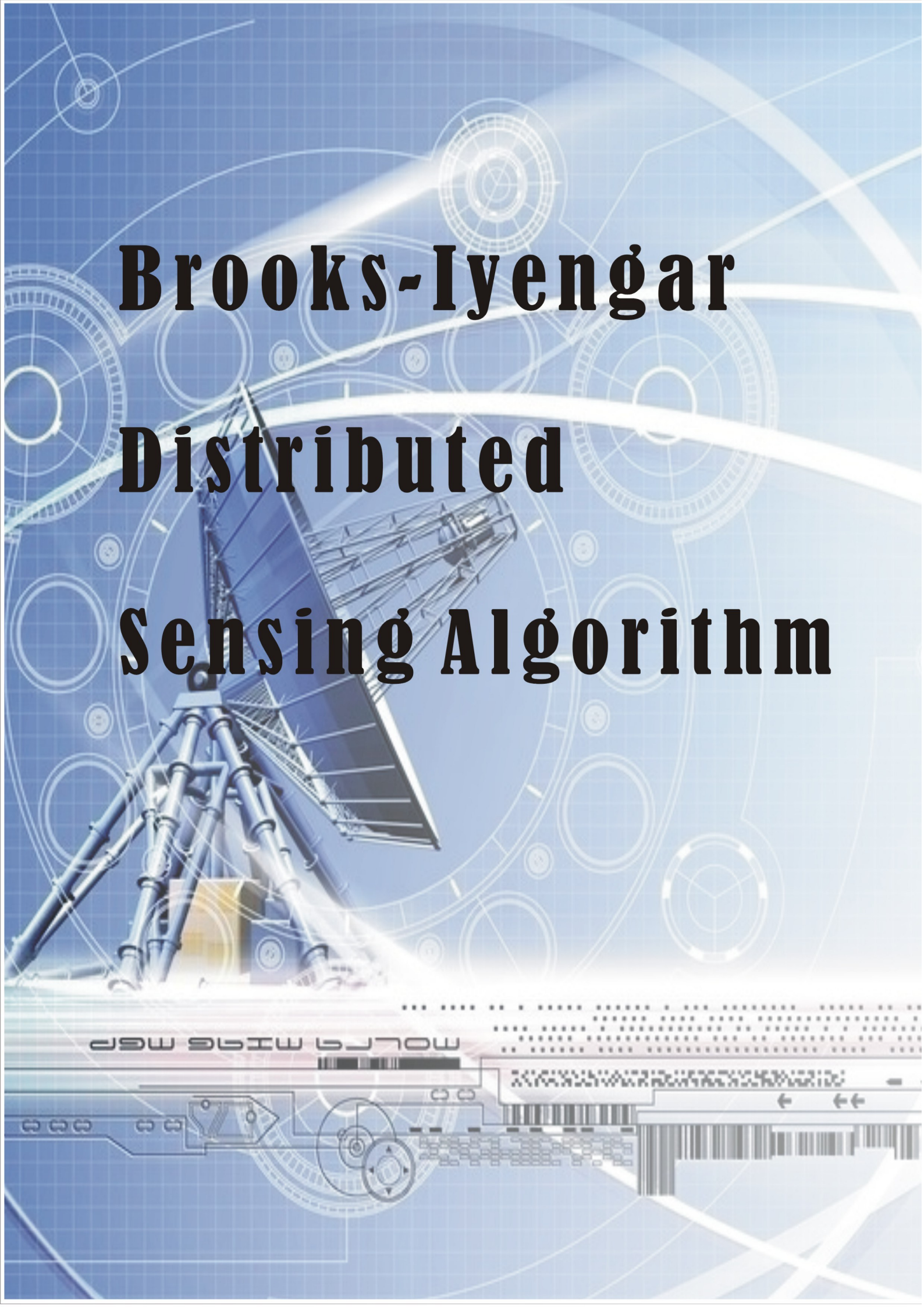
Beyond High Citation Count in Academic Publications

RESEARCH COMMERCIALIZATION AND IMPACT

S. S. Iyengar Ph. D
ACM Fellow, IEEE Fellow, AAAS Fellow
Director and Ryder Professor
School of Computing and Information Sciences
Florida International University


Brooks-Iyengar
Distributed
Sensing Algorithm

BROOKS-IYENGAR ALGORITHM

The BrooksIyengar algorithm or BrooksIyengar hybrid algorithm is a distributed algorithm, that improves both the precision and accuracy of the measurements taken by a distributed sensor network, even in the presence of faulty sensors. The sensor network does this by exchanging the measured value and accuracy value at every node with every other node. And it computes the accuracy range and a measured value for the whole network from all of the values collected. Even if some of the data from some of the sensors is faulty, the sensor network will not malfunction.

Iyengar is the Co-inventor of the Brooks-Iyengar algorithm for noise tolerant distributed control, which bridges the gap between sensor fusion and Byzantine fault tolerance thus providing an optimal solution to the fault-event disambiguation problem in sensor-networks.

R.R. Brooks and S. S. Iyengar. "Robust Distributed Computing and Sensing Algorithm." IEEE Computer. vol. 29, no. 6. pp. 53-60. June 1996.

R.R. Brooks and S.S. Iyengar. "Optimal Matching Algorithm for Multi-Dimensional Sensor Readings.? Sensor Fusion and Networked Robotics. Schenker, SPIE International Symposium on Intelligent Systems and Advanced Manufacturing, Phildelphia, PA. SPIE, vol. 2589. pp. 91-99. SPIE, Bellingham, WA. October 1995

Text Book (Prentice Hall)

2 APPLICATION OF THIS ALGORITHM IN MODERN DAY LINUX OPERATING SYSTEM FOR COMBINING DATA IN FAULT-TOLERANCE. (MINIX)

In 1996, Iyengar? s group, in collaboration with Brooks and with funding from Oak Ridge National Laboratory, invented a method of fault tolerance modeling that offers a computationally inspired real-time task management solution. This work has emerged in new versions of real time extensions to Linux Operating Systems. Many of these algorithms were used and installed in the RT Linux Operating System. They are now working on formal model verification by incorporating the algorithms into a new embedded kernel for robotic applications.

The profound contribution
of the Brooks-Iyengar Distributed
Computational Sensing work has
enhanced new real-time features
By adding fault tolerant capabilities.

APPLICATION IN DARPAS?S PROGRAM DEMONSTRATION WITH BBN, CAMBRIDGE MASSACHUSSETTS, MURI, RESEARCHERS FROM PSU/ARL, DUKE, U. WISCONSIN, UCLA, CORNELL AND LSU

In 2000, the DARPA program manager used two major demonstrations to showcase SensIT? s advances and document the ability of sensor networks to provide new capabilities. One demonstration took place at the Twentynine Palms, California Marine Training grounds in August 2000, the other took place at BBN offices in Cambridge, Massachusetts in October 2011. Dr. Gail Mitchell of BBN coordinated this work for BBN, DARPA? s SensIT integration contractor.
Both demonstrations used the Brooks-Iyengar fusion approach to combine sensor readings in real-time. Acoustic, seismic, and motion detection readings from multiple sensors were combined and fed into a distributed tracking system. The first deployment was effective, but noisy. The second demonstration built on the success of the first testing California. An improved ? outfielder algorithm? was used to determine which node was best situated to continue existing tracks.
This work was an essential precursor to the Emergent Sensor Plexus MURI from Penn State Applied Research Laboratory (PSU/ARL) with Dr. Shashi Phoha as PI. In that MURI, researchers from PSU/ARL, Duke, U. Wisconsin, UCLA, Cornell, and LSU extended SensIT's advances to create practical and survivable sensor network applications.

4 BROOKS–IYENGAR SENSOR FUSION ALGORITHM HAS BEEN EXTREMELY INFLUENTIAL

This algorithm was central to the DARPA SensIT program's prototype distributed tracking program demonstrated at 29 Palms marine base.

This algorithm was used to combine heterogeneous sensor feeds in the application fielded by BBN Technologies, BAE sytems , Penn State Applied Research Lab (ARL), USC/ISI. This program was a major milestone in establishing the field of distributed sensing.

The Thales Group, a UK Defense Manufacturer, used this work as part of its Global Operational Analysis Laboratory.

The research in developing this algorithm has continued over time and associated researchers have had many follow on programs. The final results of these follow on programs include tools used by the US Navy in its maritime domain awareness software.

Education: This algorithm has been used in teaching classes at U Wisconsin, Purdue, Georgia Tech. Clemson, U of Maryland, etc.

AT BOEING CORPORATION

Mattikalli, R.Fresnedo, R.Frank, P.Locke, S.Thunemann, Z. Optimal Sensor Selection and Placement for Perimeter Defense, 2007.

AT DEPARTMENT OF DEFENSE

Capt. S. Hynes and N. S. Rowe, ? Multi-Agent Simulation for Assessing Massive Sensor Deployment? , Artucle at Naval Postgraduate School, 2004

PURDUE UNIVERSITY

UNIVERSITY OF MARYLAND

PENNSTATE

Telcordia

Linux

THALES

USC University of Southern California

DARPA

NAVY

THE UNIVERSITY of WISCONSIN MADISON

CLEMSON UNIVERSITY

Raytheon BBN Technologies

BOEING

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

6 OPTIMIZATION OF SENSOR NETWORK INFRASTRUCTURE

The impact of Iyengar? s seminal work on optimization of sensor network infrastructure has been wide-ranging. Since he laid the foundations for sensor deployment through his early papers, several major companies have commercialized this research and filed for patents.

K. Chakrabarty, **S.S. Iyengar**, H. Qi, and E.C. Cho, ?Grid Coverage of Surveillance and Target Location in Distributed Sensor Networks?, IEEE Transactions on Computers, Vol 51, No. 12, December 2002.

S.S. Dhillon, K. Chakrabarty, and **S.S. Iyengar**, ? Sensor Placement for Effective Grid Coverage and Surveillance? , Workshop on Signal Processing, Communications, Chaos and Systems, Newport, RI, 2002.

S.S. Dhillon, K. Chakrabarty, and **S.S. Iyengar**, ? Sensor Placement for Grid Coverage under Imprecise Detections? , Proceedings of the International Conference on Information Fusion (FUSION 2002), pp. 1581-1587, 2002.

Research Monograph (Springer Verlag London Ltd)

Chakrabarty and S.S. Iyengar, ? **Scalable Infrastructure for Information Processing in Distributed Sensor Networks?**, Springer Verlag London Ltd, June 2005, pp. 252.

APPLICATION OF OPTIMIZATION OF SENSOR NETWORK STRUCTURE IN TELCORDIA, MOTOROLA?S R&D WORK

One of the major areas of Dr. Iyengar's R&D work for Telcordia is network optimization and resource allocation, including the design and maintenance of sensor networks. The seminal work of Dr. Iyengar and his colleagues on sensor network infrastructure constitute foundations for sensor placement and for the optimization of information obtained from sensor networks. The ideas and algorithms introduced by Iyengar et al. played an important role in Telcordia patent 8,019,576 entitled ? Method for placement of sensors? and Motorola patent 7,688,793 entitled ? Wireless sensor node group affiliation method and apparatus,? both of which build up upon his pioneering work.

Patents that cite nominee? s work on sensor networks
8019576: Method for placement of sensors for surveillance – Issued: September 13, 2011 , Assignee Company: Telcordia
http://www.patentgenius.com/patent/8019576.html
7688793: Wireless sensor node group affiliation method and apparatus – Issued: March 30, 2010. , Assignee company: Motorola
http://www.patentgenius.com/patent/7688793.html

Telcordia

MOTOROLA

8 IMPACT ON GRADUATE THESES AND IN DIVERSE AREAS

Integrated Circuit Design: On-Chip Thermal Sensor Placement, M.S. Thesis at UMass-Amherst (Yun Xiang), 2008

Wireless Networks: Secure Localization and Node Placement Strategies for Wireless Networks, PhD Thesis at Auburn University (Santosh Pandey), 2007

Robotics: Energy-Efficient Mobile Robots, PhD Thesis (Yongguo Mei) at Purdue University (2007)

Sensor Management: Global Sensor Management: Allocation of Military Surveillance Assets, PhD Thesis at NC State University (Kristin Arney), 2008

Wireless Sensor Networks: Effiziente Kommunikation und Optimierung der Knoten-Positionierung in drahtlosen Sensornetzen unter Ausnutzung r? umlicher Korrelationen (in German), PhD Thesis at Technical University of Aachen, Germany (Frank Odewurtel), 2011

Cargo Monitoring: Optimal Communications Systems and Network Design for Cargo Monitoring, PhD Thesis at University of Kansas (Daniel Fokum)

Human Activities Space: A Multi Sensor System for a Human Activities Space Aspects of Planning and Quality Measurement, Blekinge Institute of Technology, Sweden, Licentiate Dissertation Series, 2008.

Structural Health Monitoring: Identification of Damage Using lamb Waves, Springer Book volume 2009.

Dimensional Measurement: Distributed Large-Scale Dimensional Metrology: New Insights (book).

In the area of sensor networks narrowly defined, cited in over 23 PhD thesis.

IMPACT ON NSF GRANT

The nominee? s research has also influenced university research over the past 10 years, and several NSF grants have been awarded to researchers who have built up on and leveraged the nominee? s pioneering work on sensor deployment and minimalistic sensor networks. Here is a snapshot of some these grants

Award Number: CNS-1054935 (? CAREER: A Theoretical Foundation for Achieving Sustainability and Scalability in 3D Wireless Sensor Network Deployments?

Award Number: CNS- 1152134 (? Optimal Surface Gateway Deployment for Underwater Acoustic Sensor Networks?

Award Number: 0449309 (? Collaborative Signal and Information Processing in Sensor Networks?

Award Number: CNS-1149611 (? SensorFly: Minimalistic Dynamic Sensing and Organization in Groups of Semi-Controllable Mobile Sensing Devices?

10 AUTOMATED ANALYSIS AND INTERPRETATION OF SATELLITE IMAGERY OF THE OCEAN. K. (90-95)

Sankar, **S.S.Iyengar**, R. Holyer and M. Lybanon, "Histogram Based Morphological Edge Detector", IEEE Transactions on Geoscience and Remote Sensing Vol. 32, No. 4, pp. 759-767, July 1994.

R. Brooks, **S.S.Iyengar** and J. Chen, "Automatic Correlation and Calibration of Noisy Sensor Readings Using Elite Genetic Algorithms", Artificial Intelligence Journal, 84, pp. 339-354, 1996.

S.S.Iyengar and W. Deng, "An Efficient Edge Detection Algorithm using Relaxation Labeling", Journal of Pattern Recognition, Vol. 28, No. 4, pp. 519-536, 1995.

Oceanographers possess high-level knowledge about currents, eddies, and other dynamic ocean features. Image processing techniques locate edges, uniform regions, or shapes in satellite imagery of the ocean. One of the major problems associated with automated image interpretation is bridging the gap between low-level image features and high-level oceanographic features. In other words, is a sharp gray level gradient in the image part of the Gulf Stream North Wall, part of an eddy, or part of some other meaningful ocean structure? This linkage of low-level features to oceanographic objects is the problem addressed by Prof. Iyengar's research. Without useful results in this key area, the work of other laboratories involved with this project could not have been integrated into a working prototype system.

Prof. Iyengar's use of non-linear probabilistic relaxation to perform feature labeling was innovative and well executed. His work was a key factor leading to the first fully automated interpretation of a satellite image of the ocean in 1989. Subsequent work has shown the method to produce labelings that are too dependent upon having a previous analysis. The method will hopefully be replaced by one of several alternate approaches, also under development in the Computer Sciences Department at LSU. However, for three years Prof. Iyengar's research served well as the centerpiece of this pioneering effort in computerized image analysis systems. He made a significant contribution to image analysis science and to the goals of the Naval Research Laboratory. In short, I strongly support Prof. Iyengar for a research award at LSU.

Sincerely,

RONALD J. HOLYER
Head, Computer Sciences Section

IMPACT ON NAVAL RESEARCH LABORATORY

Provided the foundation for a much larger effort involving U.S. Navy laboratories, industry partners and leading universities to construct next-generation U.S. Navy surveillance systems

Provided the centerpiece for the Navy's pioneering efforts in developing a computerized image analysis system leading to the first fully automated U.S. Navy system for interpretation of satellite images of the ocean

Provided the fundamental framework for today's operational U.S. Navy systems

Expanded the frontiers of image analysis science, and are captured in his book, Advances in Distributed Sensor Integration: Applications in Theory, published in 1995 and his new, soon to be published work, The Design and Analysis of Algorithms for Processing Digital Satellite IR Images

CONTRIBUTION TO US NAVY

Dr. Iyengar? s research on image processing systems was used in 1988-93 by the US Navy as a centerpiece of architecture. Dr. Iyengar addressed the problem on linkage of low level features to oceanographic objects. Without useful results in this key area, the work of other laboratories involved with this project could not have been integrated into a working prototype system.three years Dr. Iyengar's research served well as the centerpiece of this pioneering effort in computerized image analysis system

12

CO-INVENTED THE COGNITIVE INFORMATION PROCESSING SHELL

Co-Invented the Cognitive Information Processing Shell, a complex event processing architecture and engine which recognizes and responds to complex patterns in mission critical,real-time applications.

S.S.Iyengar,Supratik Mukhopadhyay, Christopher Steinmuller, and Xin Li "Preventing Future Oil Spills with Software-Based Event Detection" IEEE Computers,pp: 76-78,August 2010.

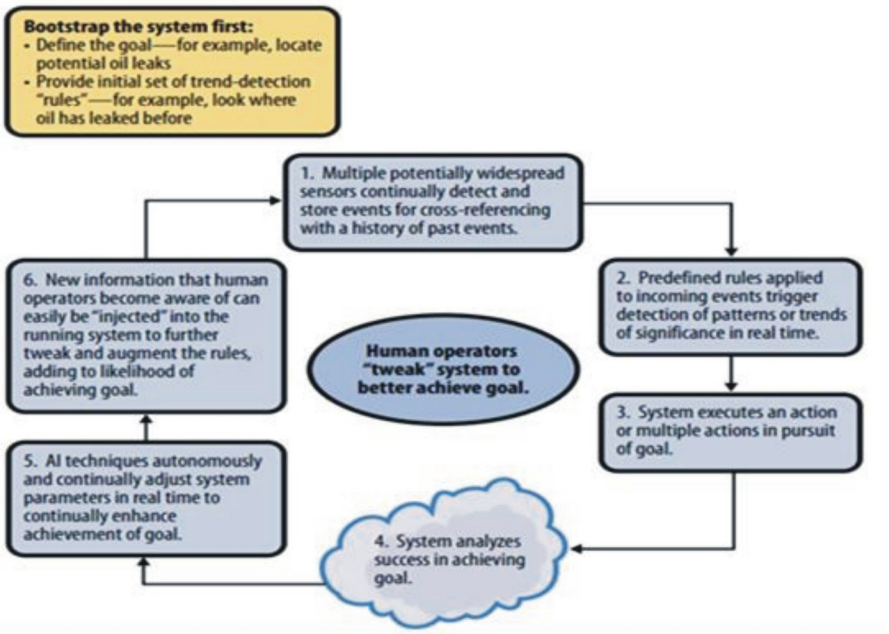


Figure 1. High-level view of Cognitive Information Management Shell.

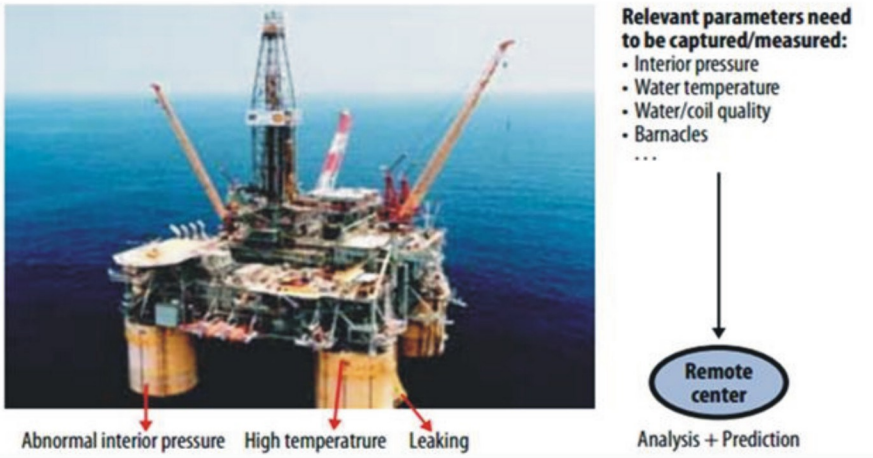


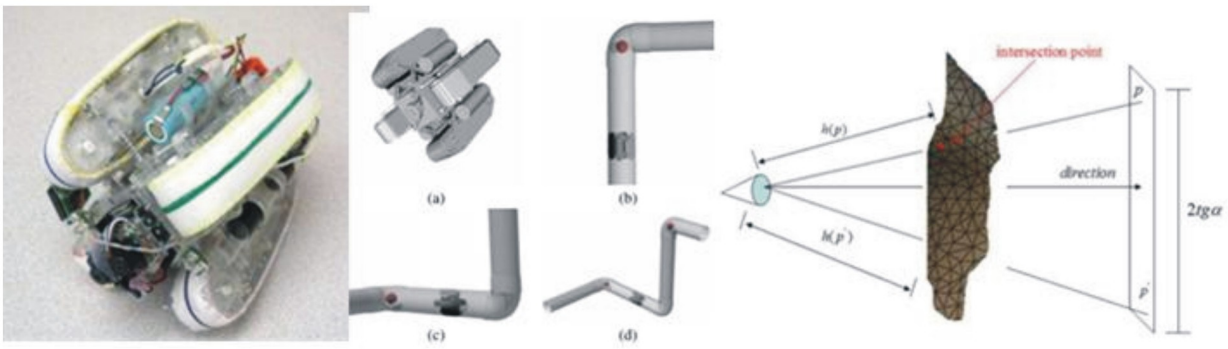
Figure 2. Had CIM Shell been integrated with the Deepwater Horizon infrastructure, it would have interpreted prior maintenance incidents and concerns voiced by BP's engineers as a complex event and magnified the associated risks.

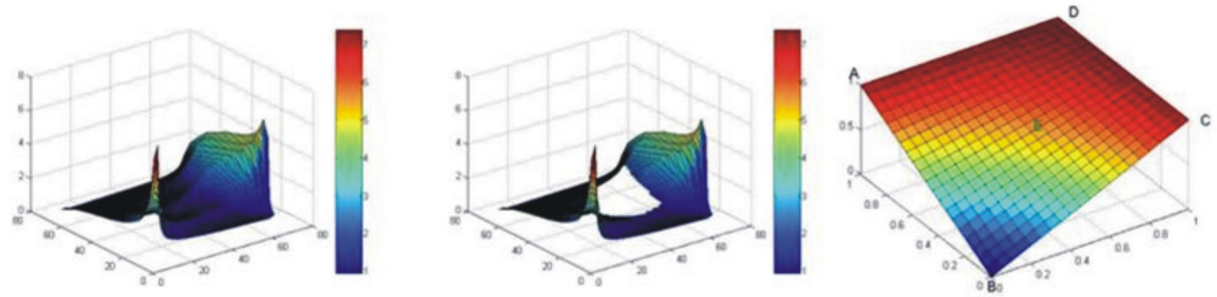
NC ALGORITHM CHORDAL GRAPHS AND K-TREES

Solved decade-old problem in graph recognition ? NC Algorithm Chordal Graphs and K-Trees? (IEEE Tran, 1988) laying foundation for designing for fast parallel for log large scale data sets. Also Solved fundamental problem in computer graphics: First optimization framework for the NP hard 3D region guarding problem; significantly impacted robotics, medicine and multimedia processing.N. Chandrasekharan and S.S. Iyengar ? NC algorithms for recognizing chordal graphs ad K-Trees? , Computers, IEEE Transactions on, Volume 37, Issue 10, Page(s): 1178-1183, Oct, 1988.

ALGORITHM FOR AUTONOMOUS PIPELINE INSPECTION

Xin Li, Wuyi Yu,Xiao Lin, S.S.Iyengar. "On Optimizing Autonomous Pipeline Inspection" IEEE Transaction on Robotics, VOL. 28, No. 1, February 2012





RESEARCH INTO MEDIA

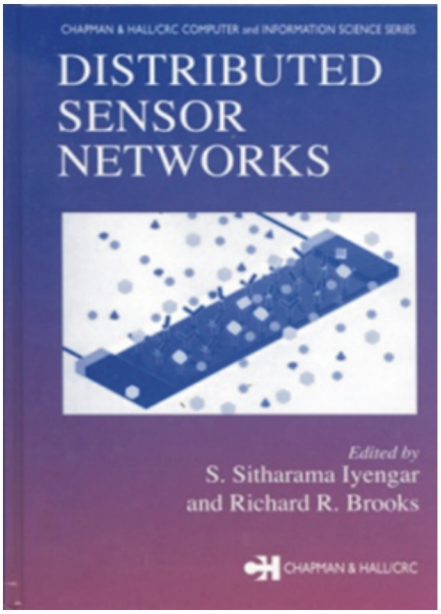
His research work was shown on the Discovery channel, History channel, local ABC news affiliates (WBRZ News), Fox TV channel(Fox 44 WGMB), Youtube and major news outlets (LSUReville, The Advocate) around the world, over 60 million homes distributed worldwide (Russia, Korea, Europe, China, India etc.)

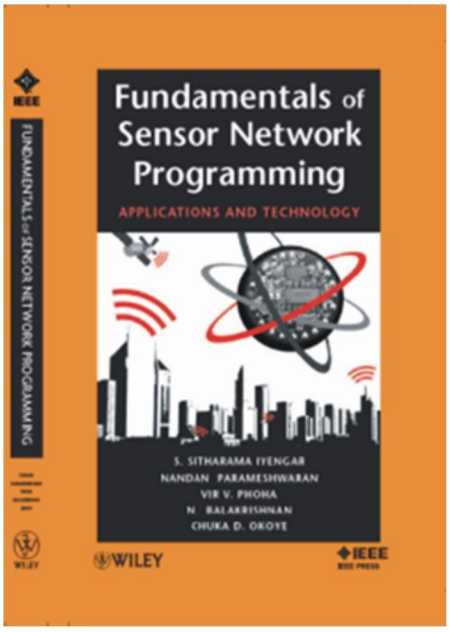
One of Dr. Iyengar's students Brian Obe? s love of digital artistry emerged in 1990 with a visit to LSU robotics research laboratory where he was introduced to many techniques and that ended him getting an animation award at the 78th Academy Awards.

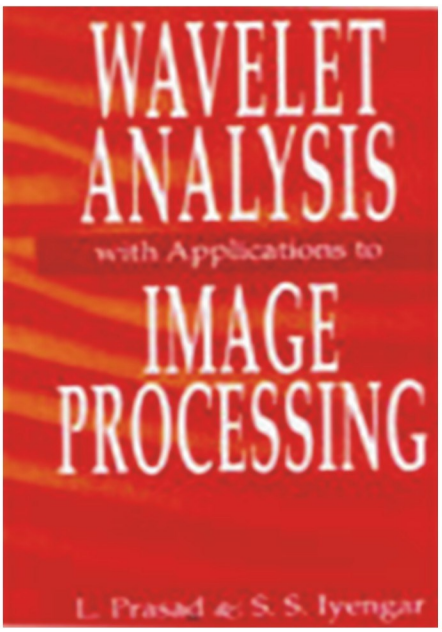
INFLUENTIAL TEXT BOOKS

Have been used extensively and translated into many languages worldwide in Multi-Sensor Fusions , Sensor Network Programming , Wavelet Analysis, Distributed Sensor Networks.

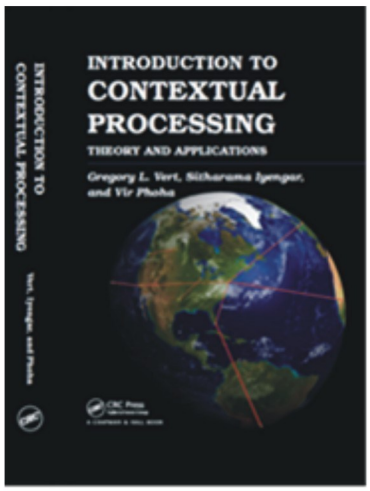
The research findings uniquely connect computing techniques to imaging techniques to biological systems protocols and modeling.

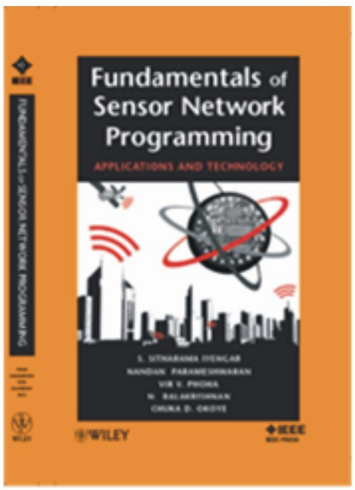


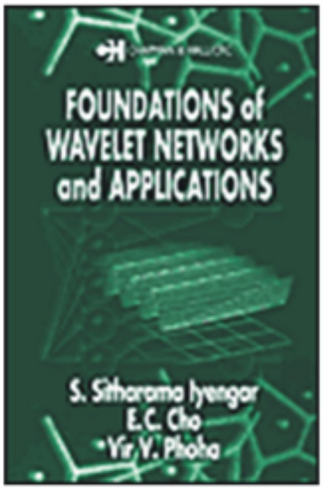


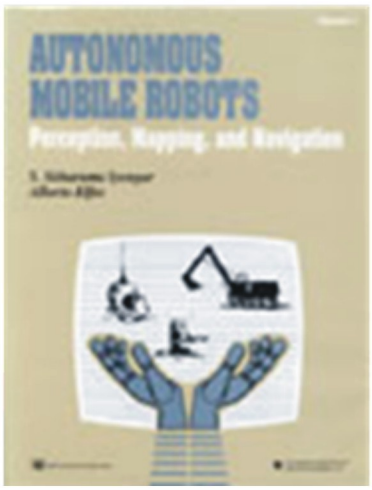


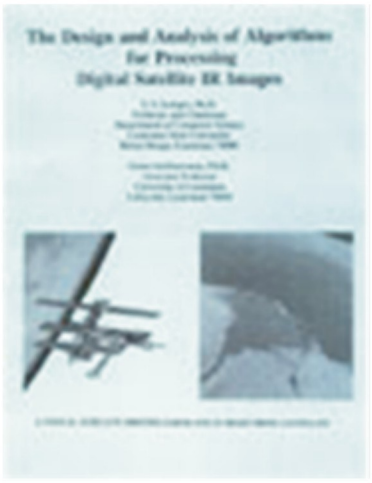
16 BOOKS AUTHORED

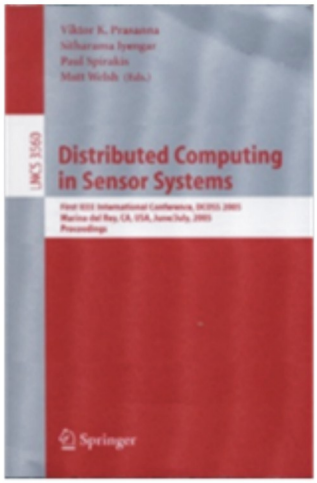


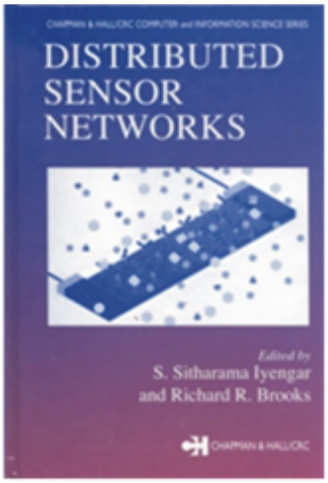


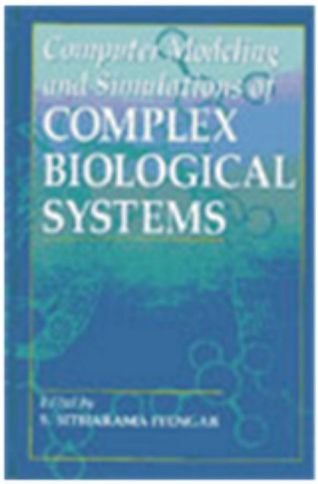




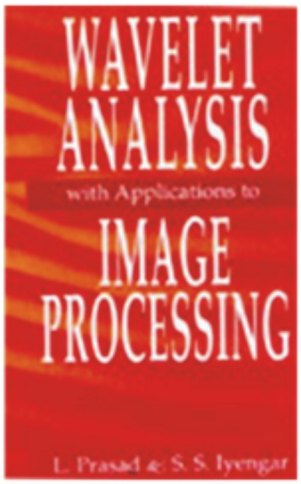

The Design and Analysis of Algorithms for Processing Digital Satellite IR Images


Distributed Computing in Sensor Systems
LNCS 3560
Springer

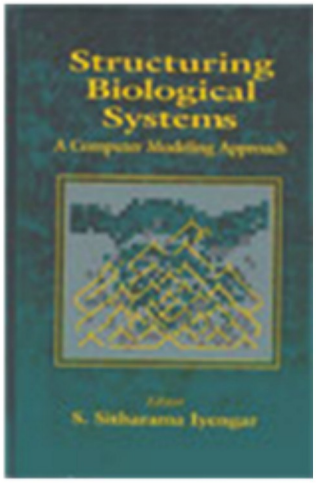

DISTRIBUTED SENSOR NETWORKS
Edited by
S. Sitharama Iyengar
and Richard R. Brooks
CHAPMAN & HALL/CRC


Computer Modeling and Simulations of
COMPLEX BIOLOGICAL SYSTEMS


MULTI-SENSOR FUSION
Fundamentals and Applications with Software


WAVELET ANALYSIS
with Applications to
IMAGE PROCESSING
L. Prasad & S. S. Iyengar


COMPUTER MODELING COMPLEX BIOLOGICAL SYSTEMS
S. Sitharama Iyengar


Structuring Biological Systems
A Computer Modeling Approach
Edited
S. Sitharama Iyengar

RESEARCH INTO COMMERCIAL AREA

One of Dr. Iyengar's project along with Dr. Phoha (LA Tech) and Dr. Kannan (LSU) entitled "Fast Web Page Allocation on a Server Using Self-Organizing Properties of Neural Networks" was selected in World's Best Technology Showcase in the year 2007. This is a highly competitive summit and other competitors were Los Alamos Labs, Johns Hopkins University, EPA , NASA and many other.

His research has spanned over three decades producing a number of new inventions and has led him to have his impact on thousands of researchers. Professor Iyengar has named patents and has guided graduate level research of almost 150 students.

WBTshowcase
world's best technologies

GROUNDBREAKING WORK HAS INSPIRED RESEARCHERS IN ACADEMIA AND INDUSTRY

Patent no. US 7,676,805 B2 , Issued: March 9, 2012

Wireless sensor node executable code request facilitation method and apparatus

Yang Yu et al

Assigned to: Motorola

Patent no. US 7,688,793 B2 , Issued: March 30, 2010

Wireless sensor node group affiliation method and apparatus

Loren J. Rittle et al

Assigned to: Motorola

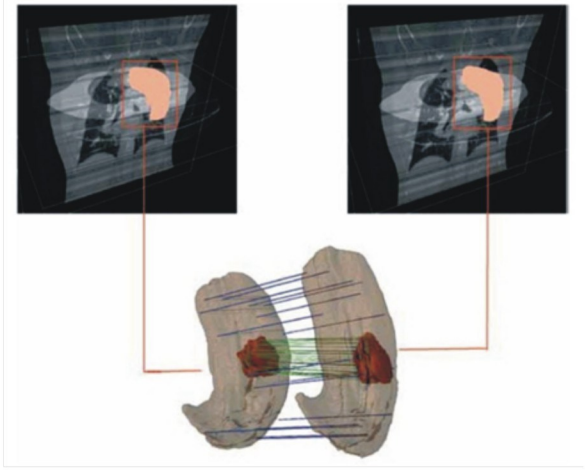
Patent no. US 8,019,576 B2 , Issued: September 13, 2011

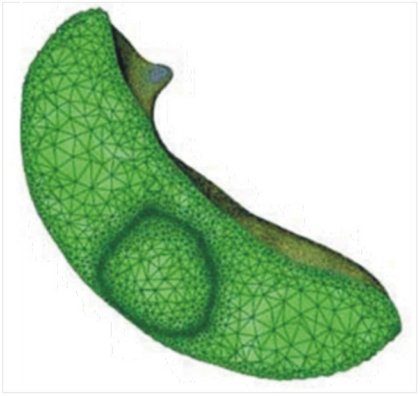
Method for placement of sensors for surveillance

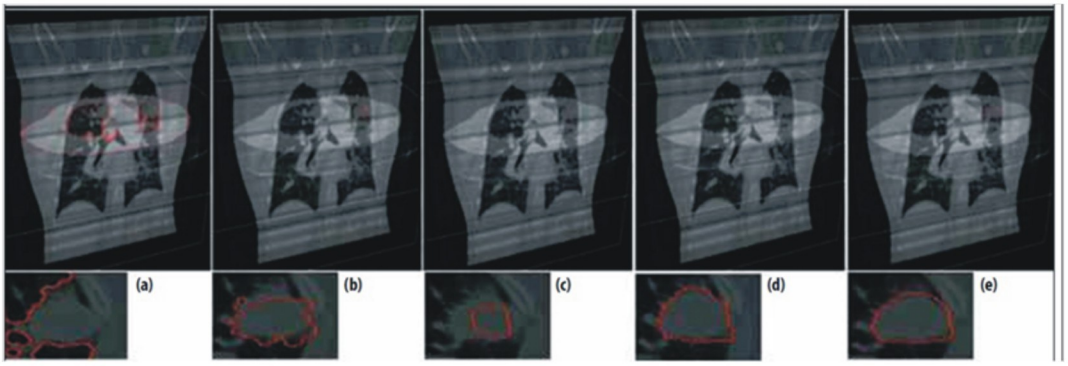
Hanan Luss

Assigned to: Telcordia

S.S. Iyengar, Xin Li, Huanhuan Xu, Supratik Mukhopadyay, N. Balakrishnan, Amit Sawant, Puneeth Iyengar, "Toward More Precise Radiotherapy Treatment of Lung Tumors", Computer, January 2012. A computational framework for modeling the respiratory motion of lung tumors provides a 4D parametric representation that tracks, analyzes, and models movement to provide more accurate guidance in the planning and delivery of lung tumor radiotherapy.







20 STARTUP COMPANIES

In 2010, Iyengar as a president of NoeticNexus company has been instrumental in setting up the technology goals and vision of the start-up www.noeticnexus.com. And built up innovative applications using Java, PHP and the latest web technologies.

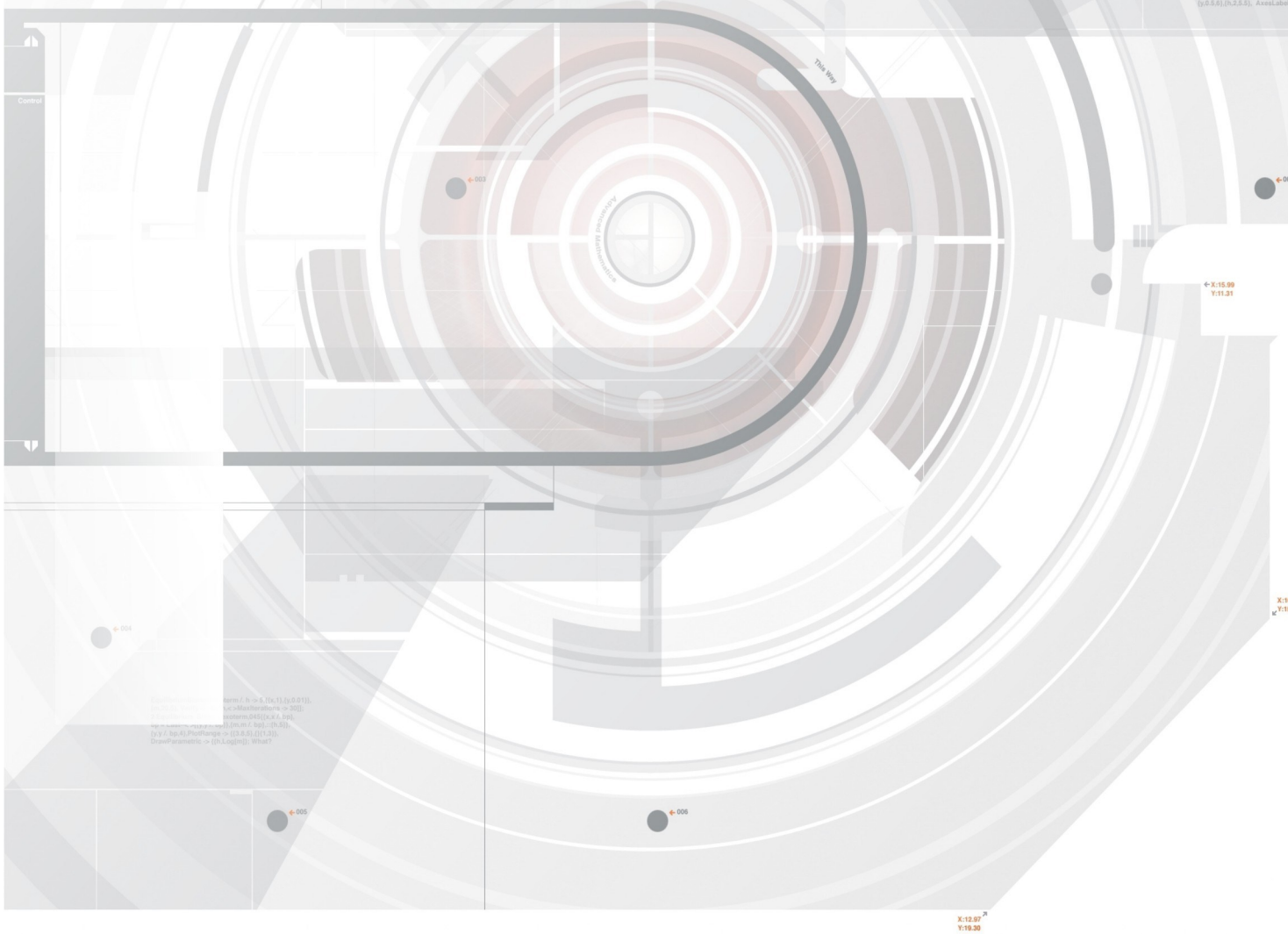
We also build iPhone Apps. In 2010, He co-founded GroupThink, a start-up company for social network applications. He has been helping the company on getting the tight clientele and keeping up a competitive edge with the competitors. Under his guidance the following projects have been delivered

http://myip-online.net/ ,

http://www.voicegain.com

http://thatva.com/

Http://www.thegroupthink.com/



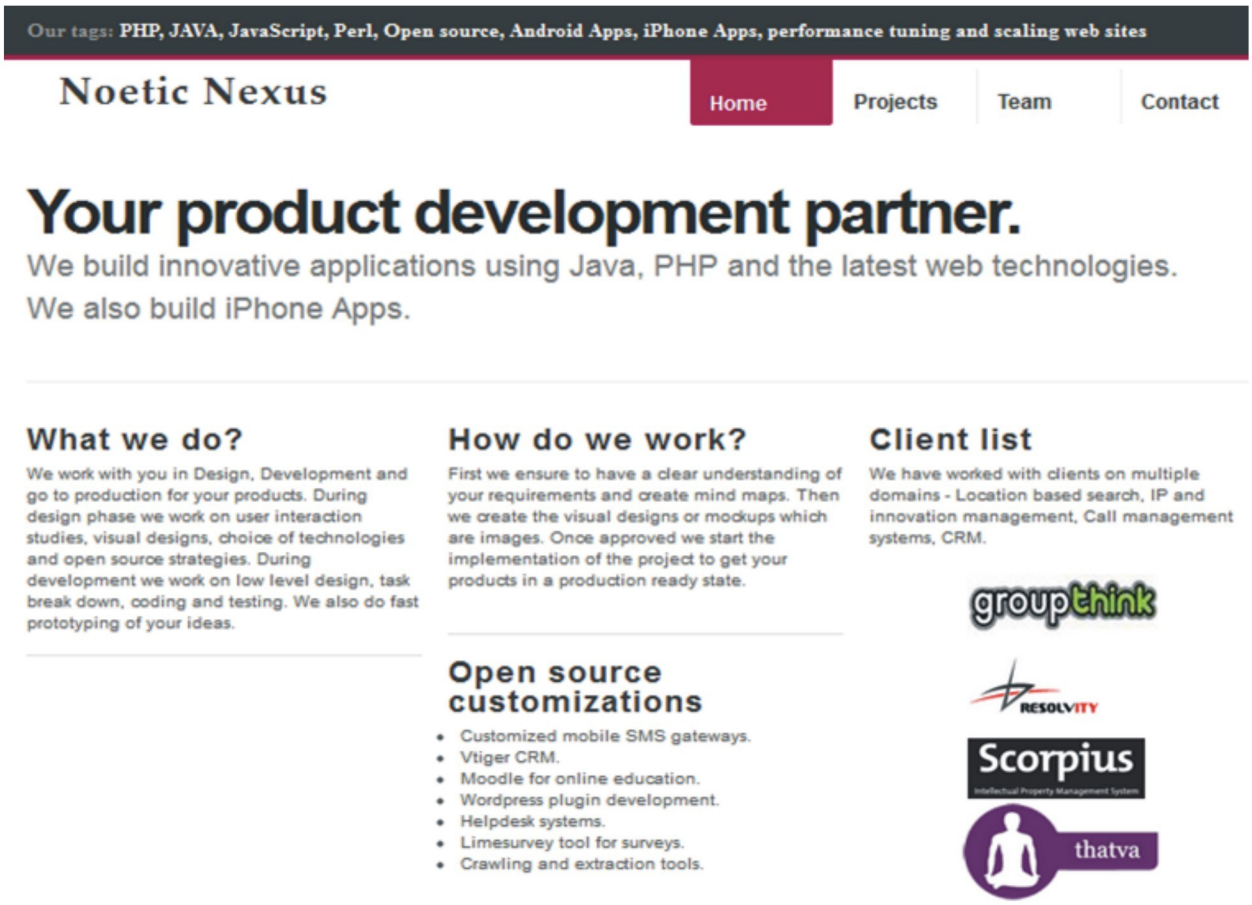
In collaboration with Morph2O and Indian Agricultural Research Institute, Dr. Iyengar led the engineering team at NuLogix Labs, a start up company that he founded in 2010 to commercialize this technology and lead its deployment in the agricultural domain in India and the United States.

Dr. Iyengar invented the Cognitive Information Management Shell, a complex event processing architecture and engine that innovatively combines automated agent synthesis with machine learning-based agile analytics and distributed databases. This shell introduced a new paradigm for combining machine learning with expert knowledge and human input.

Prof. Paulraj serves on several boards / councils of corporations, universities, foundation, and governments.

STARTUP NOETIC NEXUS

In 2008, Iyengar cofounded a company, Noetic Nexus, with Venkat Ramshet to build innovative applications for the latest Web Technologies in the context of open source frameworks for rapid development. The company has worked with clients such as Scorpius, Thatva, Sagas, Yulop, and SynaBEE in multiple domains including location based search, IP, and innovation management while generating multi million dollars. Dr. Iyengar is serving as the President and CTO of ?NoeticNexus.?



STARTUP GROUPTHINK

In 2011, Dr. Iyengar cofounded GroupThink, a Social Network Company created to give its users an easily accessible mobile platform on which they can directly ask their friends questions using multiple types of multimedia and receive answers instantaneously. GroupThink? s mobile platform allows users to directly route a quext (a question text message) to different groups of friends, while retaining complete creative control over the entire message. The GroupThink quext is the text message 2.0.

BRIEF PROFILE

- October 2010 Present, Chief Scientist at Nulogix Lab (http://www.nulogixlabs.com/index.html) a high-technology startup company in New Jersey focusing on agile analytics.

- October 2008Present, Member of Board of Advisors, SAI Technology, a high technology startup company in Silicon Valley.

- Dec 2007-July 2008- Visiting Homi-Bhabha Distinguished Professor at IGCAR, India.

- 2002- Present- Satish Dhawan Chaired Professorship, Indian Institute of Science, Bangalore India.

- July 2000 Present, Roy Paul Daniels Distinguished Professor and Chair, Computer Science, LSU.

- 1991Present, Chairman, Department of Computer Science, LSU.

- 1987 1991, Professor Computer Science, LSU. 1990-Summer Faculty Fellow, Jet Propulsion Laboratory, California Institute of Technology.

- 19851988- Visiting Faculty, Robotics and Artificial Intelligence Group, CESAR Division, Oak Ridge National Laboratory, Oak Ridge, TN.

- 19801987, Assistant/Associate Professor, Computer Science, LSU.

- 19741980, Assistant/Associate Professor, Computer Science, Jackson State University.

- Visiting Professor in Taiwan (ASIA), Korea (KAIST), Paris, Bonn,etc.

SELECTED PUBLICATIONS

- R.R. Brooks and S. S. Iyengar. "Robust Distributed Computing and Sensing Algorithm" IEEE Computer. vol. 29 No. 6. pp. 53-60. June 1996.
- R.R. Brooks and S.S. Iyengar ?Multi-Sensor Fusion,? Fundamentals and Applications with Software, 1998 Prentice Hall PTR.
- K. Chakrabarty, **S.S. Iyengar**, H. Qi, and E.C. Cho, ?Grid Coverage of Surveillance and Target Location in Distributed Sensor Networks?, IEEE Transactions on Computers, Vol 51, No. 12, December 2002.
- Krish/Iyengar, "Distributed Bayesian Algorithms for Fault-Tolerant Event Region Detection in Wireless Sensor Networks", IEEE Tran Comp, 2004.
- Iyengar et al "Preventing Future Oil Spills with Software-Based Event Detection" IEEE Comp; 2010.

IEEE

PATENTS ISSUED

●Vir V. Phoha, S. S. Iyengar, and R. Kannan, ? Method of allocation of Web pages using neural networks.? *U.S. Patent No. 7,191,178. Issued March 13, 2007. (Featured in the World's best technology showcase, 2007, Arlington, TX)

●Vir V. Phoha, S. S. Iyengar, and R. Kannan, ? Data Set Request Allocations to Computers.? US. Patent No. 7,730,086 B1. Issued June 1, 2010.

●S.S. Iyengar, P.R.K. Prasad, and A. K. Kumar and others, A pattern recognition device to indicate pressure in the eye due to Glaucoma by means of optical changes, 2012 (Published in Miami Business Today). Won The Florida Information Technology Award (IT2). Global International Application PCT/IN2010/000054 and US Patent Application no. 13/138,316 already filed for proposed device.

●S. Mukhopadhyay and S.S. Iyengar, SYSTEM AND ARCHITECTURE FOR ROBUST MANAGEMENT OF RESOURCES IN A WIDE-AREA NETWORK, Patent was filed on June 3rd, 2011, United States Application Number or PCT International Application Number 13/153,388. Licensed to (NuLogix and/or Prases Corp. and also inter-institutional agreement with Utah State University)

FELLOWSHIP

●Fellow, IEEE, 1995 , Fellow, AAAS, 2000 , Fellow, ACM, 2001

●Fellow of Institution of Engineers (India)

●Fellow Design and Process Science SDPS, 2004

●2010 Village Fellow The Academy of Trans-disciplinary Learning and Advanced Studies

●Member, European Academy of Sciences, 2002;

●Founding Editor & Chief, International Journal of Distributed Sensor Networks, 2005

●Founding Chair, Innovations and Commercial Applications of Distributed Sensor Networks Conference

●Member of the International Conference Program Committee on Sensor Networks/Distributed Computing, Keynote Speaker for various international conferences all around the world, 2004-2008

●Editor/Editorial board member of IEEE Computer journals - various IEEE Transactions and the Computer Magazine. Member of the National Lib of Medicine Biomedical Lib Review Committee NIH (1993).

●Member of the European Sensor Networking Community jointly with University of Melbourne, Australia (2002).

●Member of the National Research Council of Experts reviewing international proposals.

●Co-Founder of Groupthink Co., 2011

●President of Noetic Nexus Co.,2011, Chief Scientist of NuLogix Lab., 2010;

●Member of the Programming Team for SynaBee, 2011

28 AWARDS

●Florida Innovation Award for designing a pattern recognition device, March, 2012

●Eminent Engineer Award Institution of Engineers (India), 2012

●Honorary Doctorate Techno Global University (Calcutta, India) Distinguished Alum Award, Visvesvarya College of Engineering, India (2010)

●Distinguished Research Award, Xiamen University, China (2010)

●Honorary Professor, Asia Univ, Taiwan (2008)

●Homi-Bhaba Chaired Professor, Atomic Energy Commission, India (2007-2010)

●Distinguished Research Award, Xiamen Univ, China (2005).

●Distinguished Alum Award, Indian Inst of Science (2003)

●IEEE Comp Soc Golden Core Member (2000)

●SIAM Distinguished Lecturer (2000-02)

●ACM National Lecturer (1986-1995)

●IEEE Comp Soc Tech Achievement Award (1998)

●LSU Distinguished Research Award & Hub Cotton Award(1998)

●Best Paper Award Distributed Sensor Networks Symposium 2005, and Intl Conference on Information Systems 2004.

●The Greater Miami Chambers of Commerce Techonology Leadership of the year Award, 2012

●Harry Good IEEE Award ,Nicole Haberman ACM Award , ACM Karlstorm Award

NOMINATED FOR

The research findings uniquely connect computing techniques to techniques to biological systems protocols and modeling. Dr. Iyengar's work has led to fundamental breakthroughs that allow users to program on many of his protocols and techniques including a framework for detecting glaucomatous progression in the optic nerve head of an eye using proper orthogonal decomposition (IEEE Transactions on Information Technology in Biomedicine) 2009

Asian Innovation Awards 2010

March 24th, 2012

S.S. Iyengar PhD

Director and Ryder Professor

School of Computing and Information Sciences

FIU, 11200 SW 8th Street, Miami, Florida 33199, USA

Dear Prof. Iyengar,

I am deeply honoured to have had the chance to discuss my past research on the Brooks-Iyengar algorithm on Robust Distributed Sensing and its application in Linux Operating Systems, as discussed on the phone last week.

As I mentioned, in 1993 I was a researcher in the field of Real-Time Operating Systems (with a focus on Real-Time scheduling). During that period of research I was able to define new RT scheduling algorithms, and I included these (and other RT techniques) in the first existing RT version of an open-source OS (RT-Minix). The MINIX operating system was extended with real-time services, ranging from A/D drivers to new scheduling algorithms and statistics collection. A testbed was constructed to tests several sensor replication techniques in order to implement and verify several robust sensing algorithms. As a result, new services enhancing fault tolerance for replicated sensors were also provided within the kernel. The resulting OS offers new features such as real-time task management (for both periodic or aperiodic tasks), clock resolution handling, and sensor replication manipulation.

Using this workbench, we implemented different versions of the Brooks-Iyengar algorithm for robust sensing, using inexact agreement and optimal region. The introduction of this new mechanism provided more accuracy and precision.

These results were published in various papers and a book. My ideas were used shortly after by other researchers in the field, leading to the development of the first versions of RT-Linux. Fifteen years after, this approach continues to be used and cited, and new Real-Time projects based on the concepts I defined have been started in the last 5 years.

I congratulate you on your numerous successful endeavours, and wish you the best of luck.

Sincerely,

Dr. Gabriel Wainer

Associate Professor

Department of Systems and Computer Engineering

Carleton University

4456 Mackenzie Building, 1125 Colonel By Drive

Ottawa ON. K1S 5B6, Canada.

http://www.sce.carleton.ca/faculty/wainer

gwainer@sce.carleton.ca

About myself: I am a Senior Member of SCS and IEEE. I received a Ph.D. (1998, *with highest honors*) at the Université d'Aix-Marseille III, France. In July 2000, I joined the Dept. of Systems and Computer Engineering at Carleton University. I have authored three books and over 260 research articles; I edited four other books and helped organizing over 110 conferences. I am Vice-President Publications of the SCS (Society for Modeling and Simulation International). I am Special Issues Editor of SIMULATION, member of the Editorial Board of Wireless Networks (Elsevier), Journal of Defense Modeling and Simulation (SCS), and International Journal of Simulation and Process Modelling (Inderscience). I have received the IBM Eclipse Innovation Award, the SCS Leadership Award, various Best Paper awards; also, Carleton University's Research Achievement Award (2005), the First Bernard P. Zeigler DEVS Modeling and Simulation Award (2010), and the SCS Outstanding Professional Award (2011).

Telcordia

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April 5, 2012

Professor Thomas Kailath
350 Serra Mall, Packard Building 276
Stanford University
Stanford, California 94305-9510

Dear Professor Kailath,

I understand that Professor SS Iyengar is being nominated for membership in the National Academy of Engineering. This letter is in strong support of this nomination.

To briefly introduce myself, I am Vice President for Research and General Manager of Telcordia Applied Research Laboratories. Since our separation from Bell Laboratories in 1984, Telcordia Research has been a leader in telecommunications research ranging from traffic and network engineering, optical communications and wireless systems, to emerging technologies such as cyber security and smart grid systems, with over 1900 US and international patents issued. We are also a leading developer of technologies for mission-critical communications systems for government agencies, including DoD and the Intelligence Community, telecom operators and commercial enterprises.

One of major areas of our Telcordia R&D work is network optimization and resource allocation, including the design and maintenance of sensor networks. The seminal work of professor Iyengar and his colleagues on sensor network infrastructure constitutes a foundation for sensor placement and optimization of information obtained from sensor networks. The ideas and algorithms introduced by Iyengar et al. played an important role in Telcordia patent 019576 entitled "Method for placement of sensors for surveillance" and Motorola patent 7688793 entitled, "Wireless sensor node group affiliation method and apparatus," both of which build up upon his pioneering work

I believe that professor Iyengar work on sensor deployment, coverage, and surveillance has led to major advances in network technologies and he fully deserves to be a member of NAE.

Regards,

Marek Rusinkiewicz

CLEMSON
UNIVERSITY

To whom it may concern,

This letter attests to the importance of the Brooks-Iyengar sensor fusion algorithm in the development of some of the earliest sensor network applications. Both Dr. Brooks and Dr. Iyengar were Principle Investigators (PIs) of projects in the DARPA Sensor Information Technology (SensIT) program with Dr. Sri Kumar of DARPA as the Program Manager (PM). This program ran from 1999 to 2003. It brought together leading researchers from industry and academia to develop core enabling technologies for sensor networks. Previous DARPA programs in this domain concentrated on developing sensing hardware; SensIT researched the networking and applications layers of the sensor network protocol stack.

The DARPA program manager used two major demonstrations to showcase SensIT's advances and document the ability of sensor networks to provide new capabilities. One demonstration took place at Twenty Nine Palms, California Marine Training ground in August 2000; the other took place at BBN offices in Cambridge Massachusetts in October 2011. Dr. Gail Mitchell of BBN (gmitchell@bbn.com) coordinated this work for BBN, DARPA's SensIT integration contractor.

Both demonstrations used the Brooks-Iyengar fusion approach to combine sensor readings in real-time. Acoustic, seismic, and motion detection readings from multiple sensors were combined and fed into a distributed tracking system. The first deployment was effective, but noisy. The second demonstration built on the success of the first test in California. An improved "outfielder algorithm" was used to determine which node was best situated to continue existing tracks.

Other participants in these demonstrations included:

- Faculty form UCLA developed the sensor platforms used,
- Engineers from BAE Systems in Austin developed signal processing algorithms, and
- Researchers from USC/ISI implemented the directed diffusion data routing approach.

The fusion algorithm was the central piece that combined the new networking and sensing approaches.

This work was an essential precursor to the Emergent Sensor Plexus MURI from Penn State Applied Research Laboratory (PSU/ARL) with Dr. Shashi Phoha (sxp26@psu.edu) as PI. In that MURI, researchers from PSU/ARL, Duke, U. Wisconsin, UCLA, Cornell, and LSU extended the SensIT advances to create practical and survivable sensor network applications.

Regards,

R. R. Brooks
rrb@clemson.edu
(Approved by Gail Mitchell, BBN)

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College of Engineering & Science 105 Riggs Hall Box 340915 Clemson, SC 29634-0915
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DEPARTMENT OF THE NAVY
NAVAL RESEARCH LABORATORY
STENNIS SPACE CENTER, MISSISSIPPI 39529-5004

IN REPLY REFER TO
3910
Ser 7240/194
4 Dec 95

Dr. Bush Jones
Chair, Awards Committee
Department of Computer Science
Louisiana State University
Baton Rouge, LA 70803

Dear Dr. Jones:

This letter is to endorse the nomination of Prof. S.S. Iyengar for Distinguished Faculty Research Award. Professor Iyengar has been involved for several years in Navy funded research in the automated analysis and interpretation of satellite imagery of the ocean, a research area of considerable importance to the Navy. His work has been a key part of a larger effort involving Navy laboratories, industry, and several universities. He was selected an IEEE Fellow in January 1995 for his contributions in high performance algorithms and data structures for image processing applications.

Oceanographers possess high-level knowledge about currents, eddies, and other dynamic ocean features. Image processing techniques locate edges, uniform regions, or shapes in satellite imagery of the ocean. One of the major problems associated with automated image interpretation is bridging the gap between low-level image features and high-level oceanographic features. In other words, is a sharp gray level gradient in the image part of the Gulf Stream North Wall, part of an eddy, or part of some other meaningful ocean structure? This linkage of low-level features to oceanographic objects is the problem addressed by Prof. Iyengar's research. Without useful results in this key area, the work of other laboratories involved with this project could not have been integrated into a working prototype system.

Prof. Iyengar's use of non-linear probabilistic relaxation to perform feature labeling was innovative and well executed. His work was a key factor leading to the first fully automated interpretation of a satellite image of the ocean in 1989. Subsequent work has shown the method to produce labelings that are too dependent upon having a previous analysis. The method will hopefully be replaced by one of several alternate approaches, also under development in the Computer Sciences Department at LSU. However, for three years Prof. Iyengar's research served well as the centerpiece of this pioneering effort in computerized image analysis systems. He made a significant contribution to image analysis science and to the goals of the Naval Research Laboratory. In short, I strongly support Prof. Iyengar for a research award at LSU.

Sincerely,

RONALD J. HOLYER
Head, Computer Sciences Section

CNO STRATEGIC STUDIES GROUP
686 CUSHING ROAD
NEWPORT RI 02841-1207

22 May 2009

Dr. S.S. Iyengar, Ph. D.
Roy Paul Daniels Professor and Chairman
Department of Computer Science
Louisiana State University
Baton Rouge, LA - 70803 USA

Dear Dr. Iyengar,

The CNO's Strategic Studies Group thanks you for the arrangement you made for Mike McGuire's trip to Louisiana State University. The insights provided by LSU show great promise and will drive the entire military's efforts forward in the unmanned systems arena. The potential applications exceed anything that we could have hoped for. We thank you and your team for all the collaboration necessary to make the trip a success.

We appreciate your support of the SSG.

Sincerely,

JAMES R. HOGG
Admiral, U.S. Navy (Ret)
Director

MICHAEL S. MCGUIRE, Associate Fellow