INTERNATIONAL ASSOCIATION FOR PATTERN RECOGNITION

IAPR Newsletter

Volume 27 Number 2
April 2005

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Newsletter Editor: Lawrence O'Gorman *logorman@avaya.com*

Calls for Papers

GREC 2005
6th IAPR International Workshop on Graphics Recognition
City University of Hong Kong, Hong Kong SAR, China
Deadline: April, 2005
25-26 August 2005

EMMCVPR 2005
Energy Minimization Methods in Computer Vision and Pattern Recognition
St. Augustine, FL, USA
deadline: May 1, 2005
November 9-11, 2005

NNLDAR 2005
IAPR Workshop on Neural Networks and Learning in Document Analysis and Recognition
(a satellite workshop of ICDAR 2005)
Seoul, Korea
deadline: May 15, 2005
29 August 2005

ICBA 2006
2006 International Conference on Biometric Authentication
Hong Kong
deadline: June 1, 2005
January 5-7, 2006

X CIARP 2005
10th Iberoamerican Congress on Pattern Recognition
Havana, Cuba
deadline: June 19, 2005
November 15-18, 2005

DICTA 2005
Digital Image Computing: Techniques and Applications
Cairns Convention Centre, Cairns, Queensland, Australia
Deadline: July 31, 2005
December 6-8, 2005

IVCNZ05
Image and Vision Computing New Zealand 2005
University of Otago, Dunedin, New Zealand
Deadline: early September, 2005
November 30-December 2, 2005

DAS 06
Document Analysis Systems
Nelson, New Zealand
Deadline: September 15, 2005
February 13-15, 2006

ICPR 06
18th International Conference on Pattern Recognition
Hong Kong
deadline: December 15, 2005
August 20-24, 2006

IWFHR 06
10th International Workshop on Frontiers in Handwriting Recognition
La Baule, France
Deadline: September 15, 2005
October 23-26, 2006

Feature Article

Pattern Recognition in Astronomy and Photonics

By Larry O'Gorman

In the course of recalling the evolution of her work toward applying pattern recognition to astronomy, the realization hit Tin Kam Ho like a bolt of lightning. "I find one continuing theme in my different application areas - they all have something to do with light! I started with optical character recognition, then continued with optical spectra, optical fiber design, optical network simulation, and eventually optical astronomy." It is often the case that technologists must adapt and learn new areas to keep up with the fast pace of technology. It is a tribute to Tin's knowledge in the field of pattern recognition and a testimonial to pattern recognition's versatility that such diverse problems as these can be attacked with the same tools.

Tin joined Bell Labs in 1992. Her early work was on multiple classifiers, and this was applied to optical character recognition systems. This was valued work at Bell Labs in the early 1990s because it was applied to one of the parent company's divisions, NCR, which built systems to manage paper documents for the financial and retail industries. In the mid-1990s, Tin became interested in another area, spectral analysis. She was able to apply this new interest to another NCR project, analyzing the spectra of different fruits presented to self-service checkout devices at retail stores. These two projects ended in 1997 with Lucent's divestiture of NCR.

With her main customer gone and Lucent re-focusing on its telecommunications core competency, Tin was faced with the challenge of how to apply her expertise to aid the company. As Tin tried her hand at various telecommunication projects, a colleague Lawrence Cowsar was intrigued by her talk on clustering. Lawrence was working on a simulation tool for designing optical fibers at the time. He felt that the clustering work could help to sort groups in the design space and to understand their implications. Tin proceeded to build a graphical tool to help Lawrence see the design clusters and explore their correlations with computed fiber properties. The tools shortened the design time of the fiber considerably and led to a successful prototype. This started their collaboration, which has continued for several years. They worked on simulation of power control dynamics in sophisticated optical transport systems, and helped design and engineer a major optical network now being deployed in the US. But photonics is only part of the story we wish to tell here. While Tin was looking for projects that involved spectra, she became interested in light of a different nature.

IRAS (Infrared Astronomical Satellite) was a collaboration of the space agencies of the United States, the Netherlands, and the United Kingdom in the early 1980s to create an all-sky atlas of objects measurable by an infrared telescope carried by a satellite. Over 300,000 point sources of light were detected, and many were observed with a low resolution spectra (LRS). A version of the LRS data went into the UC-Irvine machine learning data depository, and attracted Tin's attention. She tried her classifiers on the data, but she was unhappy about the results. Tin wanted to know more about the classes, so she pursued the story behind this dataset. She eventually found an expert, Kevin Volk in Canada, and the Netherlands team who created the instrument. Kevin and the team told Tin a lot more about the data, including a need to reprocess and recalibrate the spectra from the raw scans. This required significant learning in professional astronomy, and Tin needed a local mentor.

Tony Tyson was a scientist at Bell Labs (now at UC Davis) who learned of Tin's interest and areas of knowledge and enthusiastically supported Tin's application to his own area, astronomy. Tony was (and still is) a principal investigator on a project called the Deep Lens Survey, the purpose of which is to survey mass structures in the distant universe. An unknown form of matter, called *dark matter*, is not directly observable because it emits no light. Because it cannot be seen, one way to detect it is to measure how light from more distant galaxies is bent around the dark matter during its travel to our own Milky

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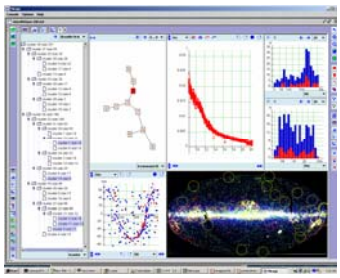
Way galaxy. So they captured images of far-away galaxies by taking very long and multiple exposures of locations in space, and looked for systematic shape distortions in the sample. A need in the analysis is to first separate those galaxies from the foreground stars. Tony recommended Tin to work on this classification problem and suggested that she read *Physical Universe – An Introduction to Astronomy* in order to become familiar with this field.

What she learned intrigued her. Not just about the science, but about the astronomy community as well. She was astonished to find a worldwide group that was united in a pursuit to see literally beyond the stars. For instance, astronomical journal articles greater than two years from publication were available online and free in a single source, NASA's *ADS* (Astrophysics Data System) digital library. Recent articles could be obtained from the *arXiv* e-print service. Tin was amazed to see the entire literature available at her desktop. She was also amazed at the cohesiveness and singularity of efforts of the astronomy community. An International Virtual Observatory Alliance was being built. The scientists were working as one to reveal the secrets of the universe. She leapt at the opportunity to participate with this community.

As Tin started, she found an immediate difficulty: there is no training data, as the objects most difficult to separate are the faintest and thus have never been seen before. Discrimination is nevertheless possible for a few reasons. Galaxies have shapes and spectral features that are different from point-function stars. In addition, there is an expectation on how many objects of each type should appear in each grade of brightness, and how the objects should distribute in the color space according to stellar evolution theory. In attempts to relate all the supporting evidence, Tin found the tools she was using were clumsy and inconvenient. This brings us back to the photonics part of the story.

Concurrent to this need for a better tool for astronomical image analysis, came an urgent call for a tool to analyze the results of large photonics simulations. Tin decided to extend the pattern recognition functionality of her fiber design tool, and delivered *Mirage 0.0* to her optical engineer colleagues. Mirage was designed for the needs in classification. This involves ways to view high-dimensional feature vectors and their classes in histograms, scatter lots, connecting structures of clusters, minimum spanning trees and tools for navigating between clusters. This enables the optical engineers—as well as astronomers—to perform interactive pattern discovery by manipulating the multidimensional data and visualizing its interrelationships. Tin took the tool to the ADASS (Astronomical Data Analysis Software and Systems) conference in 2002. It became popular instantly and has had over 700 downloads to date.



Tin has found productive areas of research in both astronomical science and telecommunications technology. There is precedence for this combination at Bell Labs where scientists won the Nobel Prize in physics in1978 for the Big Bang Theory, work that resulted from investigating how background microwave radiation caused noise to communication systems. With this business environment, collaborators throughout the world, and a pattern recognition skill-set, who knows what further problems Tin will be shedding light on?

FOR MORE INFORMATION:
Tin Kam Ho's web site:
http://cm.bell-labs.com/who/tkh/

Introduction to Infrared Astronomical Satellite:
http://irsa.ipac.caltech.edu/IRASdocs/iras.html

NASA's Astrophysics Data System:
http://adswww.harvard.edu/

International Virtual Observatory Alliance:
http://www.ivoa.net/

Deep Lens Survey:
http://dls.physics.ucdavis.edu/index.html

Tony Tyson's Dark Matter work:
http://www.bell-labs.com/org/physicalsciences/projects/darkmatter/darkmatter.html

Mirage:
http://www.bell-labs.com/project/mirage/

INSIDE the IAPR

The Office of the Secretariat

By: Linda J. O'Gorman, IAPR Secretariat

In June, 2004, I accepted the position of Secretariat of the IAPR with only a vague idea of what that would entail. Here we are, about nine months later, and a Secretariat has been born.

So, what are the responsibilities of the IAPR Secretariat? Generally speaking, the Secretariat handles the administrative functions for IAPR. More specifically, here is an annotated list of my responsibilities:

- ***Provide a permanent postal address:*** IAPR is an international organization with no headquarters. For legal and practical reasons, there must be some physical address. The address of the Secretariat is that address.
- ***Maintain a membership database*:** Each member society has contact information. While this is available at the web site, an official database is also maintained.
- ***Collect annual dues:*** Each year, I send dues invoices to the IAPR Member Societies to remind them to renew their annual subscription to IAPR.
- ***Collect conference and workshop levies:*** IAPR-sponsored events make use of the IAPR name and advertising vehicles.
- ***Maintain the IAPR archive:*** The archive contains copies of official documents like contracts and agreements, Governing Board Meeting minutes and IAPR Constitutions.
- ***Respond to inquiries:*** This is actually my favorite task. I get inquiries ranging from "How do I become a member?" to "Can you help me find software or a method to match and positively identify images?" (see Pattern Recognition in Cryptic Wildlife Species article in this issue of the *Newsletter*).
- ***Set-up and run an IAPR booth at ICPR:*** I saw many IAPR members from my booth in the Corn Exchange at ICPR in Cambridge, UK, last August. I plan to be at the next ICPR, so stop by and say "Hi."

A Tribute to "Secretariat"

Painting: *Secretariat with Blinkers*
By: Katie Upton
katieupton.com/index.html

Secretariat ((s ĕ k ' r ĭ -târ ' ē - ĭ t)) *n.*
1. a. The department administered by a governmental secretary, especially for an international organization. b. The office occupied by such a department. 2. The office or position of a governmental secretary.
The American Heritage® Dictionary of the English Language, Fourth Edition.
Copyright © 2000 by Houghton Mifflin Company.

IAPR is the first international organization of which I've been a part. The term *secretariat,* referring to the definition above, was foreign to me when my assuming the office was first being discussed.

Of course, I had heard the word "secretariat", but in a completely different context—that of horseracing. So, as a tribute to that great racehorse, I include some biographical information on "Secretariat".

Secretariat (1970-1989) is viewed by many as the greatest thoroughbred in history, with his only contender for that title being Man O' War (see Secretariat, the Greatest Racehorse in History).

Indeed, his racing record was impressive. In his 16-month career, he won 16 of 21 starts and was horse of the year in both years (1972 and 1973). His most famous accomplishment was being the 9th horse to win racing's Triple Crown (Kentucky Derby, Belmont Stakes and the Preakness) in 1973. This win created an enormous stir, since no horse had won the Triple Crown since Citation did it in 1948—a 25-year gap.

Secretariat was so popular in America in 1973 that it was said he could have won a presidential election if he were on the ballot.

CVonline: an overview

By: Robert B. Fisher, Editor, CVonline, School of Informatics, University of Edinburgh

CVonline, the Evolving, Distributed, Non-Proprietary, On-Line Compendium of Computer Vision, is one of the key online research and teaching resource for computer vision students and researchers. Its goal is to be a first point of introduction for every major image analysis concept, with enough content that you could determine if the concept is relevant to your current task. In short, it is a sort of online encyclopedia for computer vision, machine vision and image processing, etc. When we first started developing CVonline, in jest we subtitled it ``The Evolving, Distributed, Non-Proprietary, On-Line Compendium of Computer Vision'', but this is close to what it has become.

CVonline currently provides explanations for about 1100 of the 1400 listed vision-related topics, organized into 19 top level categories. About half of the topics have tutorial-style explanations, with an example and with sufficient technical detail that the work can be reproduced. Under each of the 19 top level categories is a further hierarchy. Some top level categories, e.g., representation, have many screens of topics. Others, e.g., non-standard architectures, have only a single screen of topics. Topics with content have hot links to one or more explanations of the topic, with over 3000 contributions.

At the moment, CVonline is accessed about 3500 times/week through its entry page and undoubtedly has many more direct accesses to topics through Google. CVonline has received over 400K accesses since logging started in November, 1999.

Funding for the development of CVonline has come from a variety of sources: the European Community's ECVision Network, the British Machine Vision Association and the University of Edinburgh, particularly for the infrastructure. However, the main source of the content is the vision community, with direct contributions from about 350 people and many other ``contributions'' from authors with material on the web.

Technology behind CVonline:
The tree structured topic pages were created in pure HTML (by hand) and conform to the ``W3C HTML 4.01 strict'' standard. Content pages are generated by a PERL script that is given the TAG number of the topic, with content generated from a flat plain text file database. The search engine is HTDIG (www.htdig.org).

A bit of history:
CVonline was conceived in the pub (of course) in Vienna during ICPR 1996. We had been discussing the problems of textbooks for our classes - whenever you find a good book, it seems to go out of print or become too expensive. We had also recently finished the HIPR (homepages.inf.ed.ac.uk/rbf/HIPR2) package and were excited by the possibilities of the web and control of the content. Within a year, the basic structure was complete, with all the content listed after each topic label. The lowest level topics were inspired by a few textbooks and by USC's Annotated Computer Vision Bibliography (iris.usc.edu/Vision-Notes/bibliography/contents.html). From that time, the basic hierarchy was set; however, there has been much re-arrangement of the structure to remove redundancy, remove misplaced or misunderstood relationships and certainly to add new material.

Several early collections of online course notes (Andy Wallace, David Marshall, Robyn Owens, Ian Young, Jan Gerbrands, Lucas Van Vliet, David Young) and conference tutorial notes (Boyle and Hogg/ BMVC95,Zisserman/EPSRC Summer School 1995,

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Thacker and Cootes/BMVC96) got the content initialized. For the rest, we asked conference paper authors whose research overlapped with CVonline topics, got a few voluntary contributions, went web-surfing, and made creating a web page one of the assignments on our computer vision course. Now more than 80% of the topics have content. With the growth of the content links, it eventually became hard to see the structure of the topic hierarchy. In 2003, we added the server-based PERL script method (funded by the ECVision network) that separated the topic tree from the content.

The most recent development was the catalog of vision related books, where we try to list all modern computer vision, image processing and closely related books. The catalog contains online books, books with online support sites, as well as traditional physical books. For editorial reasons, we decided to omit most conference proceedings. Currently we have 308 books listed (24 online, 30 web supported, 254 others). The growth rate of the field can also be seen from the book publication dates (1950's: 1; 1960's: 1; 1970's: 18; 1980's: 66; 1990's: 150; 2000-2004: 72).

Future Developments:

The most realistic view of the future CVonline is one of incremental expansion. New topics and terms appear due to research developments. Given the great growth in research over the past 10 years, I fully expect that CVonline will also continue to grow in content. What would an ideal resource consist of? The individual entries should be written and cross-referenced to a common level. The mathematical notation and terminology should be consistent, with a high level roadmap linking them. Each entry should have a set of examples, standard test datasets, free code for algorithms and an interactive exploration of the topic. There should be citations to deeper discussions of the topic.

Pattern Recognition Letters

By: Tin Kam Ho, Editor-in-Chief

Pattern Recognition Letter (PRL) is the official journal of IAPR. It publishes concise articles in a broad range of areas that roughly match the interests represented in the IAPR Technical Committees. In 2004, PRL published 16 issues, including 3 special issues (*Remote Sensing*, *Video Computing,* and *Discrete Geometry for Computer Imagery*). Due to the strong link between PRL and the IAPR, IAPR sponsorship has been considered one of the key features to accept a proposal for a special issue devoted to a conference.

On April 1, 2004, the journal moved to a new editorial system, which handles all submissions, reviews, editorial decisions and revisions over the internet (except for special issues). On the same date, Tin Kam Ho took over the Editor-in-Chief responsibility from Eric Backer, one of the two founders of the journal, who retired after 22 years of service as Managing Editor. Currently, Tin handles the regular issues of PRL, while Gabriella Sanniti di Baja continues to be the Editor-in-Chief for the special issues.

The electronic editorial system (EES) enabled a fast editorial workflow, but, at the same time, the convenience encouraged a sharp increase in submissions. The large volume as well as the enhanced scope of coverage made it necessary to invite many new members to the editorial board, including three area editors (Gunilla Borgeforrs, Horace Ip and Carl-Fredrik Westin) who are helping with a wide range of topics. PRL is committed to a fast review process, but we expect that it will take a few more months to balance the demand with proper editorial resources for the desired speed.

A broad-reaching journal with a rapid review cycle is desirable to many of us. We have all experienced frustration from long publication delays and not being able to attend as many conferences as we wish. PRL intends to serve this need. We believe this can be done, and we know there are other scientific communities where this has become a tradition. But to achieve our goals, we need help from the community. Specifically, we ask for:

1. *More volunteers to sign up as reviewers.* The journal depends critically on speedy and high-quality reviews. A broad base of reviewers is absolutely necessary to support this. By being a reviewer, you can contribute your opinions to the community, and can benefit yourself as well in seeing the latest developments and other perspectives on a subject. We ask anybody interested to send your contact information and area preferences to patrec@elsevier.nl.

2. *Responsible submissions that make a genuine and substantial contribution to the field.* The quality of the journal is a function of the quality of the submissions. PRL intends to publish papers that communicate the latest, significant results to a broad audience. Poor quality submissions or plagiarism, including self-plagiarism, not only damage the journal's reputation, but draw precious resources away from deserving papers. We hope members of our community can enjoy and treasure this resource and do their part by refraining from sending premature works and by observing all professional standards of conduct.

Related Web Links:

PRL's Home Page:
www.elsevier.com/locate/patrec

PRL Table of Contents at Science Direct:
www.sciencedirect.com/science/journal/01678655

IAPR Technical Committees:
http://www.iapr.org/committees/techco.php

News from the IAPR Executive Committee

By Denis Laurendeau

In the November Edition of the Newsletter, it was announced that the result of the GB ballot for the Nominating Committee and the K.S. Fu Prize Committee would be posted on the IAPR Web page. Unfortunately, the quorum was not reached and the ballot was reinitiated in January 2005. This time, the quorum was reached, and it is a pleasure to announce that Professor Rangachar Kasturi has been elected Chair of the Nominating Committee and that Professors Horace Ip, Attila Kuba, Ingela Nyström, and Yuichi Ohta have been elected members of the Nominating Committee.

It is also a pleasure to announce that Professor J.K. Aggarwal has been elected Chairman of the K.S. Fu Prize Committee for 2 years. Professors J.K. Aggarwal and Yuichi Ohta have also been elected members of the K.S. Fu Prize Committee for 6 years.

With this ballot completed, all IAPR standing committees are now formed and the Web page will be updated to reflect these changes (www.iapr.org/committees/).

Speaking of the Web page, those of you who have visited the IAPR site recently have probably noticed that its layout has changed. This results from the transfer of the site from its previous server, which was located in the Czech Republic and was maintained by Michal Haindl, to a new server that is now hosted at CEDAR, the Center of Excellence for Document Analysis and Recognition, at the State University of New York at Buffalo. The migration was done very smoothly and, although a few details still need to be addressed, the Web site is now fully operational. Our warmest thanks go to Michal Haindl who has maintained the IAPR Web page for so many years and to Professor S. Srihari and his team at CEDAR for taking over this important task for the IAPR.

The first electronic issue of the Newsletter has been published and the operation was a success. Larry O'Gorman did an excellent job in supervising preparation of the e-Newsletter and in mailing it to IAPR's member societies. Here again, a few minor adjustments were required but, overall, the transition from hardcopy to electronic copy was smooth and it looks like more than a few trees will be saved by this initiative!

The IAPR Task Force for ICPR has interacted with the ICPR 2006 Organizing Committee and has checked the status of the organizing process. The year 2005 will be a busy one for the ICPR 2006 Organizing Committee with the deadline for paper submission being scheduled for December 15, 2005. Please visit the conference Web site at http://www.comp.hkbu.edu.hk/~icpr06/ for more details.

Can you help?
Pattern Recognition in Cryptic Wildlife Species

By: Jan Schipper
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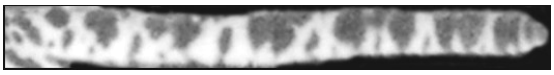
Ed Note -- Jan Schipper came to the IAPR Secretariat with a pattern recognition problem. As a field ecologist, not a pattern recognition expert, he knew his problem—identifying cats by their pattern—and sought help in finding a solution

Hearing about this problem, I thought it was interesting enough to warrant an article. If there is anyone in the *Newsletter's* readership who has worked on a problem such as this before or who has interest and knowledge to do so, please let him know.

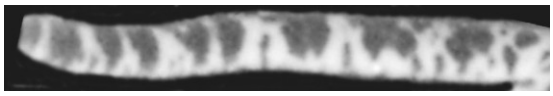
Pattern recognition in cryptic wildlife species is an evolving field resulting from the increasing use of photographic images resulting from non-invasive techniques such as infra-red, "heat-in-motion" detecting cameras in the field. We would like to introduce this concept, explain the problem and solicit ideas from the scientific community on techniques and possible solutions.

Concept: *Tools used in the field of pattern recognition can be applied to the study of cryptic wildlife species using "camera-trap" capture-recapture techniques.*

Photographs of margay (*Leopardus wiedii, see photo*), for example, form a digital "fingerprint" of the individual, and with photos of both sides of a cat, we can identify this individual each time it passes a camera. Work thus far also shows promise that the tails of these cats might have the most symmetrical markings.



Margay tail: Left



Margay tail: Right

Currently methods for inferring absolute density estimates from wildlife populations using cryptic patterns for individual ID require two cameras – one for each side of the individual as they are not symmetrical from side to side. Current image analysis techniques involve simply looking at photos from each side of an animal and creating a visual "signature" for that individual. However in this case two camera-traps are required at each site in order to get paired photos.

Margay composite

Because camera systems are relatively costly and access to remote field sites is difficult we are exploring the idea that individuals can be identified from non-paired images of the left and right side of the animal along the back and top of the tail.

Problems and solutions:

Technical Problem:

The surface on which cryptic patterns exist on cats, i.e. the fur, is susceptible to changes in distance and shape con-

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tortion between spots and markings as the animal moves. Even a simple walk in front of the camera seldom, if ever, gives identical signatures, so we tend to focus in on specific spots or regions which are hopefully always characteristic of that individual.

Markings across the back and tail have some symmetry, and from this observation, we are looking for ways to match the sides together—to map (if you will) the pattern with two halves. It would seem that a flexible image tool could be developed to match (with some error of course) two independent photos of different sides of the same individual. This could be used to positively identify this individual with a defined statistical probability. We imagine a method that can give us a nice little statistical readout, such as "image A and image B have an 85% with a probability of matching". Having done this by hand it seems feasible, but cutting out photos of cat torsos and tails and matching them by eye hardly seems a viable solution.

To save time and money we are exploring the possibility of using just one camera at each study site and hope to develop a technique for analyzing this "single-side" data by matching patterns across the back and tail.

Possible solution:
Image rectification: contorting the black and white pattern of the animals to a neutral by warping the image.

Other challenges: Photos do not always contain the entire animal (i.e., sometimes just the torso and tail, other times just a head and torso) and can be from a variety of vantage points (i.e., animal facing camera etc.), thus complicating the pattern to be recognized.

In long-term studies however a collection of photographs from the same individual can be used to put the pieces together and create a "signature" or "fingerprint" for that side of the individual, but matching left to right sides still remains problematic.

Measures of success:
Measuring the statistical probability of positive identification of individuals varies with photo quality, whether or not both cameras fired, the proportion of animal in the image (among numerous other factors) and is difficult to determine. Higher sample sizes, greater image interpretation experience and trap location and placement will certainly influence this probability. The question is whether this probability would significantly change if cameras are not paired. Our feeling based on preliminary analysis is that it is possible with either some interdisciplinary collaboration with specialist in this field or training of wildlife biologists. We, the wildlife scientists, would like to develop a technique for cryptic species "fur-print" analysis and possible develop and integrated software tool to improve out research and conservation of wild cats and other cryptic wildlife species.

We are working on this problem in the field in the Talamanca region of Costa Rica using images of jaguar, ocelot and margay. We invite any suggestions or collaborations from interested students or professional and are willing to share all image data and publications.

Technical Committee Report:
TC20 Pattern Recognition for Bioinformatics

Raj Acharya
Chair, TC20

Jagath Rajapakse
Vice-Chair, TC20

The past decade has witnessed an explosion in the amount and complexity of life sciences data, such as DNA and protein sequences, gene and protein expressions, structures, pathways, genetic information, biomedical text data, and molecular images. Although the analyses of these data involve pattern recognition and data mining, the novel and efficient data analyses techniques have not realized their true potential. Bioinformatics can be viewed as a field of discovering knowledge from life sciences data with the aid of Information Technology, to find answers to unresolved problems in biology. An example of the benefits of bioinformatics research could be the discovery of new drugs. A grand challenge in the post-genome era is to understand how the information stored in the genome, or the blueprint of life, influences the intrinsic functions of the living organisms.

The information stored in DNA, a chain of four nucleotides (A, T, G, and C), is first converted to mRNA through the process of *transcription* and then converted to the functional form of life, proteins, through the process of *translation*. The initiation of the translation or the transcription process depends on the presence of specific patterns of DNA, RNA, and motifs. Research on detecting specific patterns of DNA sequences, such as genes, protein coding regions, and promoters, leads to the better understanding of molecular level function of the cell. Comparative genomics focuses on comparisons across the genomes to find conserved patterns over the evolution, which should possess some functional significance. Construction of evolutionary trees is useful to know how genome and proteome are evolved over all species by ways of a complete library of motifs and genes.

A protein's functionality or its interaction with another protein is mainly determined by its 3-D structure. Prediction of protein's 3-D structure from its 1-D amino-acid sequence remains an open problem in structural genomics; protein-protein interactions determine essential functions in living cells. Computational modeling and visualization tools of 3-D structures of proteins help biologists to infer cellular activities.

The challenge in functional genomics is to analyze gene expression data accumulated by microarray techniques to discover the clusters of co-regulated genes and thereby gene regulatory networks, leading to the understanding of regulatory mechanisms of genes and pathways. Molecular imaging provides techniques for *in vivo* sensing and imaging of molecular events, which measure biological processes in living organism at the molecular and cellular level. The techniques to fuse and integrate different kinds of information derived from different life science data are yet to realize their full potential.

The ever-expanding knowledge of biomedical and phenotype data, combined with genotypes, is becoming difficult to be analyzed by traditional text-based methods. Advanced data mining techniques, where the use of ontologies for constructing precise descriptors of medical concepts and procedures, are required in the field of medical informatics. The vast amount of biological literature is posing new challenges in the field of text mining. These text mining techniques along with the aid of information fusion methods could help find pathways and interaction networks.

The goal of TC20 is to bring together pattern recognition scientists and life scientists to find solutions to problems in bioinformatics and to foster multidisciplinary research in the pattern recognition community. A workshop on Pattern Recognition Techniques for Bioinformatics is currently being planned.

Please visit the TC20 web site (http://www.cse.psu.edu/~acharya/IAPR/iapr.htm) for more information.

Workshop Report: ICVGIP

General Co-Chairs:
D Dutta Majumder (ISI Kolkata)
O Faugeras (INRIA, France)

4th Indian Conference on Cumputer Vision, Graphics and Image Processing

16-18 December 2004, Kolkata, India

ICVGIP 2004 was organized by D. Dutta Majumder and O. Faugeras (General Co-Chairs), B. Chanda, S. Chandran and L. S. Davis (Programme Co-Chairs) and M. K. Kundu (Organizing Chair). The event was supported by various Indian Government agencies, industries and academic societies and by IAPR. ICVGIP has grown over the years with about 304 submissions this year from 23 countries. Because of the single-track format of ICVGIP, only 120 papers (24 oral and 96 poster) were accepted for presentation.

More than 250 researchers and scientists attended the conference. The conference had five oral sessions, five poster sessions and one industry session. ICVGIP witnessed 20 oral presentation and 74 poster presentation this year. In the industry session, five different multinational companies presented their R&D activities in the field of vision, graphics and image processing. In addition to that it had five plenary talks delivered by Henry Baird of Lehigh University, Peter J. Burt of Sarnoff Corporation, Brian Curless of University of Washington, Partha P. Das of Interra Systems and Ken Nakayama of Harvard University.

A pre-conference tutorial was organized on with Andrew Zisserman of University of Oxford, Larry S. Davis of University of Maryland, College Park, Baba C. Vemuri of University of Florida, Gainesville and J. K. Aggarwal of University of Texas, Austin as the speakers. More than 80 students and researchers attended the tutorial.

The paper by M. Pawan Kumar, P. H. S. Torr and A. Zisserman entitled 'Learning Layered Pictorial Structures from Video' won the Best Paper Award.

At the valedictory session it was resolved that the next ICVGIP will be held at Madurai in mid-December 2006.

Workshop Report: IWCIA 2004

Program Chairs/Principal Organizers:
Reinhard Klette
Jovisa Zunic

10th International Workshop on Combinatorial Image Analysis

1-3 December 2004, Aukland, New Zealand

Report prepared by: Reinhard Klette

Walter Kropatsch with Vladimir Kovalesky

Maurice Nivat

John Pfaltz

There were three invited talks at the 10th edition of IWCIA. Vladimir Kovalevsky (Berlin) reviewed his work on algorithms in digital geometry based on cellular topology. Akira Nakamura (Hiroshima) talked on magnification in digital topology, and his lecture was dedicated to the late Professor Azriel Rosenfeld, who was his collaborator on this subject. Maurice Nivat (Paris) solved a tomographical problem (``Binary matrices under the microscope''). This Alberto Del Lungo memorial lecture was coauthored by Andrea Frosini (Siena).

There were 55 accepted papers at IWCIA'04 (out of 88 submissions). Just to cite a few for illustrating subjects at the meeting: John Pfaltz (the first PhD student of Azriel Rosenfeld) defined and analyzed Jordan surfaces in discrete antimatroid topologies; C.O. Kiselman spoke on convex functions on discrete sets; A. Imiya illustrated the use of curvature flow for thinning; I. Boukhriss informed on two-dimensional discrete morphing; T.Y. Kong analyzed minimal non-simple sets in 4-dimensional binary images with (8,80)- adjacency; S. Fourey's talk was on simple points and generic axiomatized digital surface-structures; S. Alayrangues informed on the equivalence between regular n-G-maps and n-surfaces; and I. Sivignon showed recent results on discrete surface segmentation into discrete planes. Altogether there were 36 talks and 22 posters at IWCIA'04 (poster presentations also included a 3 min talk). The main focus of the meeting was on digital topology or geometry (often on algorithmic aspects of particular problems), and on combinatorial issues in imaging. There were a few contributions discussing theory also in closer contact to applications of image analysis or computer vision.

The proceedings (edited by the co-chairs of the meeting, Reinhard Klette and Jovisa Zunic) are published as volume 3322 in Springer's LNCS series.

The IWCIA'04 conference events started with a pre-conference boat trip to Waiheke Island. The trip included a bus tour on Waiheke island and a lunch at "Stonyridge" (one of the island's wineyards). That evening, the conference reception was at the Computer Science building of The University of Auckland (city campus). The conference took place at CITR at the Tamaki campus. The conference excursion and dinner took place on Thursday, December 2, 2004, with a wine tasting, a visit of the wild west coast at Muriwai, and dinner at Markovina vineyard, including a show of the Cook Island Dancers. There were no complaints about the meeting's social activities!

The 11th edition of IWCIA is planed to be in May 2006 at Humboldt University, Berlin/Germany, co-chaired by Ralf Reulke (Humboldt), Ulrich Eckhardt (Hamburg University) and Konrad Polthier (Zuse Institute, Berlin).