants, in July for the International

Computer Vision Summer School 2013. The school directors, Prof. Sebastiano Battiato and Dr. Giovanni Maria Farinella of the University of Catania, and Prof. Roberto Cipolla of the University of Cambridge, chose Computer Vision and Machine Learning as the topics for the seventh successive year of the highly popular series of lectures and tutorials. The school was endorsed by IAPR and GIRPR.


David Moltisanti

The courses were delivered by world renowned experts in the field:

- Serge J. Belongie, University of California, San Diego, USA
- Horst Bischof, Graz University of Technology, Austria
- Vance Bjorn, DigitalPersona, USA
- Daniel Cremers, Technische Universität München, Germany
- Trevor Darrell, University of California, Berkeley, USA
- Irfan Essa, Georgia Institute of Technology, USA
- Andrea Fusiello, Università degli Studi di Udine, Italy
- Svetlana Lazebnik, University of Illinois at Urbana-Champaign, USA
- Yann LeCun, New York University, USA
- Vincent Lepetit, Ecole Polytechnique Fédérale de Lausanne, Switzerland
- Pietro Perona, California Institute of Technology, USA
- Bernt Schiele, Max-Planck-Institut für Informatik, Germany
- Jamie Shotton, Microsoft Research Cambridge, United Kingdom
- Stefano Soatto, University of California, Los Angeles, USA
- Antonio Torralba, Massachusetts Institute of Technology, USA
- Andrea Vedaldi, University of Oxford, United Kingdom

In amongst a packed program of over 30 hours of presentations, the organizers found time for a tour of the ancient and picturesque town of Santa Severina (KR) including the opportunity to experience the local traditions in the form of folk dancing and a delicious feast featuring many of the local delicacies.

Intended to provide a review in the existing state-of-the-art research, one of the greatest attractions of the school has been the opportunity for students at the start of their research careers to challenge and question both the professors and each other in an informal and relaxed setting, providing an inspirational atmosphere, a chance to improve research skills (though activities such as the reading group, posters session, essay competition), and fostering a sense of community.

Four prizes were assigned by the school committee.

The scholarship to the best student (grant offered by GIRPR) was assigned to Alexander Hermans, RWTH Aachen University, Germany.

The best presentation prize (grant offered by Toshiba) was assigned to Matthias Zeppelzauer, Vienna University of Technology, Austria.

The winner of the essay competition (grant offered by ICVSS) was Rina Rudyanto, University of Navarra, Spain.

The reading group prize has been assigned to a group of students of IPLAB - University of Catania, Italy: Antonino Furnari, Mario Valerio Giuffrida, Davide Moltisanti, Marco Moltisanti.

As students prepared for the closing ceremony and an evening party at the beach, many students expressed their desire to get back to the lab to test out new ideas and look forward to next year's school which will be announced soon in December 2013.

All the information about ICVSS are available at http://www.dmi.unict.it/icvss.

Check the ICPR 2014 web site www.icpr2014.org for the most up-to-date information.

CALL FOR PAPERS FOR ICPR 2014

22nd INTERNATIONAL
CONFERENCE ON PATTERN
RECOGNITION
2014

AUGUST 24-28, 2014,
STOCKHOLM WATERFRONT, STOCKHOLM, SWEDEN
www.icpr2014.org

ICPR 2014 will be an international forum for discussions on recent advances in the fields of Pattern Recognition; Machine Learning and Computer Vision; and on applications of these technologies in various fields.

ORGANIZING COMMITTEE

General Chair Prof. Magnus Borga, Linköping University
Program Chair Prof. Anders Heyden, Lund University
Program Co-Chair Prof. Denis Laurendeau, Université Laval
Local Arrangements Chair Prof. Ingela Nyström, Uppsala University
Local Arrangements Co-Chair Prof. Aysin Baytan Ertuzun, Boğaziçi University
Finance Chair Prof. Ewert Bengtsson, Uppsala University
Invited Speakers Chair Prof. Gunilla Borgefors, Uppsala University
International Liaison Chair Prof. Kim Boyer, Rensselaer Polytechnic Institute

TRACKS, CHAIRS AND INVITED SPEAKERS

Computer Vision
Kalle Åström, Sweden
Kostas Danilidis, US
Kenichi Kanatani, Japan
Invited Speaker: **Raquel Urtasun**, US

Pattern Recognition and Machine Learning
Gabriella Sanniti di Baja, Italy
Sudeep Sarkar, US
Terence Sim, Singapore
Invited Speaker: **Mark Girolami**, UK

Biomedical Image Analysis
Max Viergever, The Netherlands
Dimitris Metaxas, US
Naokazu Yokoya, Japan
Invited Speaker: **Nikos Paragios**, France

Image, Speech, Signal and Video Processing
Theo Gevers, The Netherlands
Eduardo Bayro-Corrochano, Mexico
Shin'ichi Satoh, Japan
Invited Speaker: **Fei-Fei Li**, US

Document Analysis, Biometrics and Pattern Recognition Applications
Massimo Tistarelli, Italy
Larry Davis, US
Bidyut B. Chaudhuri, India
Invited Speaker: **Stan Li**, China

IMPORTANT DATES

15 September 2013 Deadline for contest, tutorial and workshop proposals
1 November 2013 Submission opens
20 December 2013 Deadline for submission of full papers (6 pages)
24 March 2014 Notification of paper acceptance
21 May 2014 Deadline for camera-ready papers and Early Bird registration

WORKSHOPS, CONTESTS AND TUTORIALS

Workshops, contests and tutorials will be arranged the first day of the conference.

Conference Secretariat:
Academic Conferences, info@icpr2014.org

IAPR Linköpings universitet LUNDS UNIVERSITET UPPSALA UNIVERSITET

Call for Nominations

King-Sun Fu Prize

Nomination deadline: January 15, 2014

Nomination and endorsement forms can be downloaded from the KS Fu Prize page of the IAPR web site.

Past Winners of the K-S Fu Prize

Rama Chellappa
2012 Japan

Horst Bunke
2010 Istanbul

Josef Kittler
2008 Tampa

J. K. Aggarwal
2004 Cambridge

Thomas Huang
2002 Quebec City

Theo Pavlidis
2000 Barcelona

Jean-Claude Simon
1998 Brisbane

Teuvo Kohonen
1996 Vienna

Herbert Freeman
1994 Jerusalem

Laveen Kanal
1992 The Hague

R. L. Kashyap
1990 Atlantic City

Azriel Rosenfeld
1988 Rome

The International Association for Pattern Recognition (IAPR) is pleased to announce a call for nominations for the King-Sun Fu Prize in honor of the memory of Professor King-Sun Fu. (Professor Fu's biography appeared in the IEEE Trans. PAMI, May 1986 and is also available at *http://dataclustering.cse.msu.edu/KSFu_Biography.pdf*.)

Videos and slides of talks given by the most recent recipients of the KS Fu Prize can be retrieved from this website: *http://www.cse.nd.edu/Fu_Prize_Seminars/*.

Professor Fu was instrumental in the founding of IAPR, served as its first president, and is widely recognized for his extensive contributions to the field of pattern recognition.

This biennial prize is given to a living person in recognition of an outstanding technical contribution to the field of pattern recognition, and consists of a cash amount and a suitably inscribed certificate. The prize is derived from interest income from a special fund set up for this purpose.

The nomination must be made by a member of a national member society of IAPR and by endorsement of at least five members, representing at least two member societies different from that of the nominator. The prize recipient shall be selected by the Prize Committee, subject to approval by the IAPR Governing Board. Members of the IAPR Executive Committee, as well as of the Prize Committee, shall be ineligible for the prize and may not serve as nominators or endorsers.

The 2014 prize will be presented at the

22nd International Conference on Pattern Recognition (ICPR)
Stockholm, Sweden, August
August 24-28, 2014

The nomination must be made on special nomination and endorsement forms, and must be received by the Prize Committee Chairman **no later than January 15, 2014**. Completed and signed nomination and endorsement forms must be submitted as pdf files to the chairman of the Prize Committee:

Prof. Rama Chellappa
Chair, K-S. Fu Prize Committee
University of Maryland, College Park, MD, 20742, USA
email: *rama@cfar.umd.edu*

King-Sun Fu Prize nomination and endorsement forms can be retrieved here:

Nomination Form (.doc)
Endorsement Form (.doc)

Additional ICPR 2014 Calls for Nominations

Call for Nominations

J. K. Aggarwal Prize

Deadline for Submission of Nomination and Endorsement Form is January 15, 2014

The International Association for Pattern Recognition (IAPR) is pleased to announce a call for nominations for the J.K. Aggarwal Prize. Professor Aggarwal is widely recognized for his extensive contributions to the field of pattern recognition and for his participation in IAPR's activities.

The recipient is a young scientist, under the age of 40 at the date of the deadline for nominations, who has brought a substantial contribution to a field that is relevant to the IAPR community and whose research work has had a major impact on the field.

The prize recipient shall be selected by the J. K. Aggarwal Prize Committee, subject to approval by the IAPR Governing Board, upon nomination by a member of a national member society of IAPR and by endorsement of four members, representing at least two member societies different from that of the nominators and nominee.

Members of the IAPR Executive Committee, as well as of the J.K. Aggarwal Prize Committee, shall be ineligible for the prize and may not serve as nominators or endorsers.

The 2014 prize will be presented at the

22nd Int'l Conference on Pattern Recognition (ICPR)
Stockholm, Sweden
August 24-28, 2014

The prize recipient is expected to present an invited talk at the conference. The nomination must be made on special nomination and the endorsement forms, and must be received no later than January 15, 2014. Both completed nomination and endorsement forms must be submitted in electronic form. The nominator as well as endorsers should email their completed forms directly to the Appointed Chairman of the J.K. Aggarwal Prize Committee via the specified email address:

Antonio Torralba
Chair, J.K. Aggarwal Prize Committee
Office: 32-D530
32 Vassar Street
Cambridge, MA 02139
USA
email: *torralba@csail.mit.edu*

J. K. Aggarwal Prize Nomination Forms:

Endorsement Form (.doc)
Nomination Form (.doc)

Call for Nominations

IAPR Fellow Award

Deadline for Submission of Nomination and Endorsement Forms is January 31, 2014

We welcome nominations for the award of FIAPR. Anyone is eligible to be nominated, except for the current members of the Executive Committee and of the Fellow Committee.

To initiate a nomination, a nominator must submit an IAPR Fellow Nomination Form. Any member of an IAPR Member Society can serve as nominator, except for the nominee him/herself and the current members of the Fellow Committee.

Each nomination must be endorsed by at least one recommendation letter (submitted Endorsement Form), either from a member of an IAPR Member Society (different from the nominator) or from an IAPR Fellow.

Electronic Nomination and Endorsement forms should be submitted **no later than January 31, 2014**.

Each electronic submission will be acknowledged by an email containing the submitted form. In case of difficulty please address your data and the problem encountered through email to the chair of the Fellow Committee, Brian Lovell,

To: *lovell@itee.uq.edu.au*
Subject: IAPR Fellowship 2014
CC: *webmaster@iapr.org*

For detailed information about the nomination and the endorsement, please download these instructions.

Electronic versions of the nomination forms are also available.

IAPR appreciates your efforts to support our fellowship program!

BOOKSBOOKSBOOKS

Digital Imaging for Cultural Heritage Preservation: Analysis, Restoration, and Reconstruction of Ancient Artworks
By Filippo Stanco, Sebastiano Battiato, and Giovanni Gallo (Eds.)

CRC Press, 2011

Reviewed by Arjan Kuijper (Germany) and Dieter W. Fellner (Germany)

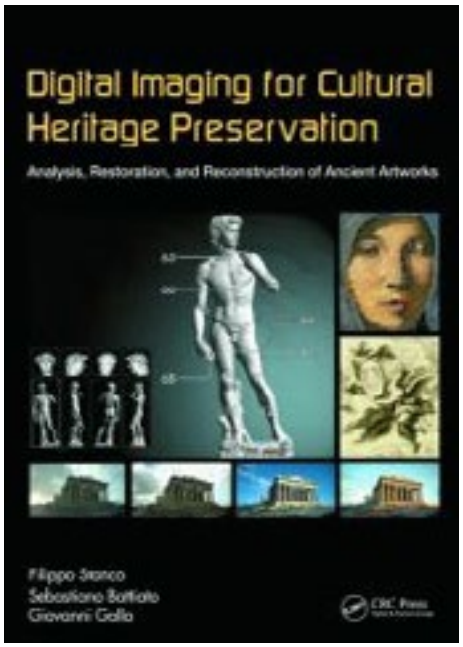
How do we summarize the diverse and numerous contributions in this book? Around 500 pages full of information center on the title words. So let us quote a part from the preface:

> "Paintings, frescos, antique photographic prints, incunabulas (check *http://en.wikipedia.org/wiki/Incunable*!), old books, handwritten documents, sculptures, ceramic fragments and other ancient manufacts constitute the elements of an extremely valuable and immense historical patrimony. The digitalization of these treasures opens up the possibility of using image processing and analysis and computer graphics techniques to preserve this heritage for future generations and to augment it with accessory information or with new possibilities for its enjoyment and use. Digital imaging solutions can be used to generate virtually restored versions of the original artworks to be presented in online museums and/or for further development of historical studies; application of various feature extraction and image data analysis techniques are useful in addressing problems of authorship and artwork style categorization in the history of the arts; three-dimensional reconstruction of ancient artworks or entire archeological sites allows the creation of multidimensional models that incorporate information coming from excavations, archaeological know-how, and heterogeneous historical sources. "

The editors are completely right. From our own experience we can say:

Millions of cultural heritage artifacts populate our museums and about 90% still await discovery in museum archives. The 3D Documentation of cultural heritage artifacts represents a huge potential which is largely unexplored.

- Arbitrary availability and concurrent access to digital surrogates of cultural heritage artifacts for art historians and scientists.
- Use of digital surrogates in cultural heritage institutions for exhibition planning, documentation and acquisition planning.
- Virtual presentation (combined with new forms of presentation technologies, such as hybrid exhibitions) as a means to increase attractiveness
- Physical surrogates based on digital 3D models
- Substitute loaning of cultural heritage artifacts by digital surrogates avoiding damage from transport, insurance fees and legal issues.
- Reusability of historically correct 3D models in gaming and the film industry as well as for architectural reconstruction.



Natural disasters such as the collapse of the historic archive in Cologne in 2009 (*http://en.wikipedia.org/wiki/Historical_Archive_of_the_City_of_Cologne*), and the fire at the Anna Amalia library in Weimar in 2004 (*http://en.wikipedia.org/wiki/Duchess_Anna_Amalia_Library*), but also prolonged armed conflict and fanaticism, destroying outstanding cultural heritage like the Bamiyan Buddhas in Afghanistan in 2001 (*http://whc.unesco.org/en/activities/2/*), and impecuniousness and officialdom, which have allowed Pompeii to deteriorate so badly (*http://www.prospectmagazine.co.uk/magazine/ashes-to-ashes-the-latter-day-ruin-of-pompeii/#.UcwW1KzPYVc*), remind us of the importance of digitally preserving our cultural heritage.

Currently the process of building 3D digitized virtual surrogates from existing Cultural Heritage resources often requires an investment of several thousand

Euros per object. Given the fact that several hundreds of millions of objects exist in Cultural Heritage institutions (more than 130 million alone in the collection of the Smithsonian), the cost and time to create a surrogate for each artifact is simply prohibitive.

According to an extensive study by the Victoria and Albert Museum conducted in the framework of the European research project 3D-COFORM, the 3D acquisition of moderately sized objects requires 5 to 20 hours with state-of-the-art structured light acquisition techniques for geometry and texture alone—without considering view dependent reflectance properties. (from: Competence Center for Cultural Heritage Digitization, Fraunhofer Institute for Computer Graphics Research, *http://www.igd.fraunhofer.de/en/Institut/Abteilungen/Digitalisierung-von-Kulturerbe*)

To summarize: it is impossible to ignore the (future) impact in digital cultural heritage. As mentioned above, this covers all areas in vision, graphics, processing, acquisition, and storage. This book covers all this issues, some more in depth than others, and is therefore a nice introduction for researchers not that familiar with the topic. Especially of interest were, in our opinion, those chapters where the archeological issues were in the spotlight. These chapters show that cultural heritage "is not just an application area to which I can apply my vision/graphics toolbox", but requires additional thinking. This was also the purpose of this book: it wishes to respond to the growing demand of this area to bridge the existing gap between the different scientific communities of scientists, historians and archaeologists.

Many of the chapters relate to the EC IST IP project 3D-COFORM (*http://www.3d-coform.eu/*) that deals with this research. This can also be considered as a small drawback: the experienced reader is probably already familiar with this project. The chapters mainly focus on results within this project and on those from some related (mainly Italian) groups. Since Italy is rich in cultural heritage, this in turn can be seen as positive contributions from local experts—both scientists and archaeologists.

Finally, with so many chapters, the diversity spans from image processing (e.g. paintings, documents) to 3D model generation, where every now and then we get the impression that some chapters mainly serve to show the expertise of the authors rather than giving an overview of global state of the art. But, for an introduction in the topic this is fine.

Feature Extraction & Image Processing for Computer Vision, 3rd Edition
by Mark S. Nixon and Alberto S. Aguado

Academic Press, 2012

Reviewed by: Mohamed Moustafa (Egypt)

The book gradually presents image processing and computer vision techniques while focusing on feature extraction for higher level image understanding. It is divided into 9 main chapters and 4 appendices.

The authors start with a brief description of the most efficient vision system of all: the human vision system. They highlight the relationship between the human eye and the nervous system. Chapter One also gives a glimpse on popular digital camera pixel sensors and computer interfaces.

Chapter Two describes the mathematical details of the infamous Fourier transform and its properties. It also discusses other similar transforms, e.g., Discrete Cosine Transform (DCT) and introductory Gabor and Haar wavelet transforms.

Most of the main topic information starts at Chapter Three with an introduction to basic image processing operations. Pixel based (brightness adjustment, histogram equalization) and neighborhood based (spatial 2D kernel filtering) operators are presented followed by morphological ones.

Chapter Four continues the low-level feature extraction by explaining different edge detectors followed by simplifying modern features like (Scale Invariant Feature Transform) SIFT and (Speeded Up Robust Features) SURF.

High-level features are discussed in Chapters Five and Six. Chapter Five covers template matching and all flavors of Hough transforms, suitable

for fixed shape object finding. Active contours and snakes, suitable for deformable shape analysis, are gathered in Chapter Six.

Chapter Seven presents some boundary (chain code and Fourier-based) and region (invariant and Zernike moments) descriptors.

Chapter Eight continues the mainstream discussion by explaining the texture as a way of object description including recent descriptors like the (Local Binary Pattern) LBP operator. The chapter goes on further to hint about distance measures and simple k-nearest neighbor classifier.

Since digital and mobile cameras now are everywhere and very capable of capturing videos, Chapter Nine is dedicated to computer vision related video analysis. The authors here summarize both concepts of moving object segmentation from the background and object tracking.

Appendix One describes camera geometry fundamentals including perspective transformation and affine camera model necessary to understand the geometry of image acquisition. Appendices Two and Three presents least square and Principal Components Analysis PCA useful in dimensionality reduction and object representation. Finally, Appendix Four makes sense of color by introducing different color models.

Overall, the book contents are presented in a simply enough to be recommended for undergraduate students. Each chapter has a wealth of references and pointers to further readings. Throughout the book, MATLAB scripts exemplify implementation of the described algorithms. Matchcad worksheets are also available for (What You See Is What You Get) WYSIWYG fans. All scripts and worksheets can be downloaded from the accompanying website, *http://users.ecs.soton.ac.uk/msn/book/*.

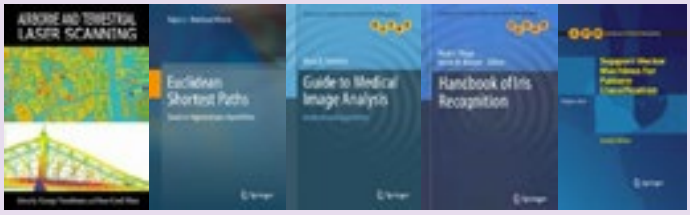
I really enjoyed the great level of detail for some included techniques. For instance, the book goes beyond the usual Hough transform for straight line and ellipses to describe the generalized version suitable for any predefined arbitrary shape object finding. On the other hand, I was hoping to see more details of some recent, well-established, techniques. It is understood that there is a space limitation and the authors must be selective. However, my personal preference would have been to thin down the Fourier transform chapter or move it to an appendix (as it is more related to signal processing material) in favor of putting more details about SIFT, SURF, HoG, and Haar cascades.

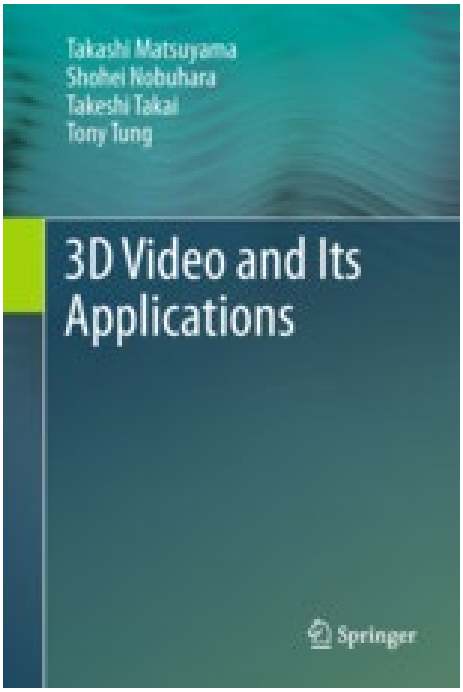
In conclusion, the book is well written and is easy to follow. In fact, the presentation order is the logical order of any actual computer vision system processing pipeline. The authors have done a great job grouping related topics together and touching upon recent techniques.

BOOKSBOOKSBOOKS

We are looking forward to reports on the following books under review:

1. *Airborne and Terrestrial Laser Scanning* by George Vosselman, Hans-Gerd Maas (Whittles Publishing, 2010). Reviewer: Giuseppe Maino.
2. *Euclidean Shortest Paths* by Fajie Li, Reinhardt Klette (Springer, 2011). Reviewer: Bhargab B. Bhattacharya.
3. *Guide to Medical Image Analysis* by Klaus D. Toennies (Springer, 2012). Reviewer: Alexandra Branzan-Albu.
4. *Handbook of Iris Recognition* by Mark J. Burge, Kevin Bowyer, Eds. (Springer, 2013). Reviewer: Valery Starovoitov.
5. *Support Vector Machines for Pattern Classification, 2nd Ed.*, by Shigeo Abe (Springer, 2010). Reviewer: Huthaifa Abderahman.





3D Video and Its Applications
by Takashi Matsuyama, Shohei Nobuhara, Takeshi Takai, and Tony Tung

Academic Press, 2012

Reviewed by: Zheng Liu (Japan)

It was in Professor Matsuyama's laboratory at the Yoshida Hon Machi campus in Kyoto where I first saw a hardcopy of this book, *3D Video and Its Applications*. This book actually summarizes his lab's research activities on 3D video commenced in 1996. As stated in the book, their research began with the cooperative distributed vision for detecting and tracking people. The system was further developed to capture and measure 3D human shape and motion by synchronizing multi-view video data. Continuous effort on texture generation and mapping makes it possible to create full 3D video. The applications of 3D video includes but is not limited to interactive visualization, content editing, etc.

As the record of the lab's research activities, the book is organized in three parts. The first chapter clearly defines the concept of 3D video and illustrates the process of 3D video generation. Chapters 2 to 6 describe the techniques for 3D video generation while Chapters 7 to 10 are devoted to a number of applications.

Chapter 2 describes the setup of the 3D video studio with static cameras. This chapter details the design of the multi-camera system, which includes the camera selection, arrangement, and geometric and photometric calibration.

Chapter 3 expands the use of static cameras in a strictly constrained environment to a wide area with active cameras. The principle of object tracking with active cameras is briefly explained with the introduction to the calibration of those active cameras. A cell-based object tracking and multi-view observation algorithm was developed and implemented by the authors. The basic idea is to partition the scene space into disjoint cells, which was originally proposed by the authors. The camera calibration and object tracking are conducted based on these cells. With this system, it is possible to acquire high-resolution and well-focused multi-view moving video data for the moving objects in a wide area. Chapter 3 also covers topics on camera control, performance evaluation, and system for large scale sport scenes.

3D video production is covered in Part II of the book. Three chapters contribute to 3D shape reconstruction, surface texture generation, and lighting estimation, respectively. Chapter 4 explores the state-of-the-art for 3D shape reconstruction. So far as 3D video production is concerned, the shape reconstruction technologies are categorized into three types, i.e. frame-wise 3D shape reconstruction, simultaneous 3D shape plus motion estimation, and 3D shape sequence reconstruction. Three design factors for 3D shape reconstruction including photo-consistency, visibility evaluation, and shape representation and associated computational model for optimization are then introduced. Taking into account these design factors, the authors implemented practical algorithms for the first and second type reconstruction. Again, quantitative and qualitative evaluations were carried out on the reconstructed results.

Surface texture generation and mapping are described in Chapter 5. Appearance-based view-independent texture generation, view-dependent vertex-based texture generation, and harmonized texture generation are developed and investigated. A viewpoint, also described as virtual camera, is introduced into the computation model of view-dependent texture generation. The harmonized texture generation demonstrates a better performance in comparison with the other two.

Chapter 6 tackles issues with the complex dynamic light field. A lighting environment estimation algorithm, which consists of three implementation stages, is presented in this chapter. The algorithm can be applied to generic texture generation and lighting effects editing. The effectiveness is demonstrated with experiments on rendering 3D video under various lighting environments.

The last part of this book demonstrates 3D video applications: visualization (Chapter 7), content-based encoding (Chapter 8), kinematic human motion estimation (Chapter 9), and data compression (Chapter 10). As presented in previous chapters, the key technology is the data representation, more precisely,

the 3D mesh data representation. Chapter 7 represents the virtual view by transforming the textured 3D mesh data in to 2D images while Chapter 8 generates behavior units from an interval of the video sequence. The last two chapters analyze non-textured 3D mesh data. Chapter 9 produces a kinematic motion description of a human represented by a sequence of skeleton structures and Chapter 10 generates a sequence of 2D images which record 3D mesh vertex coordinates. I would like to leave the rest details for the readers to find out.

In general, this book is concise and easy to read. At the beginning of each chapter, a big picture is presented for the specific topic. This prepares the readers well for the rest of the chapter. Especially, the book clearly defines and clarifies the differences with other similar techniques, which is quite important and helpful for readers who are new to this field. Another good point for this book is that the authors always keep the performance in mind. Readers will get the idea about how the algorithm works rather than just that this algorithm happens to work. The contents of this book can serve as a very practical guide for 3D video development and research. For graduate or senior undergraduate students, this is undoubtedly another good reference for study. The only problem that I have with this book is too many subsection levels, which reaches the number four. While such arrangement makes the material well organized, I sometimes had to ask myself, "Where am I?" Nevertheless, this scheme does not harm the overall quality of this book.

FREE BOOKS

The IAPR Newsletter is looking for reviewers for the books listed below. If you have interest and some knowledge in the topic, email us with your mailing address. We will send you a copy of the book—which you may keep—and will expect in return a review for the Newsletter.

~Zeeshan Zia, *IAPR Newsletter Associate Editor for Book Reviews*

The following titles in the *"Advances in Computer Vision and Pattern Recognition"* series are available:

- *Shape Perception in Human and Computer Vision* by Sven J. Dickinson (ISBN 978-1-4471-5194-4) http://www.springer.com/computer/image+processing/book/978-1-4471-5194-4
- *Unsupervised Process Monitoring and Fault Diagnosis with Machine Learning Methods* by Chris Aldrich (ISBN 978-1-4471-5184-5) http://www.springer.com/computer/ai/book/978-1-4471-5184-5
- *Decision Forests for Computer Vision and Medical Image Analysis* by A. Criminisi (ISBN 978-1-4471-4928-6) http://www.springer.com/computer/image+processing/book/978-1-4471-4928-6
- *Visual Texture* by Michal Haindl (ISBN 978-1-4471-4901-9) http://www.springer.com/computer/image+processing/book/978-1-4471-4901-9
- *Imaging Spectroscopy for Scene Analysis* by Antonio Robles-Kelly (ISBN 978-1-4471-4651-3) http://www.springer.com/computer/image+processing/book/978-1-4471-4651-3

Relevant titles from *"SpringerBriefs in Computer Science"* short communication series include:

- *Motion History Images for Action Recognition and Understanding* by Md Atiqur Rahman Ahad (ISBN 978-1-4471-4729-9) http://www.springer.com/computer/image+processing/book/978-1-4471-4729-9
- *Introduction to Image Processing Using R* by Alejandro C. Frery and Talita Perciano (ISBN 978-1-4471-4949-1) http://www.springer.com/computer/image+processing/book/978-1-4471-4949-1
- *Time-of-Flight Cameras* by M. Hansard, S. Lee, O. Choi and R. Haraud (ISBN 978-1-4471-4657-5) http://www.springer.com/computer/image+processing/book/978-1-4471-4657-5
- *Real-Time Detection of Lines and Grids* by A. Herout, M. Dubská and J. Havel (ISBN 978-1-4471-4413-7) http://link.springer.com/book/10.1007/978-1-4471-4414-4/page/1
- *Omnidirectional Vision Systems* by Luis Puig and J. J. Guerrero (ISBN 978-1-4471-4946-0) http://www.springer.com/computer/image+processing/book/978-1-4471-4946-0
- *Annual Dynamics of Daylight Variability and Contrast* by S. Rockcastle and M. Anderson (ISBN 978-1-4471-5232-3) http://www.springer.com/computer/theoretical+computer+science/book/978-1-4471-5232-3
- *Efficient Algorithms for Discrete Wavelet Transform* by K. K. Shukla and A. K. Tiwari(ISBN 978-1-4471-4940-8) http://www.springer.com/computer/image+processing/book/978-1-4471-4940-8
- *Graph-Based Clustering and Data Visualization Algorithms* by A. Vathy-Fogarassy and J. Abonyl (ISBN 978-1-4471-5157-9) http://www.springer.com/computer/database+management+%26+information+retrieval/book/978-1-4471-5157-9

Meeting and Education Planner

The IAPR web site has the most up-to-date information on IAPR events. Click here.
NOTE: Highlighting indicates that the paper submission deadline has not yet passed.
*** Asterisks denote non-IAPR events ***

		Meeting	Report	Location
2013	OCT	PSIVT 2013: 6th Pacific-Rim Symposium on Image and Video Technology		Mexico
	NOV	ACPR 2013: 17th International Conference on Image Analysis and Processing	ACPR 2011	Japan
		LS 2013: ISPRS Workshop on Laser Scanning 2013		Turkey
		CMRT13: ISPRS Workshop on City Models, Roads and Traffic 2013		Turkey
		CIARP 2013: 18th Iberoamerican Congress on Pattern Recognition	CIARP 2012	Cuba
	DEC	PReMI'13: 5th Int'l Conf. on Pattern Recognition & Machine Intelligence	PReMI'11	India
2014	APR	DAS 2014: 11th IAPR International Workshop on Document Analysis Systems	DAS 2012	**France**
	AUGv	ICISP 2014: 6th International Conference on Image and Signal Processing	ICISP 2012	**France**
		S+SSPR 2014: Joint Workshops on Statistical Techniques in Pattern Recognition (SPR 2014) and Structural and Syntactic Pattern Recognition (SSPR 2014)	S+SSPR2012	**Finland**
		ICPR 2014: 22nd International Conference on Pattern Recognition	ICPR 2012	**Sweden**
	SEP	ICFHR 2014: 14th International Conference on Frontiers in Handwriting Recognition	ICFHR 2012	**Greece**
		DGCI 2014: 18th IAPR International Conference on Discrete Geometry for Computer Imagery	DGCI 2013	**Italy**
		IJCB 2014: International Joint Conference on Biometrics	ICB 2012	**USA**

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