Recent Advances in Electrical Engineering
A Series of Reference Books and Textbooks

NEW ASPECTS OF CIRCUITS

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Heraklion, Greece, July 22-24, 2008

Proceedings of the 12th WSEAS International Conference on CIRCUITS

Editors:
Prof. Nikos E. Mastorakis, MIUE (ASEI), Hellenic Naval Academy, Greece
Prof. Valeri Mladenov, Technical University of Sofia, Bulgaria
Prof. Zoran Bojkovic, Technical University of Belgrade, Serbia
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Preface

This book contains the proceedings of the 12th WSEAS International Conference on CIRCUITS which was held in Heraklion, Greece, July 22-24, 2008. This conference aims to disseminate the latest research and applications in Fundamental Theory of Circuits, Nanostructures and nanotechnologies, Molecular Electronics, Molecular Computing, Mixed-Mode Circuits, Electronics, Silicon Devices, Optoelectronic Devices, Circuits and Electronics for Data Conversion and S-D Modulation, Capacitor/Current Technoques, Circuits and Systems for Control and Robotic, Electron Devices for Power Technology, Electron Devices and Systems for Radar and Sonar Systems, Electronics for Signal Processing and other Applications, Circuit Implementation for Fuzzy Systems, Circuit Modelling and Scientific Computing with Applications in Science and Engineering.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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CEREMONY for Prof. SIFAKIS

Opening by the Deputy Minister of National Defence of GREECE
Ioannis Plakiotakis
(Biochemical Engineer, M.Sc and Economics, M.Sc.)

http://www.plakiotakis.gr

Born in 1968 in Sitia, in the prefecture of Lasithi on the island of Crete. Plakiotakis studied chemical engineering at the University of Wales and obtained a Master's degree in biochemical engineering at London University with an MBA from the City University Business School of London. He worked at Eurocontrol, an inter-country Organisation that regulates Air Circulation and the flight safety in Europe. He is a member of the New Democracy Party since 1987. He was an active member of New Democracy's Student Movement (DAP) and in 1999 became Vice-president of the Local Committee of N.D. in Sitia (Crete). From 1998 to 2002 he acted as Municipal Advisor in Sitia. On January 2001 he was appointed as a permanent member of the Committee of Tourism by the President of the Hellenic Republic. He is a member of the Association of graduates of Biochemical Engineering at the University of London, as well as at the City University Business School.

Parliamentary- Governmental Activity:

- Member of Parliament's Special Permanent Committee of Protection of the Environment.
- New Democracy's Assistant Supervisor of Tourism and member of the Parliamentary Delegates of Production and Trade, Protection of Environment and Orthodoxy.
- He was elected MP of Lasithi with the N.D. in 2004 and in 2007.
- On 19 October 2007 he was appointed Deputy Minister of Defense.

KEYNOTE SPEAKER – TURING AWARD 2007

Embedded Systems – Scientific Challenges and Work Directions

Prof. Joseph Sifakis
Turing Award 2007,
http://www.acm.org/press-room/news-releases/turing-award-07/
1 hour Keynote Lecture (CONFERENCE ROOM 1),
Wednesday, July 23, 16:00-17:00

Nobel of Computing:
http://www.cmu.edu/homepage/practical/2008/winter/nobel-of-computing.shtml
Also: http://www-verimag.imag.fr/~sifakis/

Abstract: Embedded systems are components integrating software and hardware that are jointly and specifically designed to provide given functionalities, which are often critical. They are used in a very wide array of application areas - including transport, consumer electronics / electrical appliances, energy distribution, manufacturing systems, etc.
Designing embedded systems requires techniques taking into account extra-functional requirements regarding optimal use of resources such as time, memory and energy while ensuring autonomy, reactivity and robustness. Jointly taking into account these requirements raises a grand scientific and technical challenge: extending Computer Science with paradigms and methods from Control Theory and Electrical Engineering. Computer Science is based on discrete computation models, which are by their nature are very different from the analytic models used in other engineering disciplines, because they do not encompass physical time and resources. We discuss the main aspects of this

challenge and their associated research directions for different areas such as modelling, programming, compilers, operating systems and networks.

Biography: Joseph Sifakis is CNRS researcher and the Founder of Verimag laboratory (http://www-verimag.imag.fr/), in Grenoble, France. He studied Electrical Engineering at the Technical University of Athens and Computer Science at the University of Grenoble.

Verimag is a leading research laboratory in the area of critical embedded systems. It developed the underlying theory and technology for the SCADE tool, used by Airbus for the design and validation of its critical real-time systems, and is becoming a de facto standard for aeronautics. Verimag has a lasting and strategic collaboration with ST Microelectronics, France Telecom R&D, and Airbus, through which numerous results on validation and testing have been transferred.

Joseph Sifakis is recognized for his pioneering work on both theoretical and practical aspects of Concurrent Systems Specification and Verification. He contributed to emergence of the area of model-checking, currently the most widely-used method for the verification of industrial applications. His current research activities include component-based design, modeling, and analysis of real-time systems with focus on correct-by-construction techniques (http://www-verimag.imag.fr/~sifakis/).

Joseph Sifakis has broad experience with industry, notably though joint projects with partners such as Astrium, the European Space Agency, France Telecom, ST Microelectronics and he has also been active for many years in consulting.

Joseph Sifakis is the Scientific Coordinator of the European Network of Excellence ARTIST2 on Embedded Systems Design. (http://www.artist-embedded.org/). This network gathers 35 of the best European teams in the area, and aims to produce innovative results for cost-effective design of dependable embedded systems. It will also promote innovative methods safe and secure systems, notably through cooperation with key European industrial partners such as Thalès, Airbus, Ericsson, Philips, and ST Microelectronics.

Joseph Sifakis is the chair of "Chamber B" (Public Research Organisations) of ARTEMISIA, which is the Industrial Association within the ARTEMIS European Technology Platform on Embedded Systems (http://www.cordis.lu/ist/artemis/).

Joseph Sifakis is the director of the CARNOT Institute "Intelligent Software and Systems" in Grenoble. Joseph Sifakis is a member of the editorial board of several journals, co-founder of the International Conference on Computer Aided Verification (CAV) and a member of the Steering Committee of the EMSOFT (Embedded Software) conference.

Joseph Sifakis has received with Ed Clark and Allen Emerson for their contribution to Model Checking, the Turing Award for 2007 (http://awards.acm.org/homepage.cfm?srt=all&awd=140). He is also the recipient of the CNRS Silver Medal in 2001.

Keynote Lecture I

Distributed Estimation Using Wireless Sensor Networks

Professor Georgios B. Giannakis
University of Minnesota
USA

E-mail: georgios@ece.umn.edu

Abstract: Envisioned applications of wireless sensor networks (WSNs) include surveillance, monitoring and tracking tasks. These motivate well decentralized estimation and smoothing of deterministic and (non)stationary random signals using (possibly correlated) observations collected across distributed sensors. In this talk we present state-of-the-art algorithms for consensus-based distributed estimation using ad hoc WSNs where sensors communicate over single-hop noisy links. The novel framework reformulates basic estimation criteria such as least-squares, maximum-likelihood, maximum a posteriori, and linear mean-square error, as decomposable, constrained, convex optimization problems that are amenable to distributed solutions. The resultant distributed estimators are provably convergent to their centralized counterparts and robust to communication noise. Besides stationary, the framework encompasses adaptive filtering and smoothing of non-stationary signals through distributed LMS and Kalman filtering.

Brief Biography of the Speaker: G. B. Giannakis received his B.Sc. in 1981 from the Ntl. Tech. Univ. of Athens, Greece and his M.Sc. and Ph.D. in Electrical Engineering in 1983 and 1986 from the Univ. of Southern California. Since 1999 he has been a professor with the Department of Electrical and Computer Engineering at the University of Minnesota, where he now holds an Endowed ADC Chair in Wireless Telecommunications. His general interests span the areas of communications, networking, signal processing, estimation and detection theory -- subjects on which he has published more than 270 journal papers, 450 conference papers, two research monographs and two edited books. Current research focuses on wireless networks, complex-field and space-time coding, ultra-wideband and cognitive radios, cross-layer designs and wireless sensor networks. He is the (co-) recipient of six best paper awards from the IEEE Signal Processing (SP) and Communications Societies (1992, 1998, 2000, 2001, 2003, 2004) and also received the SP Society's Technical Achievement Award in 2000 as well as the EURASIP Technical Achievement Award in 2005. He is an IEEE Fellow since 1997, a Distinguished Lecturer for 2007-08, and has served the IEEE in various editorial and organizational posts

Keynote Lecture II
Tyflos : A Wearable System-Prototype for Assisting Visually Impaired

Dr. Nikolaos G. Bourbakis
Director, Information Technology Research Institute
Wright State University,College of Engineering and Computer Science
OBR Distinguished Professor of Information Technology
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Abstract: *Human eyes receive more than 75% of the total information accessible to the human senses.* "There are approximately 45 million blind individuals world-wide according to the World Health Report. Vision loss can be very traumatic, leading to frustration and depression. According to the American Foundation for the Blind (AFB), the rate of unemployment among legally blind individuals of working age residing in the United States (58%) is much greater than that of individuals with no functional limitations (18%). Employment opportunities and independence are scarce for visually impaired individuals. This is unfortunate in view of the fact that ingenious devices [IEEE Spectrum] and information technology (IT) strategies can be developed to help people overcome these barriers and to pursue educational opportunities that will allow them to become productive members of society." In this talk technological efforts are presented that have the same goal assisting and increasing the visual impaired people's independence in their working and living environment, and reducing their social neglect ness. In particular, the research effort (called Tyflos) is presented here that is an IT- based wearable system-prototype. It consists of a pair of dark glasses on which two tiny vision cameras, an ear speaker and a microphone are attached. The cameras are connected with a portable computer that carries intelligent software programs. The cameras, under the user's command, capture images from the surrounding and convert them via software programs into audio or vibrations. The current versions of Tyflos is used as 1) a reader by reading books or the blind user via audio conversion and 2) a navigation by converting 3D images into vibrations for navigation.

Brief Biography of the Speaker: Nikolaos G. BOURBAKIS (IEEE Fellow) received his PhD in computer engineering and informatics in 1983. He currently is the Associate Dean for Engineering Research, a Distinguished Professor of Informatics and the Director of the ATR Center at WSU. He has directed several research projects (Applied AI, Image Processing & Machine Vision, Visual Autonomous Navigation, Information Security, Bio-Informatics, Biomedical Engineering) funded by government and industry, and he has published near 300 papers in International refereed Journals, Conference proceedings and book-chapters. Previous working places: SUNY, IBM, UP, GMU. He is actively involved as an Associate Editor in several IEEE and International Journals and General Chair in numerous International IEEE Conferences. He is the EIC of the Artificial Intelligence Tools Int. Journal (WSP) and the new upcoming Bioinformatics Engineering Journal. He is an IEEE Computer Society Distinguished Speaker, and NSF University Research Programs Evaluator, an IEEE Computer Society Golden Core Member. He has received several high prestigious awards, some of them are: IBM Author recognition Award 1991, IEEE Computer Society Outstanding Contribution Award 1992, IEEE Outstanding Paper Award ATC 1994, IEEE Computer Society Technical Research Achievement Award 1998, IEEE I&S Outstanding Leadership Award 1998, IEEE ICTAI 10 years Research Contribution Award 1999, IEEE BIBE Leadership Award 2003, ASC Recognition Award 2005.

Keynote Lecture III

Algorithms for Rendering Depth of Field Effects for Synthetic Image Generation and Computational Photography

Dr. Brian A. Barsky
Professor of Computer Science
Affiliate Professor of Optometry and Vision Science
Member of Joint Graduate Group in Bioengeering, UCSF/UCB
Affiliate of Berkeley Center for New Media
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Web Page: http://www.cs.berkeley.edu/~barsky/

Abstract: Depth of field refers to the swath through a 3D scene that is imaged in acceptable focus through an optics system, such as a camera lens. It is a vitally important component of real photographs, and is useful as a tool for drawing the viewer's eye to the important part of the image. Depth of field is equally important for computer-generated images. This talk will provide an explanation of the phenomenon of depth of field and a survey of a variety of techniques to render depth of field effects in computer graphics, with particular attention devoted to the trade-offs between image quality and algorithm efficiency. Algorithms to render highly accurate depth of field effects, such as distributed ray tracing or the accumulation buffer, are sampling methods that use large numbers of samples, with high computational cost. Sampling is inherently slow because it effectively requires rendering the scene many times, which multiplies the render time by a potentially large factor. Faster algorithms are based on a post processing approach, which operates in image space. Post process methods operate on 2D images along with depth information, rather than working with a full 3D object representation as the sampling methods do. Consequently, post process methods struggle to accurately simulate the underlying optical process, and tend to suffer from artifacts or avoid those artifacts at a large cost. The talk will include an analysis of the nature of these artifacts.

Brief Biography of the Speaker: Brian A. Barsky is Professor of Computer Science and Affiliate Professor of Optometry and Vision Science at the University of California at Berkeley. He is a member of the Joint Graduate Group in Bioengineering, an interdisciplinary and inter-campus program, between UC Berkeley and UC San Francisco. He was a Directeur de Recherches at the Laboratoire d'Informatique Fondamentale de Lille (LIFL) of l'Université des Sciences et Technologies de Lille (USTL). He has been a Visiting Professor of Computer Science at The Hong Kong University of Science and Technology in Hong Kong, at the University of Otago in Dunedin, New Zealand, in the Modélisation Géométrique et Infographie Interactive group at l'Institut de Recherche en Informatique de Nantes and l'Ecole Centrale de Nantes, in Nantes, and at the University of Toronto in Toronto. Prof. Barsky was a Distinguished Visitor at the School of Computing at the National University of Singapore in Singapore, an Attaché de Recherche Invité at the Laboratoire Image of l'Ecole Nationale Supérieure des Télécommunications in Paris, and a visiting researcher with the Computer Aided Design and Manufacturing Group at the Sentralinsitutt for Industriell Forskning (Central Institute for Industrial Research) in Oslo. He attended McGill University in Montréal, where he received a D.C.S. in engineering and a B.Sc. in mathematics and computer science. He studied computer graphics and computer science at Cornell University in Ithaca, where he earned an M.S. degree. His Ph.D. degree is in computer science from the University of Utah in Salt Lake City. He is a Fellow of the American Academy of Optometry (F.A.A.O.). He is a co-author of the book An Introduction to Splines for Use in Computer Graphics and Geometric Modeling, co-editor of the book Making Them Move: Mechanics, Control, and Animation of Articulated Figures, and author of the book Computer Graphics and

Geometric Modeling Using Beta-splines. He has published 120 technical articles in this field and has been a speaker at many international meetings. Dr. Barsky was a recipient of an IBM Faculty Development Award and a National Science Foundation Presidential Young Investigator Award. He is an area editor for the journal Graphical Models. He is the Computer Graphics Editor of the Synthesis digital library of engineering and computer science, published by Morgan & Claypool Publishers, and the Series Editor for Computer Science for Course Technology, part of Cengage Learning. He was the editor of the Computer Graphics and Geometric Modeling series of Morgan Kaufmann Publishers, Inc. from December 1988 to September 2004. He was the Technical Program Committee Chair for the Association for Computing Machinery / SIGGRAPH '85 conference. His research interests include computer aided geometric design and modeling, interactive three-dimensional computer graphics, visualization in scientific computing, computer aided cornea modeling and visualization, medical imaging, and virtual environments for surgical simulation. He has been working in spline curve/surface representation and their applications in computer graphics and geometric modeling for many years. He is applying his knowledge of curve/surface representations as well as his computer graphics experience to improving videokeratography and corneal topographic mapping, forming a mathematical model of the cornea, and providing computer visualization of patients' corneas to clinicians. This has applications in the design and fabrication of contact lenses, and in laser vision correction surgery. His current research, called Vision-Realistic Rendering is developing new three-dimensional rendering techniques for the computer generation of synthetic images that will simulate the vision of specific individuals based on their actual patient data using measurements from a instrument a Shack-Hartmann wavefront aberrometery device. This research forms the OPTICAL (OPtics and Topography Involving Cornea and Lens) project.

Plenary Lecture I

Sliding mode technique in the task of the drive control

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Abstract: The paper aims to explain the basic ideas related to the use of sliding-mode technique for the control design for an electromechanic drive system containing an AC motor and a converter. three-level voltage-source inverter. A comprehensive investigation of possible AC motors, converters and control plant structures was carried out. Based on this analysis different original design procedures for control design and observer design are presented. It's show the possibility to use the "classical" result of sliding-mode theory for the real drive systems with more then 2m switched structures (m is the control space order). The performance of the considered control and observer structure has been examined by simulation.

Brief Biography of the Speaker: Sergey Ryvkin (IEEE - M'06, SM'07), born 1951, graduated from Moscow Institute for Aviation Engineering (Dipl.-Eng.), Moscow, Russia, in 1974, received the Ph.D Degree from the Institute of Control Sciences of USSR Academy of Sciences, Moscow, Russia, in 1986 and the Dr. Sci. (Eng.) from the Supreme Certifying Commission of Ministry of Education and Science, Moscow, Russia, in 2006. He is a Corresponding Member of the Russian Academy of Electrotechnical Sciences (2008). Today he works as leading researcher in the Trapeznikov Institute of Control Sciences of Russian Academy of Sciences and as part-time professor at the Russian State University for the Humanities, Moscow, Russia. His research interest center in Nonlinear System Control and Variable Structure Systems with Sliding Mode as applied to electrical drives and power systems control and observation, robotic control. Since 1986 he was in change of the industrial projects between his Institute and different large Russian plants. He was granted MacArthur Foundation as an individual research (January 1994 to June 1995), German Academic Exchange Service as a visiting research (November 2006 to January 2007), Russian Foundation for Basic Research (2008) as a book writer. He has published more than 90 technical papers in international journals and conferences and has 6 invention certificates and has served as reviewer for different international journals and conferences.

Plenary Lecture II

Advances in Semiconductor Devices and Their Growing Use in Electrical Circuits and Systems

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Abstract: The main aim of this investigation is to asses the suitability of modern power semiconductor devices for pulse power applications. Pulse power system involves the storage of energy, which is released in form of high power pulse to the load by means of a switching device. Hence the basic components of pulse power system are an energy storage element, a switch, and a load circuit. The energy storage is usually either an inductive or capacitive nature. The limiting device in a pulse power system is often the switch, which limits the pulse peak power and the repetition rate. The switch element in this case is very special and falls into two basic categories: 1-Vacuum and gas filled switching tubes, 2- Solid-state (semiconductor) switches. The conventional approach in pulsed power designs is to use spark gap and gas filled switches such as thyratron and ignitron, because they truly possess the required characteristics for high power application. However, these devices have limited lifetime, high cost, low repetition rate and high losses. On the other hand high power semiconductor devices have under gone continued improvement in switching speed, voltage and current ratings and thus are replacing the conventional gas filled devices in some applications. Solid state devices are considered environmental friendly since they do not contain nasty gases and have perceived higher reliability than gas filled devices. In this paper, a complete overview of vacuum and gas filled switches and solid-state switches will be given. Very rarely these types of power semiconductor devices are characterised for pulse power applications and so the task of dimensioning a device simply from the datasheets is somewhat difficult and time consuming. Different methods for assessing their suitability will be described and a new technique to rapidly dimension the semiconductor device for pulse power application will be presented.

Brief Biography of the Speaker: Noel Shammas is currently a Professor in Microelectronics and Solid-State Power Semiconductor Devices in the faculty of Computing, Engineering and Advanced Technology, Staffordshire University. He received the M.Sc and Ph.D degrees from Salford University in 1972 and 1975 respectively. Since then he lectured and researched at different universities and industry. Research work is primarily focused on Power Semiconductor Devices which includes mainly Power diodes, Light Emitting Diodes (LED's), Insulated Gate Bipolar Transistors and Thyristors. Other related areas of research work includes Power Module Packaging technologies (Both Conventional Press- pack and Smart pack designs) and Series/Parallel operation of high power semiconductor devices and their interaction with external circuits. Professor Shammas has extensive experience in both experimental and theoretical research work and is recognised internationally for his significant contribution to research in the field of Power Semiconductor Devices. He has published over 120 journal and conference research papers as well as several invited Keynote Lectures, and has held several research grants from funding councils, Advantage West Midland (AWM), as well as from industry. He is a regular reviewer for many journals (including IEE Proceeding Electronic devices and systems, IEEE Transactions on power electronics, and Microelectronic Reliability) and international conferences (including the European Power Electronic conference - EPE, Microelectronic conference - MIEL, Universities Power Engineering Conference-UPEC, International Symposium Power Semiconductors-ISPS, etc…). He is a member of scientific committee for many international conferences (including MIEL, EPE, WCE, WSEAS, and Microtherm) and a steering committee member for EPE, UPEC, and ISPS international conferences. He is also a book reviewer for Prentice Hall International and McGraw Hill

Plenary Lecture III

Vibro-acoustic Techniques to Diagnose Complex Electromechanical Structures

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Abstract: A diagnostics procedure based on signal processing of acoustic emissions aimed at investigating complex electromechanical structures is presented. Acquired signals emitted by a structure can be activated by either natural or artificial stimuli; when using artificial and known stimuli, that is to say, stimuli linked to a set of parameters representing "state vectors", the diagnostic method may prove to be very accurate. Signals are processed through the following stages: acquisition, segmentation, parameterization, classification and recognition. An a priori definition of the possible classes to which the system under investigation might belong is required. By means of a consultation of a predefined digital vocabulary of possible anomalies, the analysis process establishes the statistical "closeness" of the case examined to a reference model in the vocabulary and subsequently identifies the belonging class of the apparatus under checking. If the involved physical phenomena are well known, the classification can be performed using knowledge-based techniques, otherwise statistical procedures are recommended. In the past, diagnostic processes allowed to define only the object state at the moment of the investigation; nowadays, thanks to the availability of low-cost, huge digital memories and relevant power computation, the diagnostics processes allow also to predict the residual life expectation of complex jointed structures. The proposed monitoring and diagnostic method allows a time-by-time assessment of the evolution of power system components from the installation to their life end. The normal operating apparatuses can be monitored and checked from a remote, dedicated diagnostic center where information is received directly from the field. The suggested monitoring and diagnostic system allows one to usefully schedule preventative maintenance, reduce costs, and improve the quality of electric power systems. Many complex structures were examined, and some relevant real diagnostics cases concerning power transformers, power circuit breakers, and transiting electric trains are illustrated and discussed.

Brief Biography of the Speaker: Francesco Muzi is a professor of Power Systems at the University of L'Aquila, Italy, where he has also the scientific responsibility for the Power System Group. His main research interests concern Power systems transients and dynamics, Power quality in distribution systems, Power system reliability, Electromagnetic analysis, and Power systems diagnostics and protection. In these fields, he authored or co-authored over 100 scientific papers published in reviewed journals or presented at international conferences. For his contribution on Lightning Induced Overvoltages, he received mentions in books edited by John Wiley & Sons, New York and participated to the outline of the "IEEE Guide for improving the lightning performance of electric lines", IEEE Standards Department, New York. He has also a patent for an industrial invention, namely "Power system controlled by a microprocessor". He is a regional chairman of the Italian National Lighting Society and was a chairman or keynote lecturer in a number of international conferences organized by ISSAT (International Society of Science and Applied Technologies) and WSEAS. He is a technical reviewer for the following international journals: IEEE Transactions on Power Delivery, Electric Power Systems Research by Elsevier Science, IET Generation, Transmission & Distribution.

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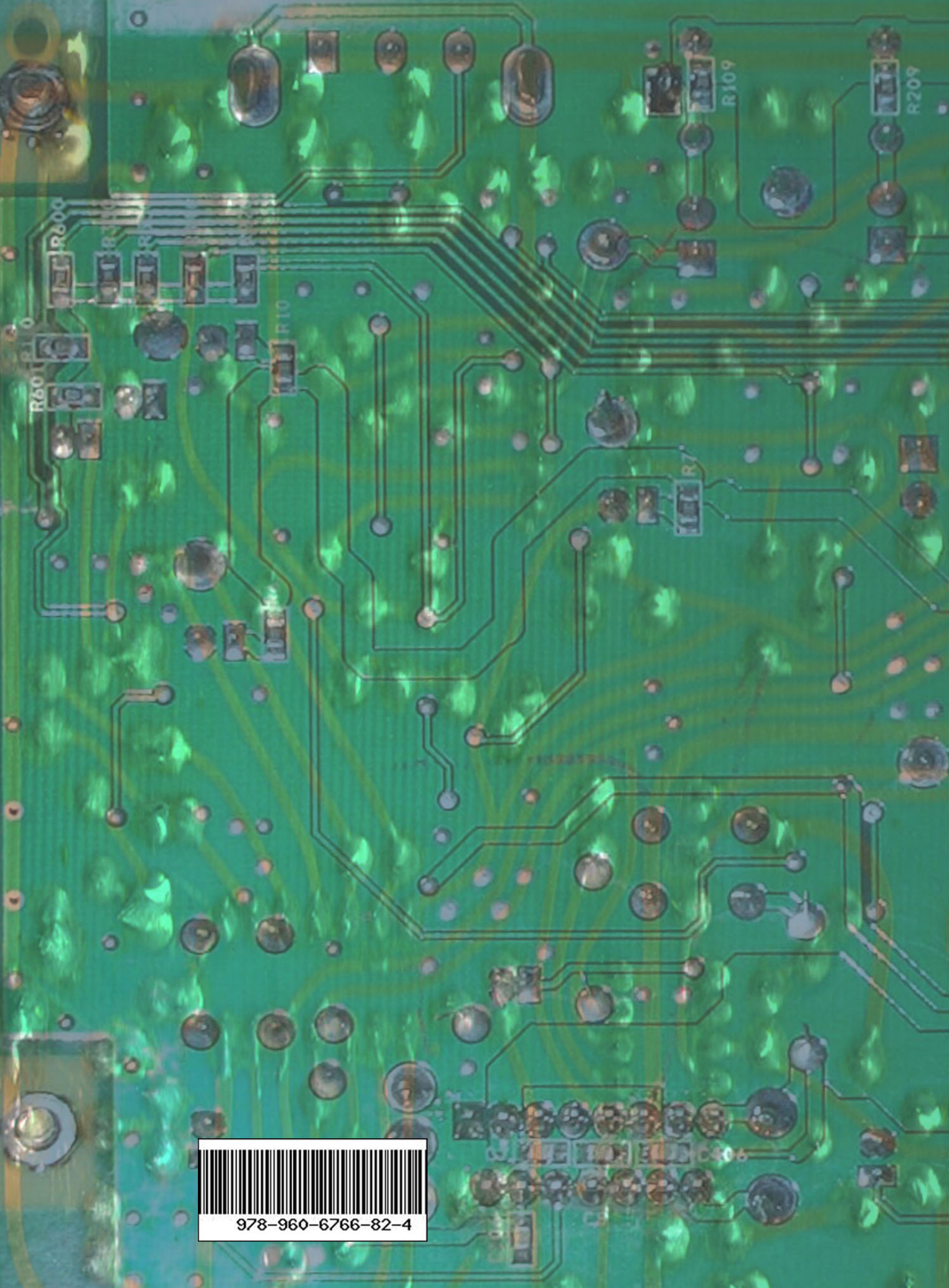

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