Program

2017 International Symposium on Sensorless Control for Electrical Drives

SLED 2017

18th–19th September 2017, Catania, Italy
<table>
<thead>
<tr>
<th>Sunday, 17/09/2017</th>
<th>Monday, 18/09/2017</th>
<th>Tuesday, 19/09/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>18:30 Welcome Reception</td>
<td>09:00 Grande Salone da Ballo</td>
<td>09:00 Sala del Rinascimento</td>
</tr>
<tr>
<td>20:00</td>
<td>Opening</td>
<td>Poster Session</td>
</tr>
<tr>
<td></td>
<td>09:30 Grande Salone da Ballo</td>
<td>11:00</td>
</tr>
<tr>
<td></td>
<td>Plenary: R. Lorenz</td>
<td>Coffee Break</td>
</tr>
<tr>
<td></td>
<td>University of Wisconsin, USA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10:20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grande Salone da Ballo</td>
<td>S7 - Grande Salone da Ballo</td>
</tr>
<tr>
<td></td>
<td>Plenary: S. Bolognani</td>
<td>PMSM Drives II</td>
</tr>
<tr>
<td></td>
<td>University of Padova, Italy</td>
<td>Chair: Fabio Giulii Capponi</td>
</tr>
<tr>
<td></td>
<td>11:10</td>
<td>S8 - Salone dei Principi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Model Based and DTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sensorless Control</td>
</tr>
<tr>
<td></td>
<td>11:10 Coffee Break</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13:00 Lunch</td>
</tr>
<tr>
<td></td>
<td>11:30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S1 - Grande Salone da Ballo</td>
<td>14:30</td>
</tr>
<tr>
<td></td>
<td>Design for Self-Sensing</td>
<td>S9 - Grande Salone da Ballo</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>Dual Three-Phase and Open-</td>
</tr>
<tr>
<td></td>
<td>Chair: Frederik De Belie</td>
<td>End Winding PM Drives</td>
</tr>
<tr>
<td></td>
<td>11:30</td>
<td>Chair: Peter Landsmann</td>
</tr>
<tr>
<td></td>
<td>12:45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S2 - Salone dei Principi</td>
<td>S10 - Salone dei Principi</td>
</tr>
<tr>
<td></td>
<td>PM and Synchronous Reluctance</td>
<td>Synchronous Motor Drives</td>
</tr>
<tr>
<td></td>
<td>Motor Drives</td>
<td>Chair: Giulio De Donato</td>
</tr>
<tr>
<td></td>
<td>Chair: Gianmario Pellegrino</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13:00 Lunch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14:30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S3 - Grande Salone da Ballo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Induction Motor Drives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair: Axel Mertens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14:30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S4 - Salone dei Principi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switched Reluctance and IPM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair: Marko Hinkkanen</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15:45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15:45 Coffee Break</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16:00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S5 - Grande Salone da Ballo</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PMSM Drives I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair: Ralph Kennel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16:00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S6 - Salone dei Principi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IPM and SyncRel Drives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chair: Pavol Rafajdus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17:15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19:30 Guided Visit to PalazzoManganelli and Gala Dinner</td>
<td>19:30</td>
</tr>
<tr>
<td></td>
<td>23:00</td>
<td></td>
</tr>
</tbody>
</table>
Welcome

The IEEE International Symposium on Sensorless Control for Electrical Drives is a very focused event for our Scientific Community, with a good tradition of providing an international forum for experts to present and discuss the latest developments in the application of sensorless control technology to industry technical excellence. For over a decade, many professors and industrial researchers have contributed to reach such a technical excellence.

The international event on Sensorless Control of Electrical Drives (SLED) dates back to 2007 and for 3 years it was held as Workshop in Msida (Malta), Varsow (Poland) and Barcelona (Spain). Due to popular demand, it was expanded into a Symposium, the first being held in Padova, Italy in 2010, the second in Birmingham, United Kingdom in 2011, the third in Milwaukee, United States in 2012, the forth in Munich, Germany in 2013, the fifth in Hiroshima, Japan in 2014, the sixth in Sydney, Australia in 2015, and the seventh in Dinarau, Nadi, Fiji in 2016.

In 2017, the eight IEEE Sensorless Control of Electrical Drives is held in Catania. This year is also a special occasion to remember our colleague and friend Prof. Alfio Consoli that passed away in July 2012, exactly in the way he preferred: presenting papers on new ideas and developments, discussing such ideas among good colleagues and friends. As a result, the 2017 edition shows a richer technical program than ever, having forty papers from authors in academia and industry. We are honored to serve our Community as the 2017 General Chairs, with the full support from all Technical, In-Memoriam and Local Organizing Committees.

We kindly ask you to join us in extending a warm welcome to the 2017 edition of International Symposium on Sensorless Control for Electrical Drives authors. Their technical contribution is fundamental to the tradition of technical excellence at the Symposium on Sensorless Control for Electrical Drives.

Sincerely yours,

Giuseppe Scarcella and Mario Cacciato
SLED 2017 General Chairmen
Social Events

Welcome Reception

Sunday, 17/09/2017, 18:30 to 20:00

Catania, Hotel Royale – La Terrazza sui Crociferi
Via Antonino di Sangiuliano 337, 95124 Catania
http://www.hotelroyalcatania.it/en/where-we-are

Visit to Palazzo Manganelli and Gala Dinner

Monday, 18/09/2017, 19:30 to 23:00

Catania, Palazzo Manganelli
Piazza Manganelli 16, 95131 Catania
http://www.palazzomanganelli.it
Plenary Speakers

Robert D. Lorenz
University of Wisconsin at Madison, USA

The Path to Widespread Use of Self-Sensing

Self-sensing is currently still a niche technology. It requires a challenging integration of machine design, power electronics, estimation and controls. This has limited its broad application despite the rapid expansion of new machine opportunities. One approach to address this is to integrate the discipline of self-sensing into undergraduate and Masters level programs on a wide international basis. This presentation will explore that path as a key enabler to achieving the full potential of self-sensing as a nearly universal solution.

Silverio Bolognani
University of Padova, Italy

Physical Understanding of Saliency-Based Position Self-Sensing Capability of AC Motors

The keynote presents a physical understanding of the rotor position self-sensing capability of AC motors based on the detection of their electromagnetic saliency by means of a high frequency voltage injection. Motors with intrinsic structural saliency, saturation-induced saliency as well as intentionally-created saliency will be discussed and compared. Simulation and experimental results will support the presentation. The purpose of the lecture is twofold: (i) delivering assessment criteria of the suitability of a given AC machine to a sensorless drive and for predicting rotor speed and position estimation accuracy; (ii) delivering hints for a self-sensing oriented design of the AC machines. Both are key concepts for enforcing the diffusion of effective and reliable sensorless drives in home, commercial and industrial applications.
Conference Program

Sunday, 17/09/2017

18:30 Welcome Reception

Monday, 18/09/2017

09:00 Opening

Plenary Session
Monday, 18/09/2017, 09:30 to 11:10
Room: Grande Salone da Ballo
Chairmen: Giuseppe Scarcella and Mario Cacciato, University of Catania, Italy

09:30 The Path to Widespread Use of Self-Sensing
R. Lorenz
University of Wisconsin, USA

10:20 Physical Understanding of Saliency-Based Position Self-Sensing Capability of AC Motors
L. Alberti, N. Bianchi, S. Bolognani
University of Padova, Italy

11:10 Coffee Break

Session S1 – Design for Self-Sensing Control
Monday, 18/09/2017, 11:30 to 12:45
Room: Grande Salone da Ballo
Chairman: Frederik De Belie, Ghent University, Belgium

S1-1
11:30 Design of Highly-Saturated Permanent Magnet Synchronous Machines for Torque Ripple Optimized Self-Sensing Control
L. Chen¹, M. Roetzer¹, G. Goetting¹, I. Hahn²
¹Robert Bosch, ²University of Erlangen-Nuremberg

S1-2
11:55 The Influence of Rotor Design on Active Flux-Based Sensorless Synchronous Reluctance Motor Drives
N. Bianchi, S. Bolognani, F. Tinazzi, M. Zigliotto
University of Padova
S1

12:20 Self-Sensing Control of Induction Machines Using an Additional Short-Circuited Rotor Coil
S. Luecke, A. Mertens
Leibniz Universität Hannover

Session S2 – PM and Synchronous Reluctance Motor Drives
Monday, 18/09/2017, 11:30 to 12:45
Room: Salone dei Principi
Chairman: Gianmario Pellegrino, Politecnico di Torino, Italy

S2-1

11:30 Sensorless Control of a Synchronous Reluctance Motor by Finite Elements Model Results
M. Tursini, M. Villani, G. Fabri, S. Paolini, A. Credo, A. Fioravanti
University of L'Aquila

S2-2

M. Hinkkanen¹, S. Saarakkala¹, H. Awan¹, E. Mölsä¹, T. Tuovinen²
¹Aalto University, ²ABB Oy Drives

S2-3

12:20 Parameter Identification of an High Efficiency PMA Synchronous Reluctance Motor for Design and Control
F. Calegari, G. Federico, E. Bassi, F. Benzi
University of Pavia

13:00 Lunch

Session S3 – Induction Motor Drives
Monday, 18/09/2017, 14:30 to 15:45
Room: Grande Salone da Ballo
Chairman: Axel Mertens, Leibniz Universität Hannover, Germany

S3-1

14:30 Effective Model Predictive Current Control for a Sensorless IM Drive
M. Mossa, S. Bolognani
University of Padova
S3-2  
14:55  Design of Estimators for the Inverse of the Rotor Time Constant of the Induction Motor with Known Flux  
M. Comanescu  
Penn State Altoona

S3-3  
15:20  Injection of Third-Order Spatial Field Harmonic for Sensorless Speed Estimation in Multiphase Induction Motor Drives  
M. Mengoni, L. Zarri, A. Tani, G. Rizzoli, G. Serra, D. Casadei  
University of Bologna

Session S4 – Switched Reluctance and IPM Drives  
Monday, 18/09/2017, 14:30 to 15:45  
Room: Salone dei Principi  
Chairman: Marko Hinkkanen, Aalto University, Finland

S4-1  
14:30  Self-Sensing Method for a Switched Reluctance Motor Using Delta-Sigma Modulators and Neural Networks  
P. Kappes, I. Krüger, G. Griepentrog  
TU Darmstadt

S4-2  
14:55  Sensorless Control of Variable Speed Drives Using Switched Reluctance Machine  
P. Sovicka\textsuperscript{1}, V. Vavrus\textsuperscript{1}, P. Rafajdus\textsuperscript{1}, Q. Gao\textsuperscript{2}  
\textsuperscript{1}University of Zilina, \textsuperscript{2}Shanghai Jiao Tong University

S4-3  
15:20  The Study on Transient Performance Improvement of Position Sensorless Control Algorithm for IPMSM  
D. Lee, K. Akatsu  
Shibaura Institute of Technology

15:45  Coffee Break

Session S5 – PMSM Drives I  
Monday, 18/09/2017, 16:00 to 17:15  
Room: Grande Salone da Ballo  
Chairman: Ralph Kennel, TU Munich, Germany
S5-1
16:00 Self-Commissioning of Sensorless Drives for Synchronous Machines: Finite Element Analysis Computation and Measurement of Flux Maps
O. Bottesi1, S. Calligaro1, P. Kumar1, L. Alberti2, R. Petrella3
1Free University of Bozen, 2University of Padova, 3University of Udine

S5-2
16:25 Sensorless Magnetic Model and PM Flux Identification of Synchronous Drives at Standstill
P. Pescetto, G. Pellegrino
Politecnico di Torino

S5-3
16:50 Enhancing Self-Sensing Estimation Accuracy Via Negative Sequence Current Image Registration, with Evaluation on a Low Saliency Ratio Machine
T. Slininger, R. Lorenz
University of Wisconsin at Madison

Session S6 – IPM and SyncRel Drives
Monday, 18/09/2017, 16:00 to 17:15
Room: Salone dei Principi
Chairman: Pavol Rafajdus, University of Zilina, Slovak Republic

S6-1
16:00 Self-Sensing Control of the Externally-Excited Synchronous Machine for Electric Vehicle Traction Application
M. Koteich1, A. Messali2, S. Daurelle2
1Groupe Renault Technocentre, 2Laboratory of Digital Sciences of Nantes (LS2N)

S6-2
16:25 Self-Adaptive High-Frequency Injection-Based Sensorless Control for IPMSM and SynRM
L. Alberti1, O. Bottesi2, S. Calligaro2, P. Kumar2, R. Petrella3
1University of Padova, 2Free University of Bozen, 3University of Udine

S6-3
16:50 Arbitrary Injection-Based Sensorless Control with a Defined High Frequency Current Ripple and Reduced Current and Sound Level Harmonics
M. Laumann1, 2, C. Weiner1, R. Kennel2
1University of Applied Sciences Darmstadt, 2TU Munich

19:30 Guided Visit to Palazzo Manganelli and Gala Dinner

Tuesday, 19/09/2017
Poster Session
Tuesday, 19/09/2017, 09:00 to 11:00
Room: Sala del Rinascimento
Chairman: Giacomo Scelba, University of Catania, Italy

SP-1 Compensation of Rotor Position Estimation Errors in Sensorless Dual–Three Phase PMSM Drives through Back-EMF Sensing
G. Scelba¹, G. Scarcella², M. Cacciato², M. Pulvirenti², A. Testa³
¹University of Catania, ²STMicroelectronics, ³University of Messina

SP-2 The Use of High-Speed Switched Reluctance Machine for Electric Turbochargers
B. Hanko, P. Drgona, M. Danko, M. Frivaldsky
University of Zilina

SP-3 Development of a Flux, Speed and Rotor Time Constant Estimation Scheme for the Sensorless Induction Motor Drive
M. Comanescu
Penn State Altoona

SP-4 Position Estimation for Linear Electromagnetic Actuators
A. El Hafni, M. Abdelrahem, R. Kennel
TU Munich

SP-5 Sensorless Control of High-Speed BLDC
M. Stulrajter¹, P. Makys², P. Rafajdus²
¹NXP Semiconductor, ²University of Zilina

SP-6 Sensorless Control for PM-Machine Based Generating Units
C. Verrelli¹, A. Lidozzi², S. Bifaretti¹, L. Solero², F. Crescimbini²
¹University of Roma “Tor Vergata”, ²University of Roma Tre

SP-7 Sensorless Field Oriented Control of Multiple-Motors Fed by Multiple-Converters Systems
S. Foti¹, A. Testa¹, S. De Caro¹, T. Scimone¹, M. Pulvirenti²
¹University of Messina, ²STMicroelectronics

SP-8 Integral Sliding-Mode Direct Torque Control for Sensorless Induction Motor Drives
A. Dannier, A. Del Pizzo, L. Di Noia, S. Meo
University of Napoli “Federico II”

11:00 Coffee Break

Session S7 – PMSM Drives II
Tuesday, 19/09/2017, 11:20 to 13:00
Room: Grande Salone da Ballo
Chairman: Fabio Giulii Capponi, University of Roma “La Sapienza”, Italy
A Moving Horizon Estimator for the Speed and Rotor Position of Sensorless PMSM Drive
F. Toso, D. Da Rù, S. Bolognani
University of Padova

Pseudo Derivative Feedback Current-Controlled Sensorless PMSM Drive with Flux-Torque Based MRAS Estimator for Low-Speed Operation
A. Karthikeyan¹, K. Prabhakaran¹, B. Venkatesa Perumal¹, C. Nagamani²
¹National Institute of Technology Karnataka Surathkal, ²National Institute of Technology Tiruchirappalli

Reduced Observer for Anisotropy-Based Position Estimation of PM Synchronous Machines Using Current Oversampling
B. Weber, G. Lindemann, A. Mertens
Leibniz Universität Hannover

Sensorless Vector Control of PMSM Using SMO and NLDO
A. Apte¹, R. Walambe², V. Joshi², H. Mehta³
¹AISSMS College of Engineering Pune, ²PVG College of Engineering and Technology Pune, ³Symbiosis Pune

Introducing a Pulse Response Based Rotor Position Estimator for DTC IPMSM Drives
H. Li, F. De Belie, J. Melkebeek
Ghent University

Sensorless Direct Torque Control for PM-Assisted Synchronous Motors with Injection High-Frequency Signal into Stator Flux Reference Frame
P. Guglielmi, A. Yousefi-Talouki, G. Iabichino, G. Pellegrino
Politecnico di Torino
S8-3
12:10  Sensorless Vector Control of PMSM with Observer-Based Phase Current Reconstruction Using Only a DC-Link Current Sensor
A. Kraemer, V. Heusinger, S. Schad, A. Ali
University of Applied Sciences Wuerzburg-Schweinfurt

S8-4
12:35  Predictive Phase Locked Loop for Sensorless Control of PMSG Based Variable-Speed Wind Turbines
M. Abdelrahem, A. El Hafni, R. Kennel, C. Hackl
TU Munich

13:00  Lunch

Session S9 – Dual Three-Phase and Open-End Winding PM Drives
Tuesday, 19/09/2017, 14:30 to 15:45
Room: Grande Salone da Ballo
Chairman: Peter Landsmann, TU Munich, Germany

S9-1
14:30  Anisotropy-Based Position Estimation Approach for Symmetrical Dual Three-Phase Permanent Magnet Synchronous Machines
M. Roetzer¹, U. Vollmer¹, L. Chen¹, R. Kennel²
¹Robert Bosch, ²TU Munich

S9-2
14:55  Self-Sensing Control of Open-End Winding PMSMs Fed by an Asymmetrical Hybrid Multilevel Inverter
G. Scelba¹, G. Scarcella¹, S. Foti², S. De Caro², A. Testa²
¹University of Catania, ²University of Messina

S9-3
15:20  Sensorless Control of Single-Inverter Dual-Motor AC Brushless Drives
G. Brando, A. Del Pizzo, I. Spina
University of Napoli “Federico II”

Session S10 – Synchronous Motor Drives
Tuesday, 19/09/2017, 14:30 to 15:45
Room: Salone dei Principi
Chairman: Giulio De Donato, University of Roma “La Sapienza”, Italy
S10-1
14:30 Sensorless Control of Matrix Converter-Fed Synchronous Reluctance Motor Drives
A. Yousefi-Talouki¹, F. Stella¹, S. Odhano², L. De Lilo², A. Trentin², G. Pellegrino¹, P. Zanchetta²
¹Politecnico di Torino, ²University of Nottingham

S10-2
14:55 Sensorless Position Estimation at low Speeds till Standstill with Reduced Filtering Requirements for an Externally Exited Synchronous Machine
J. Schuster, V. Ketchedjian, J. Roth-Stielow
University of Stuttgart

S10-3
15:20 Sensorless Position Estimation for Ironless Surface Mounted Permanent Magnet Synchronous Motors in Full Speed Range
C. Zhao, M. Tanaskovic, F. Percacci, S. Mariéthoz, P. Gnos
Maxon Motor

15:45 Closing Address by the Conference Chairs
Committees

General Chairmen

- Giuseppe Scarcella, University of Catania, Italy
- Mario Cacciato, University of Catania, Italy

Technical Program Co-Chairmen

- Angelo Raciti, University of Catania, Italy
- Antonio Testa, University of Messina, Italy
- Francesco Profumo, Politecnico di Torino, Italy

Local Organizing Committee

- Calogero Cavallaro, University of Catania, Italy
- Giacomo Scelba, University of Catania, Italy
- Salvatore De Caro, University of Messina, Italy

Italian Alfio Consoli In-Memoriam Committee

- Ciro Attaianese, University of Cassino and of Southern Lazio, Italy
- Ezio Bassi, University of Pavia, Italy
- Francesco Benzi, University of Pavia, Italy
- Aldo Boglietti, Politecnico di Torino, Italy
- Federico Caricchi, University of Roma “La Sapienza”, Italy
- Domenico Casadei, University of Bologna, Italy
- Carlo Cecati, University of L’Aquila, Italy
- Fabio Crescimbini, University of Roma Tre, Italy
- Andrea Del Pizzo, University of Napoli “Federico II”, Italy
- Antonino Di Gerlando, Politecnico di Milano, Italy
- Fabio Giulii Capponi, University of Roma “La Sapienza”, Italy
- Mario Marchesoni, University of Genova, Italy
- Alfonzo Damiano, University of Cagliari, Italy
- Rosario Miceli, University of Palermo, Italy
- Honorati Onorato, University of Roma “La Sapienza”, Italy
- Francesco Parasiliti Collazzo, University of L’Aquila, Italy
- Giovanni Petrecca, University of Pavia, Italy
- Giuseppe Ricco Galluzzo, University of Palermo, Italy
- Alberto Tenconi, Politecnico di Torino, Italy
- Alfredo Vagati, Politecnico di Torino, Italy
Technical Program Committee

- Luigi Alberti, University of Padova, Italy
- Nicola Bianchi, University of Padova, Italy
- Iustin Radu Bojoi, Politecnico di Torino, Italy
- Gérard-André Capolino, University of Picardie “Jules Verne”, France
- Maurizio Cirrincione, University of the South Pacific, Fiji
- Francesco Cupertino, Politecnico di Bari, Italy
- Frederik De Belie, Gent University, Belgium
- Chris Gerada, University of Nottingham, UK
- Valeria Hrabovcova, University of Zilina, Slovakia
- Marko Hinkkanen, Aalto University, Finland
- Thomas Jahns, University of Wisconsin, USA
- Kevin Lee, Eaton Corporation, USA
- Mario Pacas, University of Siegen, Germany
- Gianmario Pellegrino, Politecnico di Torino, Italy
- Roberto Petrella, University of Udine, Italy
- Marcello Pucci, ISSIA CNR, Italy
- Faz Rahman, University of New South Wales, Australia
- Jul-Ki Seok, Yeungnam University, South Korea
- Luca Solero, University of Roma Tre, Italy
- Luca Zarri, University of Bologna, Italy

International Steering Committee

- Silverio Bolognani, University of Padova, Italy
- Greg Asher, University of Nottingham, UK
- Robert D. Lorenz, University of Wisconsin, USA
- Fernando Briz, University of Oviedo, Spain
- Ralph Kennel, TU Munich, Germany
- Seung-ki Sul, Seoul National University, South Korea
- Michael Harke, UTC Aerospace Systems, USA
- Z.Q. Zhu, University of Sheffield, UK
- Shigeo Morimoto, Osaka Prefecture University, Japan
- Frede Blaabjerg, Aalborg University, Denmark
- Ion Boldea, University Politehnica of Timisoara, Romania
- Tom Lipo, University of Wisconsin, USA
- Pericle Zanchetta, University of Nottingham, UK
In Memoriam Alfio Consoli

Alfio Consoli, IEEE Fellow and Professor at University of Catania passed away July 7th, 2012, after a long battle against cancer. Alfio was a very special person, liked by many friends and IEEE colleagues. All along he demonstrated extraordinary courage, strength and enthusiasm for teaching and research. Even till he very end, during his battle against the severe illness, he never stopped to transmit this enthusiasm and optimism to relatives and colleagues. We will always remember his intellectual capacity and hard work, his friendliness and honesty, his energy and optimism.

Alfio will be remembered as a pioneer in establishing the collaboration between the Italian and American Power Electronics and Drives communities. Alfio was recipient of a NATO Grant for a one-year stay in 1980 at Purdue University, West Lafayette, Indiana. In 1985, he was Visiting Professor at the University of Wisconsin, Madison, teaching classes in Electromagnetic Design and supervising the activities and theses of two Ph.D. students. He witnessed the birth of the WEMPEC consortium at UW and always kept close contacts with the WEMPEC scholars and visitors, always encouraging younger generations of Italian engineering students and professionals to take part in a global experience that serves not only be individual aspirations but also humanity. As such, from 1987 till 2006, he was responsible for the Ph.D. programs in Electrical Engineering in Catania. Furthermore, from 2006 to 2012 he was the Coordinator of the International Ph.D. course on ENERGY of the Scuola Superiore at University of Catania. He was also responsible of a SOCRATES project for the European student Exchange Program and successfully established collaborations with universities and research centers throughout Europe, United States and South America. In 1993, he was a member of a National Experts Group of the "Italian Foreign Ministry" for building and improving Scientific and Educational programs in three Algerian Universities. From 1990 to 1994 he was the Coordinator of the European Project TEMPUS; to build new laboratories in Zilina University, Slovakia.

Alfio Consoli was born in Catania, Italy, in 1949. In 1972, he graduated in Electrical Engineering from the Politecnico di Torino, Italy. After a short period at Fiat in Torino, Italy, working at the R&D unit, he has been with the University of Catania since 1975. In 1986, he became Full Professor of Electrical Machines, teaching in the areas of electrical machines, electrical drives and power electronics. He has authored or co-authored over 300 technical papers, as a result of more than thirty years of research activity in the areas of energy conversion, electrical drives, robotics and power electronics and its applications. He directed many international and national research projects supported by MURST, MIUR, CNR, ENEA, and the European Community. Most projects were conducted with industry cooperation, among others, Ansaldo (Genova), Ansaldo Breda (Napoli), ST Microelectronics (Catania), Fiat (Torino), and Reliance (Cleveland, USA).

Among his international achievements, it is worth to mentioning two IEEE awards, respectively obtained in the year 2000 for the best paper published in the IEEE Transactions on Power Electronics, and in 1998 as the third prize paper presented at the IEEE-IAS Annual Meeting. Both papers were on sensorless control of AC motor drives. Alfio Consoli holds three international patents and is co-author and co-editor of the book "Modern Electric Drives" published by Kluwer in 2000. He is also the author of "Electrical Motors" article published in the Italian National Encyclopaedia "Treccani". His contribution in Scientific research and industrial applications were timely and extremely relevant, and were internationally recognized by the engineering community with his elevation to IEEE Fellow in 2001.

Alfio was appointed Distinguished Lecturer for the period 2002-2004. From 1997 to 2001, he was member of the Executive Board of the IEEE-Industry Application Society. He was member of the Executive Committee of the IEEE Power Electronics Society, where he served as Chairman of the Technical Committee on "Motor Drives", and became Associate Editor of the IEEE Transactions on Power Electronics. He was member of the Executive Council of the European Power Electronics and Drives Association (EPE), where he served as Chairman of the Drives Chapter. Alfio was the Coordinator of CMAEL (Converters, Machines, and Electrical Drives) the Association of the Italian Professors on Power Electronics.

In 1982-83 and from 1986 to 1990 Alfio was Head of the "Electrical Institute" and from 1991 to 1997 directed the "Department of Electrical Electronic and Systems Engineering" at the University of Catania. From 1988 to 1990 and from 1992 to 1999, he was the Head of Council of the "Electrical Engineering Courses". From 1994 to 2000, he was appointed Rector Delegate for Research at the University of Catania. From 1995 to 2000, he was Member of the Working Group on European Research Policy in the Confederation of the European Rectors Conference. From 1987 onward he was a member of the scientific board of the Consortium on Microelectronics between ST Microelectronics and University of Catania. He was the Rector Delegate at the National Consortium on Transports and Logistics (NITEI) and Head of CePTIT, the "Center for Promotion and Transfer of Technological Innovation", that he created in 1999.

With all his fame and international recognition, Alfio was always a friendly and soft-spoken person, who carried a warm heart to all colleagues. Next to his professional work, he enjoyed being with friends. He is survived by his beloved wife Maria Grazia.

Francesco Profumo, Prof. Dr. Ing., Dr. H. C.
Former Minister for Teaching, Universities and Research, Italy