

Curriculum Vitae of Marco Ceccarelli

BIOGRAPHICAL NOTES of MARCO CECCARELLI

Updated: February 2023



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Marco Ceccarelli was born in Rome in 1958. He received the mechanical engineer degree cum laude in 1982 at the University “La Sapienza” of Rome. At the same University he received a Ph.D. degree in Applied Mechanics in 1987. In 1987 he was visiting scholar at Stanford University, U.S.A., and in 1990 he received a CNR-NATO annual grant as visiting professor at the Technical University of Valencia, Spain. Since 1990 he teaches courses on Mechanics of Machinery and Mechanisms, and Mechanics of Robots at Cassino University, and from September 2018 in University of Rome Tor Vergata. Since 1996 up to 2018 he was Director of LARM, the Laboratory of Robot Mechatronics at the University of Cassino and South Latium and since 2019 he is Director of LARM2, the Laboratory of Robotics and Mechatronics in University of Rome Tor Vergata. Since 2001 he is Full Professor of Mechanics of Machinery and Mechanisms at Cassino University. From 2003 to 2005 he has been Vice Director of DiMSAT Department. Since March 2019 he is full Professor in University of Rome Tor Vergata, Italy.

He is ASME fellow (The American Society of Mechanical Engineers) and member of AEIM (Spanish Society of Mechanical Engineers), IFToMM Italy (Italian Association of MMS), IEEE (the Institute of Electrical and Electronics Engineers), IFAC (International Federation of Automation and Control), FelbIM (Iberoamerican Federation for Mechanical Engineering), AISI (Italian Society for the History of Engineering), GMA (Italian Group for Mechanics of Machinery).

From 1998 to 2004 he has been Chairman of the Permanent Commission for History of Machine and Mechanism Science of IFToMM, the International Federation for the Promotion of Machine and Mechanism Science, and currently he is still a member. Since 1999 he is also member of the IFToMM Technical Committee for Mechatronics and Robotics. He has been member of IFToMM TC for Computational Kinematics. He has been Chairman of the Commission for Mechatronics of FelbIM, Federación Iberoamericana de Ingeniería Mecánica until 2016. In 2008-09 and 2014-16 he has been Coordinator of the Scientific Committee for RAAD, International Workshops on Robotics in Alpe-Adria-Danube Region being member since 1995. From 2002 to 2018 he has been founder Chairman of the Scientific Committee of MUSME, IFToMM-FelbIM International Conference on Mechatronics and Multibody Systems. Since 2010 is founder Chairman of the Scientific Committee of MEDER, IFToMM International Conference on Mechanism Design for Robots. He is member of scientific Committees for several other international conferences, like, Romansy, CK, SYROM, EUCOMES, ASIAN MMS; in 2008-2015 he has been associate editor for the Journal Mechanics Based Design of Structures and Machines, he is associate editor for International Journal of Mechanics and Control, Chinese Journal of Mechanical Design (Europe editor), and Journal Advanced Robotic Systems (editor-in-chief for Service Robotics), Int. Journal of Mechanisms and Robotic Systems, Frontiers of Mechanical Engineering, and many others; he has served as associated editor for Mechanism and Machine Theory; he has served and serves as reviewer for several international conferences and journals; he has served and serves as reviewer for national and international projects for Italian and foreign agencies. In 2015-16 he has been member of GEV the Italian commission for the research evaluation and since 2012 member AVA for University evaluation. He has been invited as visiting professor in institutions of several countries and has given invited lectures and short courses in many countries at conference events, celebration events, or within regular courses. He has carried out consulting activity for companies and in industrial plants on problems regarding with Automation and Robotics. He has been the founder and then Scientific Editor for the Proceedings of HMM 2000, HMM 2004, HMM 2008, HMM 2012, HMM 2016, and HMM2018 International Symposium on History of Machines and Mechanisms. He has been Chairman for HMM 2000 and 2004 that have been held in Cassino. He has been the co-founder of MUSME, the IFToMM-FelbIM Symposium on Multibody Systems and Mechatronics. He has been Co-Chairman for MUSME in 2002 in Mexico City, in 2005 in Uberlandia, Brazil, in 2008 in San Juan, Argentina, in 2011 in Valencia, Spain and in 2014 in Huatulco, Mexico. He has been Chairman for RAAD Workshops held in Cassino in 1997 and 2003. He has been Chairman for CK2005, IFToMM International Workshop on Computational Kinematics that has been held in Cassino in 2005. He has been co-founder of EUCOMES, the European conference on Mechanism Science and he has been Chairman for the second event held in Cassino in 2008. He is the Scientific Editor of a Book Series on History of Mechanism and Machine Science published by Springer since 2007. In 2007 he has edited ‘Distinguished Figures in MMS – Part 1’ published by Springer in the above-mentioned book series and he has also editor again for the Part 2, 3, and 4. He is Scientific Editor of a Book Series on Mechanism and Machine Science published by Springer since 2010. He has co-authored the book ‘A short Illustrated History of Machines’ published at Technical University in Madrid in 2008 with a revised version published by Springer in 2010. In 2008 he edited the book ‘Robot Manipulators’ published by I-Tech Education Publishing KG in Wien. In 2012 he edited the book ‘Service Robots and Robotics’ published by IGI-Global. In 2015 he co-edited two ASME books on ‘Design and prototypes of Mobile Robots’. In 2018 he coedited the Elsevier book ‘Design and operation of human-like locomotion systems. He has written the book ‘Fundamentals of Mechanics of Robotic Manipulation’ published by Kluwer/Springer in 2004. Together with prof Carlos Lopez-Cajún he has written the book ‘Mecanismos –Fundamentos cinematicos para el diseno y optimizacion de maquinaria’ published by Trillas Publisher in Mexico in 2008 with second edition in 2014. He also edited or co-edited books as proceedings of several other conferences. With LARM team he has conceived and developed several algorithms and systems, like ring formula for workspace determination, design formulation for circular-arc cams, CAPAMAN manipulator, LARM Hand, CATRASYS, CALOWI, LARM Rickshaw robot, LARM Hexapod, LARM clutched arm, Cassino Hexapod, Surveybot, leg exoskeletons, CADELL, Space astronaut robot, Exoskeleton Finger, LARMbot humanoid, Heritagebot Platform, Medical devices as robotic wheelchair and rib fixator, with patent releases, experimental characterizations and prototype results. He has also worked out findings and interpretations in the History of Mechanical Engineering, like on Screw Theory by Giulio Mozzi and on personalities like Lorenzo Allievi, Giuseppe Antonio Borgnis, Francesco di Giorgio, and Vitruvius.

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In November 2003 he has received the Degree of Doctor Honoris Causa in Mechatronic Engineering from UNI, National University of Lima, Perú; in May 2009 he received Honoris Causa Degree in Engineering from Technical University of Kursk, Russia; in October 2009 he received Honoris Causa Doctor Degree in Engineering from Technical University of Brasov, Romania; in April 2010 he received Honoris Causa Doctor Degree in Engineering from University of Craiova, Romania, as recognizing his academic and scientific career, and his support to the activity. In 2021. He has also received the 2010 Engineer-Historian Award of the American Society of Mechanical Engineers (ASME) for his lifelong involvement in mechanical engineering, specifically the history of machines and mechanisms. He received Dedicated Service Award for his career from IFToMM Italy in September 2020 and from AEIM Spanish society in 2021. He is 2017-2020 member of ASME committee National Inventors Hall of Fame and member 2019-2023 of HHC History Heritage Committee. He has been Coordinator of the Commission for Research of GMA, Italian National Group for Mechanics of Machinery for the period 2002-2006. He has been elected Secretary-General of IFToMM for the term 2004-2007. He has been elected President of IFToMM for the term 2008-2011 and again in 2016-2019 since his IFToMM leadership with different positions since 1998.

His research interests cover aspects of Machine and Mechanism Science (MMS) and Mechanics of Robots. Specific subjects of his interest are Analysis and Design of Workspace and Manipulation; Mechanical Design of Manipulators, Legged Robots; Service Robotics, Medical Devices Grippers and Hands; Mechanics of Grasp; History of MMS; and Mechanism Design. He is author or co-author of more than one thousand papers, which have been presented at Conferences or published in national and international journals. His publication impact is with Scopus H= 32.

More information at the web page: LARM2 webpage: <https://larm2.ing.uniroma2.it/marco-ceccarelli/>

Curriculum Vitae of Marco Ceccarelli

Marco Ceccarelli is professor at University of Rome Tor Vergata. He was born in Rome in 1958. He received the mechanical engineer degree cum laude in 1982 at the University “La Sapienza” of Rome. At the same University he received a Ph.D. degree in Applied Mechanics in 1987. In 1987 he was visiting scholar at Stanford University, U.S.A., and in 1990 he received a CNR-NATO annual grant as visiting professor at the Technical University of Valencia, Spain. Since 1990 he teaches courses on Mechanics of Machinery and Mechanisms, and Mechanics of Robots; from 1990 to 2018 at the School of Engineering at the University of Cassino and since 2019 at University of Rome Tor Vergata. From 1996 to 2018 he was Director of LARM, the Laboratory of Robotics and Mechatronics at the University of Cassino. From 2003 to 2005 he has been Vice Director of Department DiMSAT in Cassino. Since 2001 he has been appointed Full Professor of Mechanics of Machinery and Mechanisms. Since 2019 he is Director of LARM2, the Laboratory of Robot Mechatronics at the University of Rome Tor Vergata.

He is member of ASME (The American Society of Mechanical Engineers), AEIM (Spanish Society of Mechanical Engineers), IFToMM Italy (IFToMM Italian Association of MMS), IEEE (the Institute of Electrical and Electronics Engineers), IFAC (International Federation on Automation and Control), FelbIM (Iberoamerican Federation for Mechanical Engineering), AISI (Italian Society for the History of Engineering), GMA (Italian Group for Mechanics of Machinery).

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Since 2005 he is Chairman of the Commission for Mechatronics of FelbIM, Federaciòn Iberoamericana de Ingenieria Mecànica. In 2007-09 and 2014-16 he has been the Coordinator of the Scientific Committee for RAAD, International Workshops on Robotics in Alpe-Adria-Danube Region. Since 2000 he is Chairman of the Scientific Committee of HMM, IFToMM International Symposium on History of Machines and Mechanisms, that he started in 2000. Since 2002 he is Chairman of the Scientific Committee of MUSME, IFToMM-FelbIM International Conference on Mechatronics and Multibody Systems, that he started in 2002. Since 2009 he is Chairman of the Scientific Committee of MEDER, IFToMM International Conference on Mechanism Design for Robotics, that he started in 2009. He has been Coordinator of the Commission for Research of GMA, Italian National Group for Mechanics of Machinery for the period 2002-2006. He has been elected Secretary-General of IFToMM for the term 2004-2007. He has been elected President of IFToMM for the term 2008-2011 and again 2016-2019.

He is member of scientific Committees for several conferences, like RAAD, Romansy, CK, AIM, SYROM, ISRM, HMM, MUSME and many others; he is associate editor for the journals: MDPI Machines, International Journal of Mechanics and Control, Chinese Journal of Mechanical Engineering (CJME), Frontiers of Mechanical Engineering, The Open Mechanical Engineering Journal, Journal of Zhejiang University-Science A and Journal Advanced Robotic Systems (Editor-in-chief for S4ervice Robotics); he has served as associated editor for Mechanism and Machine Theory in 2003-06; he has served as reviewer for several international conferences and journals; he has served as reviewer for national and international projects for Italian and foreign agencies. He has given invited lectures and short courses by invitation in many countries at conference events, celebration events, or within regular courses. He has been visiting professor for short and long periods in several universities abroad, as for example in 2014-19 at BIT in Beijing, China. He has carried out consulting activity for companies and in industrial plants on problems regarding with Automation and Robotics. He has worked on a project with Sogin in 2011-2013 for the design and construction for a special robot in nuclear plants with a budget of 150 KEuro. He has participated to projects in PRIN Italian Nation Research program as team leader for Cassino unit and project coordinator in 2003-2005 for a project on Cam systems with a budget of 150 KEuro. He is the coordinator of several bilateral agreement for Socrates–Erasmus program and also for special agreement with extra-European Universities. He has coordinated several international bilateral project in the frame of governmental programs. Significant projects can be considered those within China-Italy for the years 2006-2009 with BUAA Beihang University of Beijing; within Russia-Italy for the years 2008-09 with technical Universities of Kursk and Moscow. In 2010-13 the project ‘Digital Mechanism and Gear Library goes Europeana thinkMOTION’ has been funded (with 2MEuro) by the European Union with Grant Agreement No 250485 in which prof Ceccarelli is the leader of a Cassino team as one of the main partners. In addition he is involved in the European project within a Cassino team in the MAGDRIVE (with 1MEuro) and ERRIC (with 2MEuro) projects. In

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particular, prof Ceccarelli has been team chair for several research projects. The most significant research projects in the last decade, demonstrating his leadership and pioneer capability, can be identified in:

- since 1997 "Design and operation of robots and manipulations" with funds by University of Cassino, for LARM, Laboratory of Robotics and Mechatronics.
- 1999-2000 "Design of Robotic Grippers" within the program of Integrated Action between Italy and Spain in collaboration with a team of University of Coruna whose chair was by prof Javier Cuadrado.
- 2001-2002 "Design of a Robot for Restoration activity of Monumental Goods" within the program of Integrated Action between Italy and Spain in collaboration with a team of Technical University of Valencia whose chair was d by prof Juan Ignacio Cuadrado Iglesias.
- 2001-2002 "Design and Experimental Validation of Robots for Medical Applications" within the program CNR-CMOS between Italy and Israel in collaboration with a team of Technical University of Haifa whose chair was d by prof. Moshe Shoham.
- 2001-2004 "Kinematics and Design of Workspace of Robotic Manipulators" within the program of CNR- CSIC between Italy and Spain in collaboration with a team of the Institute for Industrial Robotics of Barcelona whose chair was d by dr Federico Thomas
- 1999-2001 "METAFORE: Design of Robots for Medical Applications" within the Italian national research program PRIN 1999-2001.
- 2001-2003 "RIME: Robots in Medical Environment" within the Italian national research program PRIN
- 2003-2005 "Design and Validation of cam mechanical transmissions" within the Italian national research program PRIN, as also national coordinator.
- 2005 "Design and construction of a robotic system cleaning tanks' within a research contract with the enterprise Italgasbeton Sud SpA in Anagni.
- 2007 "Analysis and characterization of unbalance sources in pneumatic tyres' within a research contract with the enterprise Marangoni Tyres SpA in Anagni.
- 2007-2010 "Design and operation of robots for medical robot services" with funds by University of Cassino, for LARM, Laboratory of Robotics and Mechatronics.
- 2006-2009 "Design of mechanism for robotic structures" within the Italy-Russia program with a team of the Technical University of Kursk whose research director is prof. Sergey Jatsun.
- 2006-2010 "Design, Simulation, and Experimental Validation of a Hand with Underactuated Fingers" within the program between Italy and China in collaboration with a team of the BUAA Bheiang University of Beijing, China whose research director is prof Lu Zhen.
- 2010-2013 "Design and implementation a robotic system for pipeline cuts and inspections in a nuclear plants' within a research contract of 150 KEuro with the enterprise Sogin SpA of Rome.
- 2010-2013 'Digital Mechanism and Gear Library goes Europeana - thinkMOTION' has been funded by the European Union with Grant Agreement No 250485 within ICT call, in which prof Ceccarelli is the leader of a Cassino team as one of the main partners.
- 2011-2014 'Magnetic non contact harmonic drive for space applications – MAGDRIVE' has been funded by the European Union with Grant Agreement No 26789 within Space call, in which prof Carbone is the leader of a Cassino team as one of the main partners.
- 2015-2018 'Heritagebot: robotic systems for cultural heritage goods' in which prof Ceccarelli is the leader has been funded by the Region Lazio in Italy with grant FILAS-2014-1044 in which prof Ceccarelli is the scientific leader
- 2021-2023 'TORVEASTRO: Design and testing of a prototype of astronaut robot' in which prof Ceccarelli is the leader has been funded by the Region Lazio in Italy with grant LazioInnova 36517 for which prof Ceccarelli is the scientific leader

He has been Scientific Editor for the Proceedings of HMM 2000, HMM 2004, HMM 2008 and HMM2012 International Symposium on History of Machines and Mechanisms. He has been Chairman for HMM 2000 and 2004 that have been held in Cassino. He has been Co-Chairman for MUSME in 2002 in Mexico City, in 2005 in Uberlandia, Brazil, in 2008 in San Juan, Argentina, in 2011 in Valencia Spain, and in 2014 in Huatulco, Mexico. He has been Chairman for RAAD Workshops held in Cassino in 1997 and 2003. He has been Chairman for CK2005, IFToMM International Workshop on Computational Kinematics that has been held in Cassino in 2005. He has been Chairman for EUCOMES 2008, European Conference on Mechanism Science that has been held in Cassino in 2008, as one of founders of the conference series.

He has written the book 'Fundamentals of Mechanics of Robotic Manipulation' published by

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Kluwer/Springer in 2004. Together with prof Carlos Lopez-Cajùn he has written the book 'Mecanismos' published by Trillas, in Mexico in 2008 and 2nd edition in 2014. He has edited the book 'Robot Manipulators' published by I-Tech Publishing in Wien in 2008. He has edited the book 'Service Robots' published by IGI Global in New York in 2012. He is Scientific Editor of a Book Series that has been started in 2007 on History of Mechanism and Machine Science published by Springer. In the above-mentioned book series he has edited 'Distinguished Figures in MMS' Part 1, Part 2, and Part 3 published by Springer. In 2007 he has co-authored with Spanish colleagues the book 'A Short illustrated History of Machines' that has been published in 2010 as a revised English version in the above book series. He is also Scientific Editor of a new Book Series that has been started in 2011 on Mechanism and Machine Science published by Springer.

In November 2003 he has received the Degree of Doctor Honoris Causa in Mechatronic Engineering from UNI, National University of Lima, Perú; in May 2009 he received Honoris Causa Degree in Engineering from Technical University of Kursk, Russia; in October 2009 he received Honoris Causa Doctor Degree in Engineering from Technical University of Brasov, Romania; in April 2010 he received Honoris Causa Doctor Degree in Engineering from University of Craiova, Romania, as recognizing his academic and scientific career, and his support to the academic activity. He has also received the 2010 Engineer-Historian Award of the American Society of Mechanical Engineers (ASME) for his lifelong involvement in mechanical engineering, specifically the history of machines and mechanisms. Because of this, he has been now accepted as corresponding member of the committee for History and Heritage of ASME. He is 2017-2020 member of ASME committee National Inventors Hall of Fame. Since January 2012 he is ASME fellow.

His research interests cover aspects of Mechanisms and Machines Science MMS (as TMM in the past), Mechanics of Robots, and History of Mechanical Engineering. Specific subjects of his interest are Analysis and Design of Workspace and Manipulation; Mechanical Design of Manipulators, Legged Robots, Grippers, and Hands; Mechanics of Grasp; History of MMS; and Mechanism Design. He is author or co-author of more than six hundreds papers, which have been presented at Conferences or published in national and international journals. He has edited or co-edited 16 books and authored 4 books. His publication impact as in January 2017 is with $H=32$ and $H_{i10}=139$.

More information is available at the web page: <http://larmlaboratory.net>

Prof Ceccarelli has directed his research with activity that can be linked also to teaching and transmission of the acquired knowledge and expertise to professionals and production activity. In particular, subjects on Robotics and Automation have been developed also to train young researches and young engineers, even coming from abroad at LARM, in research and design with theoretical, numerical, and experimental activities. In the last decades, he has addressed specific attention to the design and operation of robotic systems, like parallel manipulators, gripper and hands, walking machines, with specific features for low- cost designs and easy user-oriented operations, in service applications.

He has developed design methodologies and operation strategies for the construction and operation of several prototypes of new robotic systems, like CAPAMAN (Cassino Parallel Manipulators); CATRASYS (Cassino Tracking System); CALOWI (CASSINO Low-cost Wire Manipulator), LARM HAND, LARM clutched arm, Cassino Hexapod, Cassino linkage bided walkers, and LARMbot humanoid. In particular, he has developed and formulated original algorithms for workspace analysis and design of manipulators with a companion activity for experimental validations.

In the last years prof Ceccarelli has carried out even activity on the subject of the research on system for Cultural Heritage goods in collaboration with the team of prof Michela Cigola, who is architect professor in Cassino too. Results have been obtained in studies of feasibility and even in a design and construction of a first prototype of a six-leg mobile robot as a platform for equipment in survey activity on pavements of architectonical monuments. This prototype is still under development to make it feasible for applications by architects.

In the last years prof Ceccarelli has carried out activity on the subject for research proposals on the design and development of medical service robots. Results have been obtained in studies of feasibility and even in a design and construction of a very first prototypes of cable-based parallel manipulators and applications of the CAPAMAN design. Those prototypes are still under development to make them feasible for applications with doctors and nursery.

Main achievements by prof Ceccarelli can be recognized in scientific research activity, organizing events and teams, searching funds sources within fields of his expertise in Mechanics of Robots, Mechanism

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Design, and History of TMM (Theory of Machines and Mechanisms). Details of those activity and results can be found in the website <http://larmlaboratory.net> of the LARM lab whose prof. Ceccarelli is Director.

In particular, in research activity prof Ceccarelli has been continuously active in several topics of Mechanics of Robots and he has achieved a worldwide reputation. Main fields of achievements are design and experimental evaluation of manipulators and mechanisms for robots, mainly with user oriented low-cost easy-operation features. In particular, he has formulated an original algebraic approach for workspace analysis and synthesis of serial manipulators with revolute joints that is considered and cited in many works (papers and monographs) by other authors around the world. This workspace formulation is useful to determine efficiently workspace characteristics and can be inverted in a suitable form for design purposes. The significance of this contribution is also proved by the several invited plenary lectures that prof Ceccarelli has given in international conferences. This algorithm has been also used in design approaches for direct synthesis and in optimization procedures of manipulators structures.

Another relevant contribution can be recognized in the design and experimental validation for new applications of parallel manipulators. Parallel manipulators have attracted interest towards practical application since the beginning of 1990s'. Prof Ceccarelli has approached the problems and in 1995 has developed a novel design that has been named as CAPAMAN (Cassino Parallel Manipulator). Three different architecture have been developed under his supervision at LARM up to the construction of several prototypes. A novel application has been experienced for CAPAMAN as 3D earthquake simulator. CAPAMAN design is well-known around the world. A second version as CAPAMAN 2 has been developed for surgery applications and a further modification has been experienced as trunk system in a humanoid design. It has also given the possibility for several international collaborations, both in teaching for thesis works and research for experimental and theoretic developments, with or without institutional contracts. Results of those collaboration have produced conference and journal papers, whose list can be found in the LARM website as the enclosed list of publications.

In the field of parallel robots, a new research line is on cable-based manipulators for non-conventional use like for medical applications. In this field prof Ceccarelli has also achieved interesting results that have attracted interest and activity of several students and young researchers. Significant results are documented with the design, construction and experience of CATRASYS (Cassino Tracking System) and CALOWI (Cassino Low-Cost Wire manipulator). CALOWI system has been also experienced as suitable for rescue operations in earthquake damage environments.

Mechanism design has been also oriented to the development of finger mechanisms with one actuator and robust design as an extension of work on two-finger grippers. LARM Hand design has been conceived at human size with three fingers mimicking the human grasp but with only one motor per finger. The finger mechanism has been designed so that its links will be always within the finger body with energy efficiency and human-like properties. Solutions with undertactuated mechanisms have been also designed and investigated with significant results. Recently, a LARM clutched arm has been conceived and designed with details with the aim to achieve an anthropomorphic arm for humanoid robots but with only one motor and an easy control system. The topic has been developed mainly with a PhD work under the supervision of prof. Ceccarelli.

Relevant international collaborations on the above topics and many other design problems have been carried out like for example with teams from University of Stanford in USA, Mc Gill University in Canada, Waseda University in Japan, IRI of Barcelona in Spain, Technical University Braunschweig in Germany, Technical University Valencia in Spain, BUAA (Beihang University) in China, University of Queretaro in Mexico, University of Uberlandia in Brazil, University of San Juan in Argentina, Bauman Technical University in Moscow in Russia and so on.

It is to note that the above-mentioned novel systems have been not patented since prof. Ceccarelli has thought up to now that since design paternity is efficiently legally proved by international publications, patent expenditures could be avoided.

In the last decade prof Ceccarelli has approached the design and operation of robotic systems with challenging features of low-cost design and easy user-oriented operation. Thus, he and his co-workers have conceived, designed, built, and experienced several automatic mechanical systems, among which significant are also the LARM Hand, grippers, LARM clutched arm, Cassino Hexapod mobile robot, LARMbot humanoid robot, and several legged walking machines. Recently he has developed Heritagebot robotic Platform for Cultural Heritage.

Relevant are the results that he obtained in revitalizing scientific interest on cam transmissions by

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achieving even funds from the Italian national research program PRIN for a team of researchers that he has aggregated from several Italian Universities. This collaboration is still ongoing, even without specific funds. New algorithms for design and operation of circular arc cam profiles have been proposed by prof Ceccarelli and his co-workers not only within the abovementioned projects.

In the field of History of TMM he has carried out a pioneering activity in addressing attention to the History of Mechanical Engineering from technical viewpoints. He looks at past works and achievements in order to understand the technical contributions and conditions that led to them with the aim to discover a modern interest for renewed practical applications. Thus, he looks at past results with the possibility to properly interpret and reformulate them with current terminology and modern engineering means. This activity has attracted great interest within the worldwide IFToMM community (IFToMM is the International Federation for the Promotion of Mechanism and Machine Science) and prof Ceccarelli has successfully revitalized the IFToMM Permanent Commission for History of TMM, by even starting a series of HMM symposium every four years since 2000 and a series of annual workshops since 2002. Particularly this conference activity is organized by prof Ceccarelli with the help of colleagues in order to bring those conference events in different countries around the world. Prof Ceccarelli has also attempted integration and collaboration with historians from the traditional community of History of Science.

The significance of the scientific contributions by prof Ceccarelli and his team can be recognized also from the considerable activity in international collaborations both in teaching and research, with or without funded projects. In fact, at LARM students, young researchers, scholars, and visiting professors are continuously received coming from Europe (even beside Socrates program) and from the rest of the World for short and long periods, in general with a support of the guest origin institutions. These collaborations are documented by the results in publications in conference and journals whose a list is available in the LARM website as the enclosed list of publications.

The International recognition of prof Ceccarelli can be proved by his participation at several scientific committees for international conferences, his position as associate editor of several international journals, editor of several books and two book series, invitations that he has received and continuously receives for giving plenary lectures and invited seminars in conferences and in academic institutions, and finally his election as IFToMM president for the term 2008-2011. In particular, recognition of his reputation is also proved by the Honoris Causa Degrees he received from abroad universities, as mentioned above.

Prof Ceccarelli has also contributed to new activities both for organization goals and new interdisciplinary areas within mechanical engineering. His reputation in this aspect can be proved by considering also his position in several international bodies. Significant are his chairmanships of scientific committees for international conferences and commissions, like for example for conference series of MUSME, the FelbIM- IFToMM Symposium of Multibody systems and Mechatronics and RAAD, the International Workshop on Robotics in Alpe-Adria-Danube Region; and for the FelbIM Commission for Mechatronics (FelbIM is the Iberoamerican Federation for Mechanical Engineering). In particular, he has started the MUSME series with other colleagues as a joint conference between IFToMM and FelbIM since 2002 with the specific goal to disseminate and promote Multibody Dynamics and Mechatronics in South America communities. He has also been a promoter of ISRM IFToMM International Symposium on Robotics and Mechatronics that has been started in Hanoi in 2009, as well as IFToMM Asian Conference on Mechanism and Machine Science that has been started in 2010 in Taipei.

The organizing activity in the field of History of TMM is well recognized by the success both of the HMM symposium and annual Workshop on History of TMM. The success of the HMM Symposium is proved by the third event that has been held in Taiwan in November 2008, and a fourth one is scheduled in 2012 in Amsterdam. This activity has contributed to achieve the significant result of a book series on History of Machine and Mechanism Science that has been started in 2007 as published by Springer with prof Ceccarelli as scientific Editor. Within this book series prof Ceccarelli has promoted a project of a dictionary on MMS personalities with invited papers describing shortly biography and explaining the technical contribution with a modern view. A first volume has been published in 2007 and a second one has been published in 2009. He has been the founder and promoter also of the Workshop series on History of MMS that has been started in 2002 in Admont (Austria) and since then every year an event has been celebrated as in Dresden (Germany) in 2005, in Moscow (Russia) in 2005, in Queretaro (Mexico) in 2005, in Ithaca (USA) in 2006, in Bangalore (India) in 2007, in 2009 in Porto Alegre (Brazil), in 2010 in Beijing (China) and many others up to the 2015 Workshop in St Petersburg (Russia).

In addition, prof Ceccarelli together with few European colleagues has started the series of European

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Conference on Mechanism Science EUCOMES with the aim to aggregate the European community working in the several topics of Mechanism Science within a unique well-identified forum. The first conference event has been held in Austria in 2006 and second one has been successfully organized in 2008 by prof Ceccarelli in Cassino with a confirm of the initiative with an increasing participation up to two hundred participants. A third event is held in Cluj-Napoca (Romania) in 2010 for which he has been co-editor of the Proceedings.

The activity of leadership in MMS has given also a result in starting in 2010 a book series by Springer on MMS with prof Ceccarelli as scientific Editor.

Prof Ceccarelli has experienced successfully activity in interdisciplinary fields for studying the History of Mechanical Engineering, for developing robotic systems and operation strategies in medical applications and in survey of architectonic goods. He has approached aspects of History of Mechanical Engineering not only with the aim to establish an interest for a modern reconsideration of past works and methodologies, as outline above, but he has also attempted to integrate that novel viewpoint with traditional studies of History of Science. Thus, he has also collaborated with historians to better understand and analyze the frames within which the investigated past personalities and methodologies have been developed. In particular, he has also collaborated to integrate interpretation of the developments in Mechanism Design by looking at aspects that are related to Descriptive Geometry and Drawing.

Prof Ceccarelli has approached problems for using parallel architectures of robots in medical applications, like surgery assistance and physiotherapy exercises. In this activity he has tried to collaborate with doctors and physiotherapists. Indeed, this activity is still at preliminary stages, although interesting results have been obtained within the above-mentioned PRIN research projects in the years 2001-2005. Recently, prof Ceccarelli and his team have approached the problems of using cable-based parallel manipulators for diagnosis and physiotherapy exercise of human limbs with guidance by doctors and physiotherapists. Interdisciplinary activity for survey and analysis of historical architectonic goods has been carried out since the beginning of 2000s' with preliminary studies of feasibility for design and operation of a hexapod mobile robot as a suitable platform for survey equipment in outdoor environments. In this activity collaborations have been successfully experienced with architects researchers working in the fields of Analysis and Survey in Architecture. Indeed, preliminary results and integrated interests from this activity have identified frames and potentialities for this projects with the aim to achieve better interdisciplinary experiences with practical results and new challenges for new professional viewpoints in Restauration fields.

Curriculum Vitae of Marco Ceccarelli

ASSOCIATE EDITOR IN JOURNAL BOARDS

2003-2005 Mechanism and Machine Theory
2005-present Transactions of Canadian Society of Mechanical Engineering
2006-present Int. Journal of Advanced Robotic Systems (editor-in-chief for Service Robotics)
2006-2018 Int. Journal Mechanics Based Design of Structures and Machines
2007-present Int. Journal of Mechanics and Control
2007-2018 The Open Mechanical Engineering Journal (2012 - Chair for Europe)
2008-present open-access Int. Journal Advances in Mechanical Engineering
2008-present Robotica & Management Int. Journal
2008-present Frontiers of Mechanical Engineering
2009-present Chinese Journal of Mechanical Engineering
2011-present open-access Machines: Machinery and Automation
2011-present open-access Journal of Mechanical Sciences
2011-present Int. Journal of Mechanisms and Robotic Systems
2012-present Int. Journal of Basque Studies
2013-present Advances in Historical Studies
2016- present Int. Journal Inventions
2019- present MDPI Robotics (editor in chief)

Activity of scientific Evaluator 2010-2017

(activity since 1997, but the last years are listed)

dal 1999 è nominator for Japan Prize nel campo dell'Ingegneria, bandito dal governo del Giappone.
2013 nominator for ASME Timoshenko Medal
2014 nominator for ASME Leonardo da Vinci Award 2014 nominator for ASME D'Alembert Award
2014 nominator for ASME landmark of engine collections at the Museum of Palermo University
2011- present: corresponding member in the ASME History & Heritage Committee
2017- present: member of the ASME committee for the Inventors Hall of Fame

Valutatore di Progetti in programmi nazionali/internazionali:

Evaluator of National and International programs:

from 2012 iscritto all'Albo degli Esperti del MIUR
from 2011 Ministry of Education and Science of Russian Federation
from 2011 Council for Research and Development of Romania
2009 National Fund for Scientific and Technological Development, Chile
2010 Ministry of Education and Science of Russian Federation
2011 Delft University, Netherlands
2011 Science and Engineering Council of Canada
2011 POR FESR 2007 - 2013 e l'APQ Ricerca Scientifica della Regione Calabria
2012 Science and Engineering Council of Canada
2013 Spanish National Agency of Evaluation and Prospective (ANEP)
Feb-giu 2013 Science and Engineering Council of Singapore
Sett-ott 2013 National Fund for Scientific and Technological Development, Perù
2015-2016 Croatian Science Foundation
April-May 2015 Progetti FAR-FAS della Regione Toscana
2015-present esperto disciplinare ANVUR per verifica Corsi di Studio in Ingegneria
2014-2017 GEV 09 member of the national Italian Evaluation program VQR2011-2014
2014-2017 Programma Industria 2015 di Invitalia per il Ministero per Sviluppo Industriale
2015-2017 Russian Science Foundation (RSF)
April 2018 (president) commissione AVA per verifica Corsi di Studio in Ingegneria

Curriculum Vitae of Marco Ceccarelli

Valutatore di bandi per ruolo di Professore:

Evaluator for positions of Professor:

March-Apr 2011 Nanyang University, Singapore

Jan-March 2012 Tokyo Institute of Technology

Aug-Oct 2012 University of New Brunswick, Canada

June-July 2013 Delft University, Netherlands

Marc-april 2013 Institute of Advanced Manufacturing Technology, Changzhou China,

Jan- March 2014 Bauman Moscow State Technical University in Moscow, Russia

Jun-Jul 2014 Ohio State University, USA

Oct –nov 2014 Nanyang University, Singapore

Jan-March 2015 Beograd University in Beograd, Serbia,

Jan- March 2015 Institute for the History of Natural Science, Beijing, China

March- April 2015 St. Petersburg Polytechnic University, in St. Petersburg, Russia

March- April 2016 and June 2017 Technical University of Turin, Italy

April-July 2016 (president) Technical University of Barcelona, Spain

March -April 2017 University of Padova in Vicenza

Feb-June 2017 (president) Cassino University

May-June 2017 IIS Bangalore, India

Jan-march 2018 (president) Padua University

Commissioni di esame finale di Dottorato di ricerca:

Evaluator of PhD Theses:

Gen-apr 2010 Politecnico di Valencia, Spagna

Sett- nove 2010 Politecnico di Barcellona, Spagna

Gen-Feb 2011 Università di Bilbao, Spagna

Giu-lug 2011 Politecnico di Cluj-Napoca, Romania

Apr-lug 2011 King's College of London, UK

Feb-apr 2011 Università di Santander, Spagna

Gen-march 2012 Nanayng University, Singapore

Sett-nov 2012 Lappeenranta University of Technology, Finland

Sett- nove 2012 Politecnico di Barcellona, Spagna

Gen-Feb 2013 Università di Bilbao, Spagna Sett-nov

2013 Università di Santander, Spagna

Gen-apr 2014 Politecnico di Valencia, Spagna

Gen -april 2016 Southampton University, UK

Prof Marco Ceccarelli

(Past IFTOMM President, ASME fellow, Dr Honoris Causa)

LARM2 webpage: <https://larm2.ing.uniroma2.it/marco-ceccarelli/>