



Indian Statistical Institute

Systems Science and Informatics Unit

(COMPUTER AND COMMUNICATION SCIENCES DIVISION)

Bangalore-560059, India

FOUR-DAY COURSE

On

MATHEMATICAL MORPHOLOGY IN IMAGE ANALYSIS,
GISci, GEOMORPHOLOGY

19-22 OCTOBER 2010

Website: www.isibang.ac.in/~cwjs70

Organized by the

SYSTEMS SCIENCE AND INFORMATICS UNIT (SSIU)

COMPUTER AND COMMUNICATION SCIENCES DIVISION (CCSD)
INDIAN STATISTICAL INSTITUTE-BANGALORE CENTRE, INDIA
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and

LABORATOIRE D'INFORMATIQUE GASPARD MONGE

Université Paris-Est, Paris, FRANCE

TWO-DAY WORKSHOP

HONOURING PROFESSOR JEAN SERRA

25-26 OCTOBER 2010

Website: www.isibang.ac.in/~cwjs70

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COURSE ON MATHEMATICAL MORPHOLOGY IN IMAGE ANALYSIS, GISci, GEOMORPHOLOGY

19-22 October 2010

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This course of Four Days duration is scheduled during 19-22 October 2010, and would be held at Systems Science and Informatics Unit (SSIU) of Indian Statistical Institute-Bangalore Centre. This course is being co-organized with ESIEE of Université Paris-Est. Set theory based Mathematical Morphology invented by Jean Serra along with Georges Matheron has shown highly promising applications in the fields of Digital Image Processing, and in Image Analysis. Its connections with digital geometry and computational geometry are evident. Of late, the applications of mathematical morphology are realized in the fields of remotely sensed data analysis, Geographical Information Science (GISci), and in geomorphology. This Four-Day course on "Mathematical Morphology in Image Analysis, GISci, Geomorphology" covers various aspects. Course instructors include:

- ♦ **Prof. Jean Serra** (Inventor of Mathematical Morphology), France
- ♦ **Dr. Jean Cousty**, France
- ♦ **Dr. B. S. Daya Sagar**, India

There will be (i) lectures in the first session of the day (10.00am- 1.00pm), and practical training in the second shift of the day (2.30pm-5.30pm). Several demonstrations and case studies related to applications of mathematical morphology would be covered during practical training.

The following topics will be addressed:

- ♦ Erosion, dilatation, opening, closing, granulometries, gradients, top-hat.
- ♦ Morphological filtering.
- ♦ Geodesy, connected operators, levellings.
- ♦ Segmentation : watershed, hierarchical segmentation, ultimate opening.
- ♦ 3D images, image sequences.
- ♦ Color processing.

All these notions will be illustrated through many examples, selected from different application domains. The manipulation of images during practical training in the afternoon allows a full understanding of the studied notions. Expected participants are final year undergraduates, postgraduates, research scholars, and young faculty members. You will find the necessary information, including a registration form and lecture/practical time schedules, on our website : www.isibang.ac.in/~cwjs70

WORKSHOP HONOURING JEAN SERRA

25-26 OCTOBER 2010

www.isibang.ac.in/~cwjs70



<http://cmm.ensmp.fr/~serra/aaccueil.htm>

In 1965 Jean Serra founded, with G. Matheron, the theory of Mathematical Morphology and, in 1967, they founded together the Centre de Morphologie Mathématique, or CMM at School of Mines of Paris, that J. Serra led for more than two decades from 1979 to 2002. At first glance the expression “Centre of Mathematical Morphology” refers to some administrative structure, i.e. a given lab of the “Ecole des Mines de Paris”, located in Fontainebleau (France). But, in a deeper sense, it may be seen as a diachronic “flame”, illuminated by so many brilliant researchers over forty years. Some spent in Fontainebleau a few years, others a few months, both then left, providing the Centre with new ideas, solutions, software, devices...Retrospectively, when one considers the state of the art in Mathematical Morphology, the contribution of Jean Serra shows itself in heading the CMM and orienting his activities as well as in developing personally the theory he founded. He is currently professor emeritus at the ESIEE Institute of Paris-Est University. The initial, and still valid purpose, was a quantitative tool for describing structures and textures at all scales in earth sciences (geology, mining science and engineering geology). Then the activity of 'Mathematical Morphology' extended progressively to other fields, such as medical imagery, robot vision, video image processing.

Mathematical Morphology tries to understand the physical world in favouring ordering relations between regions of the space rather than their metric characteristics. In order to achieve this goal, Jean Serra has conceived descriptors, and has developed the theory along three ways. First, he proposes a set of operators expressing some characteristics of the medium of the image under study (morphological filters, connections, etc). Here the background is that of complete lattices, which allows him to formalize ordering relations, suprema, etc.. and which turns out to be a common denominator to sets, to numerical or vector functions, and to partitions. Second, Jean Serra elaborates a comprehensive range of random models, and third he achieves a synthesis between texture and physical or biological properties. This field—through original ideas spanned over four decades, and played an unimaginable role in laying foundation, and in understanding morphological bases of various physically viable geometrical operations—has produced wide-spread branches across several disciplines, some of the applications of which spawned to link physical properties with textures, in fluid mechanics, sintering processes, in optical or electron microscopy, material sciences, image processing, physics, mathematics and in the areas where numerical images are generated (e.g. remote sensing), and in new fields such as Geocomputations, GIS, and multi-media applications.

The phenomenal impact of Jean Serra's book "Image Analysis and Mathematical Morphology" which is the first book of its kind -published by Academic Press in 1982, has been to till-date cited more than 3000 times in peer-reviewed ISI recognised journals alone. This number is too big, if one considers the journals indexed in other Abstracting services. This speaks about the voluminous impact of Jean Serra's works on other scientists' research. The fact is that numerous notions that Jean Serra invented are now theoretical tools for mathematical geoscientists.

Jean Serra earned his PhD on the Thesis in Mathematical Geology from University of Nancy in 1967, and subsequently Doctorat d'Etat in Mathematics from Pierre et Marie Curie University, Paris in 1986. Jean Serra's achievements include seven books, about one hundred articles, and one hundred communications, several patents of devices for image processing. Under his able supervision, over fifty PhD students defended their theses. Serra's students are considered now the world-renowned experts. The number of persons that are inspired today by Jean Serra's theories is considerable, and practically all standard mathematical libraries in the world propose dilations, openings, morphological filters, connections, watersheds, etc... Similarly, most of the devices in telecoms, in digital radiology, or in quantitative microscopy, that incorporate image processing make use of some morphological operators that he invented.

Jean Serra worked internationally in two ways. Firstly, he largely contributed to create, over the world, research labs that develop his approach, at MGU (Moscow, 1972), ERIM (Ann Arbor, 1983), CSIRO (Sydney, 1987), UPC (Barcelona, 1991), USP (São Paulo, 1996) among others. Secondly, he dedicated his efforts towards the industrial word. During his career, a series of image processors and/or software packages were designed by him or under his direction, and commercialised under licence by several manufacturers. Notably among others include: the Leitz-TAS (Germany, 1971-1984), the Visiomat of Allen Bradley (USA, 1984-1988), the Quantimet 570, of Cambridge Instruments. (U.K., 1989 -1993), the MICROMORPH Package, of Transvalor (France, 1996 -), the APHELION Package, of Adcis (France, 1995 -).

He has four inventions patented to his credit. Under his leadership/guidance, Micromorph software has been developed that has become so popular. In 1982, Jean Serra created a spin-up company, called "Morpho-Systems" for fingerprints recognition. "Morpho-Systems" was bought up by the SAGEM group in 1993, and currently holds more than half of the fingerprints' world market.

Jean Serra served in many roles on professional societies of interest to Earth Science communities around the world, received an honour "Chevalier of the National Order of Merit" in 1989. He was the Founder and/or vice president/President of several professional societies like International Stereological Society. In 1993, International Society for Mathematical Morphology, which was founded by Jean Serra, elected him as its first president. In the same year, he received the title of Dr honoris causa of one of the most prestigious universities of Spain, the Autonoma of Barcelona. He delivered lectures in various countries situated on all the continents. His remarkable theories have shown great impact on the works of researchers, and services he rendered to professional societies as Editor/Reviewer/Consultant are noteworthy. Journal of Mathematical Imaging and Vision (JMIV) published a Special Issue (v. 22 (2-3), p.103-353) on the occasion of Serra's 65th Birthday. Prof. Jean Serra has been chosen to deliver prestigious IAMG-Georges Matheron Lecture Series' inaugural lecture during September 2006 in Belgium.

These brief remarks are meant to provide a mathematical context for the unique contributions that Prof. Jean Serra has made.

Jean Serra's extraordinary accomplishments as an inventor of Mathematical Morphology, one cannot miss his human quality. He is a man of quality, honesty, humanity, humour, status, and stature with deep-rooted principles - wrapped in an active, handsome body and mind. He is a loving beacon to his Doctor-wife, and two children. To his friends, he gives inspiration and encouragement. Notably, Serra also served as Deputy Mayor of Fountainbleau from 2001 to 2005, and is the organist in one of the churches of his city.

It is a great honour to hold a Workshop honouring Jean Serra, inventor, with Georges Matheron, of Mathematical Morphology. This workshop covers about 12-15 invited talks by eminent scientists on mathematical morphology/computational and digital geometry. This workshop is intended to honour Jean Serra on his 70 years.

Advisory Committee

- Bimal Roy (Chairman) Director of Indian Statistical Institute, India
Sankar K. Pal, Distinguished Scientist, Indian Statistical Institute, India
N. S. N. Sastry, Indian Statistical Institute, India
Jean Serra, Université Paris-Est, ESIEE, France
B. L. Deekshatulu, University of Hyderabad, India
Baldev Raj, Indira Gandhi Centre for Atomic Research (IGCAR), India
Bhabatosh Chanda, Indian Statistical Institute, India
Christer Kiselman, Uppsala University, Sweden
Laurent Najman, Université Paris-Est, ESIEE, France
Jón Atli Benediktsson, University of Iceland, Iceland
C. Babu Rao, Indira Gandhi Centre for Atomic Research (IGCAR), India
Jocelyn Chanussot, University Grenoble, France
Pedro Pina, Universidade Técnica de Lisboa, Portugal
John Stell, University of Leeds, UK
Peijun Li, Peking University, China
Helmut Pottmann, King Abdulla University of Science and Technology, Saudi Arabia
B. Chakravarthy, University of Hyderabad, India
Malay K. Kundu, Indian Statistical Institute, India
Bhargab B Bhattacharya, Indian Statistical Institute, India
Jean Cousty, Université Paris-Est, France
Bidyut B Chaudhuri, Indian Statistical Institute, India
Pabitra Pal Choudhury, Indian Statistical Institute, India
Shahryar Rahnamayan, University of Ontario Institute of Technology, Canada
Ashish Ghosh, Indian Statistical Institute, India
I.K. Ravichandra Rao, Indian Statistical Institute, India
K.S Raghavan, Indian Statistical Institute, India

Local Organizing Committee:

Sasthi C Ghosh,
Saroj Kumar Meher

H. M. Rajashekara
Kalyanaraman

B. S. Daya Sagar

For the list of invited speakers, participants selected to attend the course, and further details, please visit the course and workshop webpage at: www.isibang.ac.in/~cwjs70. This webpage also provides time table and time schedules for course and the workshop. Please keep checking the webpage from 15th September 2010 onwards.

REGISTRATION DETAILS :

The number of participants will be restricted to 25 and admission to the Course and Workshop will be strictly on a 'first-come-first-served' basis. The course and workshop speakers will include experts from India and abroad and will be drawn from both the academia and industry.

The Registration fee for the course is Rs. 1500/- and for the workshop is Rs. 1500/-. The Registration fee for both course and workshop is Rs. 2200/-. The fee covers the course material, breakfast, tea, lunch, and dinner. The fee should be paid in the form of a Crossed Demand Draft payable at Bangalore drawn in favour of the Indian Statistical Institute.

Accommodation at a nominal cost could be arranged for a limited number of participants on a 'first-come-first-served' basis in the Guesthouses/Hostels attached to the Indian Statistical Institute.

How to reach the Venue: The Course and Workshop will be held in the Indian Statistical Institute-Bangalore Centre. It is about 55kms from Bangalore International Airport. Indian Statistical Institute, 8th Mile, Mysore Road, RVCE Post, Bangalore 560 059, Phone: 91 80 28483002/3/4/5/6, Fax: 91 80 28484265.

For further details contact:

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N.B.: For up-to-date extended details, please browse through the course+workshop website at:

www.isibang.ac.in/~csjs70