Scientific and Educational Curriculum

of

Alessandro Lidozzi

- **Education**
- **Skills**
- **Scientific activity**
- **Awards**
- **Research projects**
- **Memberships and international activities**
- **Teaching**
- **Publications**

Last update, May 2019

Place and date of birth

Roma (Italy), November 27th, 1974

Research experience and teaching activities

Currently employed as Associate Professor in Power Electronics and Electric Drives at ROMA TRE University - Department of Engineering, Center for Power Electronics and Drives (C-PED), Roma (Italy),

Education

PhD Degree in Mechanical and Industrial Engineering, ROMA TRE University, November 2nd, 2003 – October 31st, 2006. Graduation Thesis: Synergetic control for power electronic converters and permanent magnets machine based electric drives.

> **Visiting Scholar** at the *Center for Power Electronics Systems* (CPES), Blacksburg, Virginia (USA), August 1st, 2005 – April 30th, 2006. During my stay, I was involved in a project concerning the development of a sensorless control for PM based electric drives for aircraft pump and fan applications. Project sponsored by Thales Avionics Electrical Systems.

Master Degree in Electronics Engineering (final mark 110/110), ROMA TRE University, March 14th, 2003. Graduation thesis: Theoretical and experimental analysis of distributed control architecture for power electronic systems.

Skills

	Level
• Electric drives and power electronics converters hardware and control design	expert
• Simulation software for power electronics, electric drives and control design: Matlab®, Simulink® and PLECS®	expert
• C and assembler programming for the C2000 series DSP from Texas Instruments and ADSP-219x from Analog Devices	expert
• Serial communication standards SPI, I2C, RS-232, RS-485, McBSP, SPORT	expert
• Implementation of Digital Signal Processor based control algorithms for both electric drives and power converters	expert
• Software for real-time data acquisition, analysis and control development: LabVIEW®, with deep knowledge of Real-Time and FPGA modules	expert
• Implementation of system communication architectures based on the Controller Area Network (CAN) standard from Bosch®	expert
• CAN based industrial and automotive protocols: CANopen and SAE-J	expert

Scientific activity

The scientific activity conducted primarily within the Department of Mechanical and Industrial Engineering (now Department of Engineering) of the ROMA TRE University, is mainly focused on hardware and control design for power electronic converters and electric drives.

I had the opportunity to work on national and international projects funded by the Italian Government, European Union and private companies, in the fields of electric and hybrid propulsion systems and power generation in both grid-tied and stand-alone applications.

Hardware and control design for **multi-input power electronic converters** (MIPECs) marks the beginning of the research activity. Several control strategies have been proposed and tested for different power sources connected to the MIPEC inputs: batteries, ultracapacitors, fuel-cells and generating units mainly based on internal combustion engines (ICEs). These power electronic configurations, initially developed for propulsion applications, are today widely used in the field of distributed power generation and micro-grid in both grid-tied and stand-alone mode of operation. Several prototypes of hybrid power trains have been realized with different combination of power and energy sources. This allowed to propose and test many power management strategies according to the system input requirements (e.g. hybridization, performance and fuel saving).
Electromagnetic interference (EMI) aspects have been analyzed for power electronics converters and their related power supply boards. Common mode and differential mode filter structures were designed and tested; as well as modulation techniques for EMI reduction in electric and hybrid vehicle have been proposed and fully verified.

In some electric drives based applications, machine speed requires to be accurately controlled and kept as constant as possible with respect to the load torque variations. I was involved in the development of non-linear control techniques for torque/speed regulation in electric drives, with particular reference to the **synergetic control** that was also the main topic of the PhD program. The proposed control strategy allows achieving a fast-dynamic response with respect to standard control techniques, including torque limitation capabilities that are not common when synergetic model-based control methods are used.
According to the high dynamic control performance achievable by the usage of synergetic control, it was applied to the previously described MIPEC interface, especially to the power stage devoted to control the high dynamic power source. Hence, the ultracapacitors bidirectional dc-dc converter, that is devoted to regulate the output dc-link voltage, was fully controlled by the synergetic approach.

As part of the **PhD program**, during my stay at the **Center for Power Electronics Systems** (CPES), Blacksburg (VA - USA), I worked on the design, implementation and testing of **back-EMF based sensorless algorithms** for aircraft pump-fan applications. The research activity was conducted in a multidisciplinary team due to the different aspects of the program. A complete system prototype was built and fully tested. It was composed by a liquid cooled 2-levels IGBT based VSI, designed using a stackable concept and feeding a 8000 rpm PM-machine having a rated torque of 100 Nm. Personal contribution was in the control algorithm, especially in the closed-loop observer for electrical machine speed and position estimation, and complete system starting procedure according to the field oriented control strategy. Project development was carried out using simulation software for system design and control tuning, whereas integrated desktop environment (IDE) for the deployment of the complete control algorithm using C language.

Concerning electric drives for propulsion and generating applications, part of the research activity was mainly focused on the development of algorithms for **speed and position estimation** using **low-resolution position sensors** (hall-effect detectors) in PM-machines. In some cases, the electrical machine mechanical shaft must be available for running further mechanical loads when the unit has to provide both electrical and mechanical power (i.e. mild hybrid systems, industrial solutions with centrifugal compressors and blowers). These requirements force to solutions with resolver having hollow shaft configuration, which are expensive and difficult to assembly in order to have also a PTO (Power Take-Off) available. The usage of Hall-effect sensors can overcome the discussed issues; in fact, the sensors are placed inside the PM-machine close to the stator winding, consequently there is no shaft interference for any mechanical arrangement.
Research objective was focused on the possibility to control sinusoidal currents inside the 60° electrical sector that is identified by the hall sensors. In this field both open-loop and closed-loop algorithms were developed for permanent magnets machines having sinusoidal back-EMF. The machine considered was an axial-flux PM-machine, and the hall-sensors were mounted using a holder connected to the chassis. Sensors work on the basis of the **leakage flux detection**, and they can be easily **replaced in case of damage**. When the sensors are placed inside the stator, between the windings, they are secreted by the thermal resin, which makes them difficult to be substituted.
Assembly process and tolerance effects could result in a relative **misalignment of the hall-effect detectors**. In this case the electrical sector could be either larger or smaller than the ideal one; therefore, a speed estimation error occurs which is respectively either lower or higher than the actual speed in the identified sector. The mentioned problem can be fixed by implementing an **automatic calibration procedure**, which is on-board the control DSP. This procedure must run before the start-up of the whole system and it does not require any additional hardware components.

Self-commissioning electric drives require an accurate tuning of the speed, torque and flux controllers. In order to overcome issues concerning instability, accurate dynamic performances and providing wide stability margins, a **direct tuning strategy** procedure was developed for field oriented controlled synchronous machines. Proposed technique is mainly based on closed form tuning expressions, which allow the automatic tuning of electric drives control loops, providing the designer directly the **input dynamic specifications** that are usually application-dependents. Developed expressions can be straightforwardly implemented on industrial DSP and μC based control platforms, to perform and automatic tuning during the electric drive start-up phase.

During the research program, I was involved in projects in the field of **variable speed-generating systems**. This particular topic is nowadays very promising due to some benefits in term of efficiency, noise, weight and size of the generating units. Research activities aimed to complete design of the power electronics interface between the permanent magnets synchronous generator, which is directly coupled to the variable speed prime mover, and the output ac-loads usually 400V/50 Hz (EU standard). In particular, I worked in a team for the development of autonomous diesel-electric generating units devoted to supply both single phase and three-phase linear and non-linear loads. Power conversion topology was mainly based on ac-dc-ac double power stage. First generating unit was deployed and it is currently used as demonstrator at an Italy-based company (Geminiani S.p.A.). From the power conditioner control aspects, several solutions have been investigated and then developed for the control of the ac-dc power converter, which are mainly based on adaptive structures due to the *non-linear behavior* of the system. In fact, dc-link voltage controlled boost-rectifier exhibit a dynamic behavior that reduce the system bandwidth when the output requested power is increased. This effect can bring the system to not-allowed operating conditions especially during transients and load steps. Proposed

control architecture takes the benefits of a classical and well-known linear control topology being based on PI regulators. However, it can provide constant dynamic behavior in the entire converter operating conditions. This is simply achieved by constantly tuning the PI controllers according to the non-linear characteristic of the boost-rectifier, continuously moving the linearization point according to the converter operating point.

The experience in the generating systems, has led the interest in the development of hardware and software solutions for **front-end inverter** operating, initially, in **intentional islanding mode**. Control schemes able to supply single-phase, three-phase, linear and non-linear loads with variable power factor, have been proposed and tested. Power conversion topology based on 4-leg VSI was selected being the most versatile configuration. In order to provide output voltages with low harmonic content, especially to be compliance with EMC 61000 Class-1/2/3 standards, an accurate tracking of the output disturbances must be implemented in the control loop. Multi-resonant controller (MRS) is at the basis of the selected control topology, with a combined integral action to compensate output voltages dc component. Moreover, inverter filter-load interaction due the requested output active and reactive power was analyzed to depict possible limitations in the control system. The proposed solution is able to adapt the MRC according to the loads requested power, providing constant dynamic and allowing high order resonant controllers to be included in the control loop. This is accomplished by the usage of a full form *3-degree of freedom resonant controller*, which allows to regulate almost independently, the controller's gain, width and phase at the resonant frequency. Phase regulation capability is at the basis of the proposed compensation technique, working directly to the phase lagging introducing by the whole filter-load system.

In order to improve the inverter output voltage or current regulation performances and reducing the control platform computational load, *resonant controller* (RC) structure has been *joined* with the *repetitive controller*. Moreover, repetitive control (RPC) requires an additional controller that is able to stabilize the system and this task is accomplished by the RC.

The obtained regulator structure can be implemented with strongly reduced DSP or μC resources, being composed by only the RC at the fundamental frequency and the classical delay lines related to the repetitive control. RC-RPC combination allows taking advantage of fast load step compensation thanks to the RC that operates at the fundamental frequency, enabling the RPC to run the harmonic compensation when non-linear loads must be fed.

Inverter **output filter topology** for stand-alone applications has been deeply investigated and a complete design procedure was proposed. Additionally, filter design criteria were extended including the inverter operating in **grid-tied mode**. Control algorithm and filter topology were tested during both mode of operations, and finally, transient behaviors from on-grid to off-grid and vice versa were inspected and solutions for smooth transitions were proposed. Robust phase locked loop (PLL) and anti-islanding algorithms were developed and analyzed to fast react to an islanding condition, allowing the control algorithm to switch to the proper configuration without affecting the supplied loads.

Further improvements in the inverter outputs can be obtained modifying the neutral configuration with an **active split dc-bus** topology (also known as *split-link*). This arrangement strongly reduces neutral voltage oscillations and common mode noise. However, the *split-link* configuration acts as a low-pass filter on the neutral leg, affecting directly the control loops stability. According to that, converter modeling was proposed to depict the dynamic behaviors and providing guidelines for the *split-link* design. Due to this particular inverter configuration, classical carrier based (CB) modulation techniques for four-leg VSI were reviewed, describing some possible limitations related to the asymmetrical behavior of the output filter, with respect to the line-to-line and phase-to-neutral output

voltages. In fact, when CB modulation schemes are used, filter asymmetry does not allow the perfect cancellation in the output voltages, of the injected third harmonic components. This result in increased distortion of inverter outputs that cannot be compensated by the control algorithm. Previously achieved modeling equations were used to overcome the shown effects, by introducing a design procedure for the *split-link* output filter with respect to the modulation scheme.

In the field of **high speed electric drives**, MOSFET based Neutral Point Clamped (NPC) three-level inverters were developed for permanent magnets electrical machines with high fundamental frequency (above kHz). In particular, a 20.000 rpm, 48 V low voltage electric drive was designed to be directly coupled to a turbo-expander for energy recovering in automotive applications. Starting from the **NPC** inverter, different power electronics configurations were analyzed, such as **two-level VSI** and **dc-dc boost** converter with **input diode rectifier**. Each static converter was built and tested to perform a full comparison in this particular application.
Furthermore, for high fundamental frequency generating units, the possibility to increase the rectifier levels was analyzed jointly with a reduction of the switch count. According to that, a five-level **unidirectional T-rectifier** was developed. Switches and diodes losses were evaluated for different power module configurations built with silicon or silicon carbide devices. It was noticed that some advantages could be achieved when SiC devices replace some Si-based components, located in particular position of the rectifier circuit: whereas, it would be not convenient to make the entire module using SiC based devices.
Main drawback of the unidirectional T-rectifier converter topology is the inherent dc-link capacitors voltage unbalance, which requires a suitable *balancing circuit*. A modified configuration of a series resonant converter topology was proposed as balancing circuit due to its simple configuration and for the zero-current switching feature. Different converter arrangements are under development.

All the presented activities in the field of power electronics and electric drives, led to the realization of **prototypes** or **industrial pre-release**. Intensive **experimental campaigns** have been performed to test and **verify the proposed solutions**. The described activities were carried out both in the Laboratory of Power Electronics and Electric Drives of the ROMA TRE University and at companies or institutions that have sponsored the research projects.

Since 2014, I have been collaborating with **Prof. Pericle Zanchetta**. The activity is centered on control aspect for 3-phase 4-leg inverter operating in stand-alone applications.

Prof. Pericle Zanchetta, The University of Nottingham, UK.

Since 2014, I have been collaborating with **Dr. Petar Grbovic**. The activity is centered on unconventional topologies for T-type and E-type multilevel converters for generating applications.

Dr. Petar Grbovic, Huawei Energy Competence Center Europe (HECCE), Huawei Technologies Dusseldorf GmbH, Munich/Nuremberg, Germany.

In 2003, I collaborated with **Prof. José Antenor Pomilio** during his stay, as visiting professor, at the ROMA TRE University. The activity was centered on linear analysis and complex regulators design for dc-dc multi-input power electronic converters for traction and generating applications.

Prof. Josè Antenor Pomilio, Universidade Estadual de Campinas, Faculdade de Engenharia Elétrica e de Computação, Departamento de Sistemas e Energia, Campinas, SP – Brasil.

Since 2003, I have been **advisor** and **co-advisor** in several **master degree theses** in the field of Power Electronics and Electric Drives.

I attend almost every year **international conferences,** such as IEEE Energy Conversion Congress and Exposition (ECCE), Annual Conference of the IEEE Industrial Electronics Society (IECON), IEEE International Symposium on Industrial Electronics (ISIE), IEEE International Conference on Electrical Machines (ICEM), where **I present** the papers of which I am a co-author to the scientific community.

Awards

- 2018 NI Academic Research Grant Program: FPGA implementation of Optimal Model Predictive Control strategies for AC-DC converters.
- National Scientific Qualification for Full Professor attained in April 6th, 2018. Scientific field ING-IND/32: Power Converter, Electrical Machines and Drives.
- National Instruments *Engineering Impact Award 2016*, category *Industrial Machinery & Control*, for the development of a reconfigurable control board based on the NI sbRIO-9651 for power electronics and drives applications. www.ped-board.com
- National Scientific Qualification for Associate Professor attained in December 18th, 2013 (first call, November 2012). Scientific field ING-IND/32: Power Converter, Electrical Machines and Drives.
- PhD student with university full financial support, November 1st, 2003 – October 31st, 2006. The PhD activity was mainly focused on non-linear control development for high performance AC-drives and DC-DC converters.
- Paper awards: third prize and travel grant winner at the Student Forum of the International Symposium on Industrial Electronics, ISIE 2004. [1]

Patents and royalty owner

- 2019. E.D. Elettronica Dedicata S.r.l. - Royalty bearing license agreement for production and sale of the *SiC Inverter its accessories*.
- 2016. E.D. Elettronica Dedicata S.r.l. - Royalty bearing license agreement for production and sale of the *PED-Board and its accessories*. www.ped-board.com

Research projects

Below is reported the project list in which I was involved as research fellow. In particular, the complete project list is divided between projects founded by private companies, international and national research projects and projects founded by public boards.

Principal investigator in research activities funded by private companies and research institutions

- 2019-2020. Construcciones Instalación y Tracción, S.A.U. (Spain) – "Dual A-NPC inverter for energy recovery in railway systems, 1.5kV and 3.3kV power converters"
- 2017-2018. ENEA Research Center – "Analysis and Evaluation of Energy Storage Technologies for high-performance Charging Stations"
- 2018. E.D. Elettronia Dedicata S.r.l. - "Active AC-DC converter for Stirling-based generating units: design and validation"

- 2018. E.D. Elettronia Dedicata S.r.l. - “Design, validation and software development of a T-SoM board for on-line production tests”
- 2018-2019. ABB S.p.A. - “Design and realization of a high-performance electric drive for motorized medium-voltage breakers (BPWR)”
- 2017-2018. ENEA Research Center – “Design and implementation of a fast charging infrastructure for public transportations vehicles”
- 2017-2020. National Instruments Corporation (TX, USA) – “Exploring the possibility to use the LabVIEW based graphical tool chain in the development of control structures for power electronics and drives applications”
- 2016-2017. ENEA Research Center – “Preliminary evaluation of fast charging systems for public transportation”
- 2017-2018. CITRACC, Construcciones Instalación y Tracción, S.A.U. (Spain) – “Dual A-NPC inverter for energy recovery in railway systems”
- 2017-2018. Huawei GmbH (Germany) – “High performance UPS based on multilevel power converter topologies”
- 2017-2018. OPAL-RT Europe – Framework agreement for a collaboration in the field of Hardware-in-the-Loop systems
- 2016-2017. ABB S.p.A. - “Design and realization of a multi-voltage capacitors charger for medium-voltage breakers (BCHRG)”
- 2016-2018. E.D. Elettronia Dedicata S.r.l. - “Design, validation and software development for an industrial board based on the National Instruments System on Module”
- 2015. 2BiT S.r.l. - “DSP-FPGA based Power Electronics and Drives board, requirements and design”

Co-investigator in research activities funded by private companies and research institutions

- 2016-2019. Infineon S.p.A. – “High dV/dt devices in electrical drives”
- 2016-2017. European Center for Power Electronics (ECPE) sponsored funding – “Passive and Active Reduction of Switching Overvoltage in SiC Equipped Industrial Drives”
- 2016. ABB S.p.A - “Evaluation and design of capacitors chargers for medium voltage circuit breaker actuated by motor drive”
- 2015. Semikron S.p.A. – “Power modules characterization for an innovative AC-DC configuration”
- 2013-2014. Hyntesys S.r.l. – “Development of the hybrid power train for medium and heavy loaders”
- 2011-2012. Carlo Gavazzi Logistics S.p.A. – “30 kW high efficiency power converter solution for a transformer-less PV inverter”
- 2011-2012. Lucchi R. Elettromeccanica S.r.l. – “Definition of the technical specification and testing of the electric drives to be used in electric farm tractors”
- 2011-2012. Larcet S.r.l. – “Design and testing of 3-phase inverters for hybrid farm equipment”;
- 2010-2011. Geant Empowering S.r.l. – “Control design and implementation for a 3 kW 1-phase NPC inverter for PV applications”
- 2010. Lucchi R. Elettromeccanica S.r.l. – “Experimental campaign for an on-board diesel-electric generating system devoted to the propulsion of heavy vehicles”

- 2009-2010. Semikron S.p.A. – "Design and test of three-level inverters and complete design of a multilevel inverters test bench"
- 2008-2009. Larcet S.r.l. – "Design and prototypal development of a 3-phase multilevel PFC with 48V output voltage"
- 2008-2009. 3C-Group S.r.l. – "Design specifications for the electric drive devoted to a 50cc scooter propulsion"

Co-investigator in international and national research projects

- 2018-2019. Progetto Regione Lazio – "Ultra-fast charging stations for electric vehicles"
- 2010-2012. TecnoTib.E.R.I.S - Bando Regione Lazio "Sviluppo dell'Innovazione Tecnologica nel Territorio Regionale", Art. 182 comma 4 lettera C, L.R. 04/06 – Progetti Imprenditoriali – "Digital control for modular power supply"
- 2010-2012. Ministry of Education, University and Research (National Research Program) – "Turbo-expander coupled electric drives for energy recovering in automotive applications"
- 2006-2008. Ministry of Education, University and Research (National Research Program) – "Thermal aspects in design and control of electric driver devoted to propulsion systems"
- 2005-2009. European Union - FP6 - HOST, "Human Oriented mean of Sustainable Transport"
- 2003-2005. Ministry of Education, University and Research (National Research Program) – "Development of Power Electronics Building Blocks (PEBB) for static conversion apparatus devoted to low-voltage fed electric drives"

Co-investigator in research activities funded by public boards

- 2011. CIRPS – "Design and testing of four 30 kW inverters for electric vehicles"
- 2006-2008. National Agency for New Technologies, Energy and Sustainable Economic Development – "Design and realization of the power electronic interface devoted to a series hybrid microcar"
- 2005. National Agency for New Technologies, Energy and Sustainable Economic Development – "Test bench characterization of a hybrid traction system using fuel cell generators and modelling of the components of the same propulsion system"
- 2004. National Agency for New Technologies, Energy and Sustainable Economic Development – "Testing methodologies for characterization of hybrid traction systems using fuel-cell generators"

Memberships and international activities

- Invited speaker and member of the National Instruments Educational Council Advisory Board (EduCab). (First edition: Oct. 19th, 2016, Rome, Italy)
- Invited speaker at the international Cyber Physical Systems round table. Title of the speech: *Smart Devices for Electrical Power Systems*. (Dec. 1st-2nd, 2016 Lille, France) http://france.ni.com/cps-roundtable
- Invited speaker at the National Instruments annual conference (NIweek), Austin (TX, USA). Title of the speech: LabVIEW RT and FPGA for Power Electronics and Drives Control Applications (May 2017).

IEEE member since 2004.

IEEE international journals and conferences:

- *Transactions on Industrial Electronics*, reviewer
- *Transactions on Power Electronics*, reviewer
- *Transactions on Industry Applications*, reviewer
- *Energy Conversion Congress and Exposition* (ECCE), reviewer, topic chair and session chair
- *Annual conference of the Industrial Electronics Society* (IECON), reviewer
- *International Conference on Electrical Machines* (ICEM), reviewer

Topic Chair for the ECCE conference since 2013

Since 2014, I have been serving as reviewer for the ELSEVIER *International Journal of Electrical Power & Energy Systems* and for the IET *Renewable Power Generation*.

Member of the editorial board of the ISRN *Journal of Automotive Engineering* (Hindawi Publishing Corporation).

Member of the editorial board of the ISRN *Advances in Power Electronics* (Hindawi Publishing Corporation).

Member of the Technical Committee for the *2017 AUTOMOTIVE Conference* (http://convegni.aeit.it/automotive2017/)

Since 2017, I have been member of the Mechanical and Industrial PhD teachers' committee.

Teaching activities

- 2014-today. Master and Bachelor degree in Mechanical Engineering, ROMA TRE University, **Laboratory of Electrical Applications and Measures (course is endorsed as National Instruments LabVIEW® Academy class)**, *Course Manager and Lecturer*
- 2014-today. Master degree in Mechanical Engineering, ROMA TRE University, **Electronic Systems for Mechanical Engineering**, *Course Manager and Lecturer*
- 2012-today. Master degree in Mechanical Engineering and Master degree in Electronics Engineering, ROMA TRE University, **Electrical Energetics**, *Course Manager and Lecturer*
- 2010-today. Master degree in Mechanical Engineering, ROMA TRE University, **Electric Propulsion**, *Teaching Assistant*
- 2009-today. Master degree in Electronics Engineering, ROMA TRE University, **Design of Power Electronic Converters**, *Teaching Assistant*
- 2008-today. Master degree in Electronics Engineering, ROMA TRE University, **Power Electronics**, *Teaching Assistant*
- 2015-today. Power Electronics Summer Course, **Practice on Power Electronics** (Hands-on class), *Course Manager and Lecturer*

- 2015-today. National Instruments LabVIEW instructor
- 2018. University of South Pacific, College of Engineering "Graphical toolchains for microprocessors and FPGA in Power Electronics and Drives Applications"
- 2017. University of Pavia, PhD school seminar "Smart Devices for electrical Power systems"

- 2015. Master in Second Grade School Teaching (TFA), **Education in Power Electronics**, *Course Manager and Lecturer*
- 2013-2014. Master degree in Mechanical Engineering, ROMA TRE University, **Electronic Systems for Mechanical Engineering**, *Teaching Assistant*
- 2014. Master in Second Grade School Teaching (PAS), **Education in Power Electronics**, *Course Manager and Lecturer*
- 2013. Master in Second Grade School Teaching (TFA), **Education in Power Electronics**, *Course Manager and Lecturer*
- 2006-2009. Master degree in Mechanical Engineering, ROMA TRE University, **Electric Drives**, *Teaching Assistant*
- 2005-2008. Master degree in Mechanical Engineering, ROMA TRE University, **Electric Drives for Industrial Automation**, *Teaching Assistant*
- 2007. Master in Second Grade School Teaching, **Education in Laboratory of Industrial and Power Electronics**, *Course Manager and Lecturer*
- 2007. Master in Second Grade School Teaching, **Education in Laboratory of Electric Drives**, *Course Manager and Lecturer*

Publications

Previously described research activities have led to publish more than 80 papers on international conferences and journals. Complete list of papers is reported below where the publications on international journals are highlighted in bold.

2019

[xx] C.M. Verrelli, S. Bifaretti, E. Carfagna, A. Lidozzi, L. Solero, M. Di Benedetto, "Speed Sensor Fault Tolerant PMSM Machines: From Position-Sensorless to Sensorless Control", in IEEE Transactions on Industry Applications, vol. XX, no. X, pp. XXX-XXX, XX.-Oct. 2019 . (in press)

2018

[xx] V. Sabatini, M. Di Benedetto, A. Lidozzi, "Synchronous Adaptive Resolver-to-Digital Converter for FPGA based High Performance Control Loops," in IEEE Transactions on Instrumentation and Measurement (in press)

[100] M. Di Benedetto, A. Lidozzi, L. Solero, F. Crescimbini and P. J. Grbovic, "Concurrent Control for Three-Phase Four-Wire Five Levels E-Type Inverter for Microgrids," 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, USA, 2018, pp. 202-207.

[99] M. Di Benedetto, A. Lidozzi, L. Solero, M. Tang, A. Formentini and P. Zanchetta, "Disturbance-Observer Assisted Controller for Stand-Alone Four-Leg Voltage Source Inverter," 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, USA, 2018, pp. 2265-2270.

[98] V. Sabatini, A. Lidozzi, L. Solero, A. Formentini, P. Zanchetta and S. Bifaretti, "Real-Time Implicit Model Predictive Control for 3-phase VSI," 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, USA, 2018, pp. 4015-4020.

[97] S. Pipolo, P. Zanchetta, S. Bifaretti, A. Lidozzi, L. Solero and F. Crescimbini, "Power Control Capabilities of the ROMAtrix Converter," 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, USA, 2018, pp. 3955-3960.

[96] L. Bigarelli, A. Lidozzi, M. Di Benedetto, L. Solero, S. Odhano and P. Zanchetta, "Modulated Optimal Model Predictive Control for Variable Speed Gen-Sets," 2018 IEEE Energy Conversion Congress and Exposition (ECCE), Portland, OR, USA, 2018, pp. 6859-6865.

[95] F. Ortenzi, M. Pasquali G. Pede, A. Lidozzi, M. Di Benedetto, "Ultra-fast charging infrastructure for vehicle on-board ultracapacitors in urban public transportation applications", International Electric Vehicle Symposium & Exhibition (EVS), 2018 (NO DOI)

[94] **M. di Benedetto, A. Lidozzi, L. Solero, F. Crescimbini and P. J. Grbović, "Five-Level E-Type Inverter**

for Grid-Connected Applications," in IEEE Transactions on Industry Applications, vol. 54, no. 5, pp. 5536-5548, Sept.-Oct. 2018.

[93] V. Sabatini, L. Bigarelli, M. Di Benedetto, A. Lidozzi, L. Solero and G. Brown, "FPGA-based Model Predictive Control for High Frequency Variable Speed Generating Units," 2018 International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), Amalfi, Italy, 2018, pp. 1364-1369.

[92] M. Di Benedetto, A. Lidozzi, L. Solero, F. Crescimbini and P. J. Grbovic, "Analysis and Design of 5-Level E-Type ISOP Rectifier for High Speed Gen-Set Applications," 2018 International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), Amalfi, Italy, 2018, pp. 667-672.

2017

[91] S. Pipolo, S. Bifaretti, A. Lidozzi, L. Solero, F. Crescimbini and P. Zanchetta, "The ROMAtrix converter: Concept and operation," 2017 IEEE Southern Power Electronics Conference (SPEC), Puerto Varas, 2017, pp. 1-6.

[90] A. Lidozzi, V. Sabatini, S. Bifaretti, G. Brown, L. Solero and F. Crescimbini, "Resolver-to-digital converter with synchronous demodulation for FPGA based low-latency control loops," 2017 19th European Conference on Power Electronics and Applications (EPE'17 ECCE Europe), Warsaw, Poland, 2017, pp. P.1-P.7.

[89] S. Bifaretti, S. Pipolo, A. Lidozzi, L. Solero, L. Tarisciotti and P. Zanchetta, "Modulated model predictive control for active split DC-bus 4-leg power supply," 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, USA, 2017, pp. 4622-4627.

[88] A. Lidozzi, L. Solero, F. Crescimbini, C. Ji, S. Bifaretti and P. Zanchetta, "FPGA-based direct repetitive control for high performance ground power units," 2017 IEEE Energy Conversion Congress and Exposition (ECCE), Cincinnati, OH, USA, 2017, pp. 3063-3068.

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