THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book:

1st Annual International Conference on **Electrical Engineering**

17-20 July 2017, Athens, Greece

Edited by

Gregory T. Papanikos

2017

Abstracts
1st Annual International Conference on Electrical Engineering
17-20 July 2017, Athens, Greece

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(In Alphabetical Order by Author's Family name)

Preface

This book includes the abstracts of all the papers presented at the *1st Annual International Conference on Electrical Engineering, 17-20 July 2017*, organized by the Athens Institute for Education and Research (ATINER).

In total 19 papers were submitted by 23 presenters, coming from 13 different countries (Canada, China, France, Lebanon, Pakistan, Poland, Romania, Saudi Arabia, South Korea, Spain, Thailand, Turkey and USA). The conference was organized into 10 sessions that included a variety of topic areas such as generators, energy and more. A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into seven research divisions and 37 research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

1st Annual International Conference on Electrical Engineering
17-20 July 2017, Athens, Greece
Organizing and Academic Committee

All ATINER's conferences are organized by the Academic Committee (https://www.atiner.gr/academic-committee) of the association.

This conference has been organized with the additional assistance of the following academics, who contributed by chairing the conference sessions and/or by reviewing the submitted abstracts and papers:

1. Gregory T. Papanikos, President, ATINER.
2. Bala Maheswaran, Academic Member, ATINER & Professor, Northeastern University, USA.
3. Nikos Mourtos, Head, Mechanical Engineering Unit, ATINER & Professor, San Jose State University, USA.
4. Lluis Jofre, Professor, Polytechnic University of Catalonia (UPC), Spain.
5. Yves Gagnon, Professor, University of Moncton, Canada.
6. Amos Olagunju, Professor, St Cloud State University, USA.
7. Silvia-Maria Diga, Professor, University of Craiova, Romania.
8. Klaus Wuersig, Associate Professor, University of Pittsburgh at Bradford, USA.
9. Alexandre De Bernardinis, Academic Member, ATINER & Research Scientist, IFSTTAR, France.
10. Vassilis Skianis, Research Fellow, ATINER.
11. Olga Gkounta, Researcher, ATINER.
12. Hannah Howard, Research Assistant, ATINER.

FINAL CONFERENCE PROGRAM
1st Annual International Conference on Electrical Engineering, 17-20 July 2017, Athens, Greece
PROGRAM
Conference Venue: Titania Hotel, 52 Panepistimiou Avenue, Athens, Greece

C O N F E R E N C E P R O G R A M

Monday 17 July 2017

08:00-09:00 Registration and Refreshments

09:00-09:30 (Room B-10th Floor) Welcome and Opening Address

Gregory T. Papanikos, President, ATINER.

09:30-11:00 Session I (Room A-10th Floor): Energy System, Generators and Motors

Chair: Bala Maheswaran, Academic Member, ATINER & Professor, Northeastern University, USA.

1. Silvia-Maria Diga, Professor, University of Craiova, Romania, Leonardo-Geo Manescu, Professor, University of Craiova, Romania, Adelaida-Mihaela Duinea, Lecturer, University of Craiova, Romania & Nicolae Diga, Design Engineer, Electroputere S.A. Craiova, Romania. Considerations on the Experimental Verifications of the Numerical Model of a Permanent Magnet Synchronous Motor Mounted in the Wheel of an Electric Bicycle.
2. Alexandre De Bernardinis, Research Scientist, IFSTTAR, France. High Efficiency Silicon Carbide-based Converters for Fuel Cells and Flywheel Energy Systems.
3. Muhammad Arslan Gondal, Electrical Engineer, Fatima Fertilizer Co. Ltd., Mukhtargarh, Sadiqabad, Pakistan. Implementation of 86G1 (Generator Lock-out) and 86G2 (Turbine Lock-out) for Steam Turbine Generator by using microprocessor based relay, Model: Siprotec 7UM62 (Make: SIEMENS).

11:00-12:30 Session II (Room A-10th Floor): Numerical, Data and Storage

Chair: Silvia-Maria Diga, Professor, University of Craiova, Romania.

1. Amos Olagunju, Professor, St Cloud State University, USA. A Call for Generalized Aggregation Functions for Modelling Complex Decisions with a Mixture Categorical and Continuous Data.
2. Qing Yang, Professor, University of Rhode Island, USA. Introducing DPU - Data-storage Processing Unit, Placing Intelligence in Storage.

12:30-14:00 Session III (Room B-10th Floor): Fuel, Power & Energy Systems

Chair: Amos Olagunju, Professor, St Cloud State University, USA.

1. Yves Gagnon, Professor, University of Moncton, Canada, Jompob Waewsak, Thaksin University, Thailand, Chana Chancham, Thaksin University, Thailand & Somphol Chiwamongkhonkarn, Thaksin University, Thailand. On the Wind Resource Assessment of Thailand. MEC
2. Dong-Wook Jerng, Professor, Chung-Ang University, South Korea & Jung-jin Bang, Graduate Student, Chung-Ang University, South Korea. Containment Cooling Methods for Safety Enhancement of Nuclear Power Plants. MEC
3. Hoseong Lee, Senior Researcher, KATECH (Korea Automotive Technology Institute), South Korea. Experimental Study on Heating Performance Characteristics of Coolant Heat-Sourced Heat Pump System in a Fuel Cell Electric Vehicle.
4. Azeddine Draou, Professor, Islamic University of Madinah, Saudi Arabia. Performance Analysis of Photo Voltaic (PV) Panel Emulator Connected to the Grid System.
5. Lidi Wang, Associate Professor, Shenyang Agricultural University, China. Photovoltaic Power Supply is Used to Improve the Voltage Level of Distribution Network and its ETAP Implementation.

14:00-15:00 Lunch

15:00-16:30 Session IV (Room B-10th Floor): Biomedical Applications

Chair: Yves Gagnon, Professor, University of Moncton, Canada.

1. Vimolrat Ngamaramvaranggul, Assistant Professor, Chulalongkorn University, Thailand, Nawalax Thongjub, Lecturer, Thammasat University, Thailand & Gawkij Teeramoke, Chulalongkorn University, Thailand. Simulation of Extrudate for Wet Powder Masses in Pharmaceutical Process.
2. Binnur Sagbas, Assistant Professor, Yildiz Technical University, Turkey. Additive Manufacturing of Biomedical Implants.

16:30-18:30 Session V (Room B-10th Floor): *A Symposium on The Future Developments and Prospects of Engineering and Science Education & Research in a Global World I*

Chair: Nikos Mourtos, Head, Mechanical Engineering Unit, ATINER & Professor, San Jose State University, USA.

1. Bala Maheswaran, Professor, Northeastern University, USA. Engineering Education via Innovations and Inventions (E2 via I2).
2. Itzhak Orion, Head of the Nuclear Engineering Department, Ben-Gurion University of the Negev, Israel. Nuclear Science Research and Education in Israel.
3. Jin He, Professor, Peking University, Shenzhen SOC Key Laboratory, China. New Teaching Technique and Method Function in the Engineering and Science Education and Research.
4. Haiduke Sarafian, Professor, The Pennsylvania State University, USA. The Research Aspect of College Education.
5. Thomas J. J. Mueller, Professor, University of Dusseldorf, Germany. Life Science – Society.

For details on the discussion please click here.

21:00-23:00 The Pragmatic Symposium of the Conference as Organized in Ancient Athens with Dialogues, Food, Wine, Music and Dancing but fine tuned to Synchronous Ethics

Tuesday 18 July 2017

07:30-10:30 Session VI: An Educational Urban Walk in Modern and Ancient Athens

Chair: Gregory Katsas, Vice President of Academic Affairs, ATINER & Associate Professor, The American College of Greece-Deree College, Greece.

Group Discussion on Ancient and Modern Athens.
Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle)

11:00-12:30 Session VII (Room A-10th Floor): Sensors and Laplacian

Chair: Lluis Jofre, Professor, Polytechnic University of Catalonia (UPC), Spain.

1. Jin He, Professor, Peking University, Shenzhen SOC Key Laboratory, China, Guoqin Hu, Peking University, Shenzhen SOC Key Laboratory, China, Bin Xie, Peking University, Shenzhen SOC Key Laboratory, China, Guangjin Ma, Peking University, Shenzhen SOC Key Laboratory, China & Xiaomeng He, Peking University, Shenzhen SOC Key Laboratory, China. Study on CMOS Image Sensor Detection of DNA Based on Self-assembled Nano-metallic Particles.
2. Roger Nakad, Assistant Professor, Notre Dame University, Lebanon. Eigenvalue Estimate for the basic Laplacian on Manifolds with Foliated Boundary.

12:30-14:00 Session VIII (Room A-10th Floor): Education

Chair: Klaus Wuersig, Associate Professor, University of Pittsburgh at Bradford, USA.

1. Lluis Jofre, Professor, Polytechnic University of Catalonia (UPC), Spain. Engineering Education. Technological and Social Leading.
2. Daniel Conway, Professor, Texas A&M University, USA & Claire Katz, Professor, Texas A&M University, USA. The Importance of Philosophy for Pre-College STEAM Education.
3. Scott Grenquist, Associate Professor, Wentworth Institute of Technology, USA. A Novel Method of Teaching a Capstone Final-year Design Course in Electrical Engineering over a Two-Semester Interval.

14:00-15:00 Lunch

15:00-16:30 Session IX (Room B-10th Floor): Special Topics

Chair: Patrick Weidman, Professor Emeritus, University of Colorado, USA.

1. Malgorzata Karczmarzyk, Professor, University of Gdansk, Poland & Grażyna Penkowska, Professor, University of Gdansk, Poland. Painting Artist in the Eyes of Children - Semiotic Analysis of the Meanings about Artists Constructed by the Children.
2. Klaus Wuersig, Associate Professor, University of Pittsburgh at Bradford, USA. MatLab, a very Potent Tool to Solve many Electrical Engineering Problems.

16:30-18:30 Session X (Room B-10th Floor): *A Symposium on The Future Developments and Prospects of Engineering and Science Education & Research in a Global World II*

Chair: Bala Maheswaran, Professor, Northeastern University, USA.

1. Nikos Mourtos, Professor, San Jose State University, USA. Teaching & Learning Engineering in the 21st Century: Challenges and Opportunities.
2. Lluis Jofre, Professor, Polytechnic University of Catalonia (UPC), Spain. Catalonia Engineering and Science Educations and Research Trends in the European Context.
3. Dong-Wook Jerng, Professor, Chung-Ang University, South Korea. Some Thoughts for Future Direction of Engineering/Science Education with Insights from a K-POP Story of BTS.
4. Isai Urasa, Professor, Hampton University, USA. International Higher Education: A Vehicle for Global Cooperation and Development in Science and Engineering.
5. Santhi Sambamoorthy, Associate Professor, Bharathidasan University, India. Creative and Inimitable Role Played by Indian Universities in Science, Engineering and Research in a Global World.
6. Ethel Petrou, Professor and Chair, Department of Physics, Erie Community College-South, State University of New York, USA. Emerging trends in New York State Community Colleges-SUNY.

For details on the discussion please click here.

21:00- 22:30 Dinner

Wednesday 19 July 2017
Educational Island Tour or Mycenae and Epidaurus Visit

Thursday 20 July 2017
Delphi Visit

Daniel Conway
Professor, Texas A&M University, USA
&
Claire Katz
Professor, Texas A&M University, USA

The Importance of Philosophy for Pre-College STEAM Education

Several recent studies have confirmed the enduring, positive effects of the **Philosophy for Children** (P4C) curriculum. In particular, these studies show that engaging in philosophical dialogue for approximately one hour a week for twenty-two weeks produces statistically significant increases in the cognitive, math, and reasoning abilities of the participating children. Furthermore, the P4C curriculum has proven effective in promoting civil dialogue, non-violent approaches to conflict resolution, and respect for ethnic, cultural, and religious differences. At the University of Hawai'i, for example, the P4C program has attracted the support of patrons, legislators, and school officials, who have joined forces to implement the curriculum in several of the (formerly troubled) public schools in Honolulu. What they have found is that the P4C curriculum is unusually successful in promoting the habits and practices associated with peaceful co-existence within an increasingly diverse and globalized society. Indeed, they credit the implementation of the P4C curriculum with reduced rates of truancy, absenteeism, and recidivism, as well as a heightened concern for the health of the body politic.

In this presentation, we explain how a P4C program for pre-college students can have a similarly positive impact on students and instructors alike. What is perhaps most interesting about our findings is that the positive impact of philosophy for pre-college students extends not simply across the disciplines of the liberal arts and humanities, but also across the full range of STEAM disciplines.

In June of 2016, Texas A&M University hosted its inaugural P4C camp for teens the week-long curriculum with three aims in mind: to introduce pre-college students to philosophical

We designed thinking and dialogue; to develop an intellectual community among the campers; and to provide a space in which young people could engage as equal partners in a series of spirited philosophical discussions.

Drawing chiefly from our local community, we enrolled a diverse mix of forty-six campers, evenly divided between high school and

middle school students, divided equally in each age group between males and females. Reflecting the demographics of the community, roughly a third identified as non-white, while the rest identified as white/non-Hispanic. Half of the campers— regardless of ethnicity or gender—identified as academically inclined toward the STEM fields.

We organized the week around themes that we believed would be of particular interest to pre-college students, while also providing a broad, historical introduction to the discipline of philosophy.

Beginning each day with a poignant reading from Plato, we engaged the campers in lively discussions about the history of these idea. The campers were able to connect Plato's questions from 2500 years ago to difficult and often painful social problems, such as police brutality, gender socialization, state- sponsored surveillance, and income inequality.

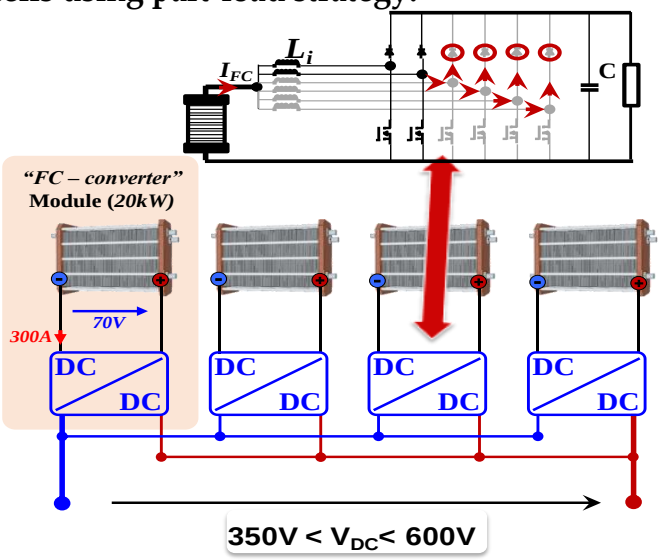
Follow-up testimonials from students and parents were overwhelmingly positive. We expect a significant percentage of returning campers for the 2017 iteration of the camp.

Alexandre De Bernardinis
Research Scientist, IFSTTAR, France

High Efficiency Silicon Carbide-based Converters for Fuel Cells and Flywheel Energy Systems

Wide band-gap semiconductors, and in particular Silicon carbide (SiC) ones, are nowadays becoming more and more used in electrical and energetic power applications. Their advantages, in terms of high frequency, high working temperature, and low dynamic losses lead to simplified cooling systems avoiding the use of complex water circuits, and compact design for the power converter. This contribution will focus on the use of a new-market Silicon carbide technology for the design of DC/DC multi-phase interleaved converter for Fuel cell application, and DC/AC inverter topology for the supply of a flywheel system for electric vehicle (EV) recharging. Potentialities of the SiC semiconductor components will be exposed in particular linked with high switching frequencies, managed junction temperatures, and efficiencies. Design considerations with control strategies (like for example the part-load methodology), driver card sizing, will be presented for both applications: Fuel cells and Flywheel, in order to have a high mass/volume density, and also fault –tolerant architecture for the interface converter.

SiC interleaved DC/DC converter for (*n x 20kW*), *350V up to 600V*, power Fuel cells using part-load strategy:



CREE (*Wolfspeed*©) SiC-based half-bridge with driver card under test for 60kW DC/AC flywheel inverter.

Silvia-Maria Diga
Professor, University of Craiova, Romania
Leonardo-Geo Manescu
Professor, University of Craiova, Romania
Adelaida-Mihaela Duinea
Lecturer, University of Craiova, Romania
&
Nicolae Diga
Design Engineer, Electroputere S.A. Craiova, Romania

Considerations on the Experimental Verifications of the Numerical Model of a Permanent Magnet Synchronous Motor Mounted in the Wheel of an Electric Bicycle

The authors studied the numerical models using 2D and 3D methods of finite element and they made numerical simulations for the original configuration of a permanent magnet synchronous motor used to drive an electric bicycle by using the specialized softwares "ANSYS Electromagnetics Low Frequency" (Maxwell 2D/3D, RMxprt) - products of the ANSYS Inc. Company.

In this paper are presented the results of the experimental verifications of the machine in a motor regime. In order to perform experimental verifications of the numerical model as a motor, was achieved a laboratory montage to allow measuring all the required parameters, namely: the developed torque, the current absorbed by the motor per each phase, the input voltage and current of the controller, the studied motor speed. All of these measurements were made at different speeds.

Then were studied comparatively some operating characteristics obtained by computation and by experimental way respectively, such as: the mechanical characteristic, electromagnetic torque = f (speed), $M = f(n)$, for $U = U_N$ and a certain value of the transducer position angle β ($\beta = 90^0$); the characteristic useful torque = f (current), $M = f(I)$; the characteristic stator current = f (speed), $I_f = f(n)$.

The authors also present an algorithm of construction by computation of the mechanical characteristic $M = f(n)$, for $U = U_N$ and a comparison between the mechanical characteristics obtained by computation, simulation and measurement in a permanent regime.

Azeddine Draou
Professor, Islamic University of Madinah, Saudi Arabia

Performance Analysis of Photo Voltaic (PV) Panel Emulator Connected to the Grid System

Recently, photovoltaic panels {PV) have become one of the main Distributed Energy Resources (DERs) in the world of renewable power. Such a panel gives DC power which can be directly used in some DC power application. In this paper, we will deal with the modeling and control of a proposed PV panel system comprising an inverter and an induction motor based on photovoltaic system. At first, the modeling and control of a standalone photovoltaic pumping system with integrated maximum power point tracking (MPPT) to reach an optimum power transfer will be addressed. The system performance is measured in terms of the efficiency of the MPPT controller and flexibility in the solar photovoltaic operation. Moreover, we will present a comparative study between two maximum power point tracking methods which are the perturb-and-observe PO method and incremental conductance method. The feature of the proposed algorithm will be supported by theoretical analysis and Matlab-Simulink simulation results.

Yves Gagnon
Professor, University of Moncton, Canada
Jompob Waewsak
Thaksin University, Thailand
Chana Chancham
Thaksin University, Thailand
&
Somphol Chiwamongkhonkarn
Thaksin University, Thailand

On the Wind Resource Assessment of Thailand

Situated in South East Asia, Thailand has engaged in public policies to increase the penetration of renewable energy in the electricity portfolio of the country. Under the recent Alternative Energy Development Plan (AEDP), the Ministry of Energy has targeted wind power generation at 3,000 MW by the year 2036. This paper presents an overview of the wind resource assessment for electricity generation in Thailand. The wind resource is obtained using mesoscale (Mesoscale Compressible Community (MC2) and Weather Research and Forecasting (WRF)) and microscale (WAsP and CFD models) wind resource modeling, long-term reanalysis climatic data (NCEP/NCAR and MERRA) and a series of met towers, ranging from 40 m to 120 m in height, distributed throughout the country. Using validated wind resource maps, the technical power potentials are evaluated in the most promising zones, notably in the Southern part of the country. Economic assessments are performed, while estimates of the reductions in CO_2 emissions by installing wind power plants rather than fossil fuel based power plants are evaluated. Specific applications, for both onshore and offshore sites, are presented and analysed.

Muhammad Arslan Gondal
Electrical Engineer, Fatima Fertilizer Co. Ltd., Mukhtargarh, Sadiqabad, Pakistan

Implementation of 86G1 (Generator Lock-out) and 86G2 (Turbine Lock-out) for Steam Turbine Generator by using microprocessor based relay, Model: Siprotec 7UM62 (Make: SIEMENS)

Starting time of turbine is far greater than starting & synchronizing time of a generator. Previously, whenever a fault occurred, both turbine and generator used to trip, no matter what the issue was. In order to reduce the production loss and down time without sacrificing reliability and mechanical integrity, we implemented 86G1 and 86G2 in our STG to trip the generator and turbine only when needed.

A lock-out relay (86) is a device that is designed to inhibit the operation of a unit/machine until the cause of the trip is determined, understood & rectified, and then it has to be manually reset in order to allow a re-start.

86G1 lock-out relay is a device that is typically actuated by several protection functions inside one protection relay, multiple protection relays or AVR which can affect the operation of the generator.

86G2 lock-out relay is a device that is typically actuated by several protection functions inside one protection relay, multiple protection relays or AVR which can affect the operation of the generator & turbine.

The immediate objective of this research project would be to identify and determine the protection features which can affect the operation of generator only and those features which can affect the operation of both generator and turbine.

Another important objective of this research project is to implement 86G1 & 86G2 for the protection of Generator & Turbine respectively by using a microprocessor based relay. In this research project, we are using 7UM 62 Generator Protection Relay which includes all the protection functions in one-unit. Keeping in view the identified protection functions which can affect the operation of generator, an output contact of relay is latched to operate 86G1 which also sends a tripping signal to generator. Similarly another output contact of relay is latched to operate 86G2 for those identified protection functions which can affect the operation of turbine and this in turn sends a tripping command to generator & turbine.

In the end, tripping matrix will be discussed which will help to implement this feature in all turbine driven generators using any type of microprocessor based protection relay.

Implementation of 86G1 & 86G2 has not only reduced the downtime and power outage duration but also made it easier for us to identify the root cause of trippings.

Scott Grenquist
Associate Professor, Wentworth Institute of Technology, USA

A Novel Method of Teaching a Capstone Final-year Design Course in Electrical Engineering over a Two-Semester Interval

A capstone final-year student project design course is common to most engineering curriculum at institutions of higher learning throughout the United States. It was decided to expand the customary one-semester final-year student project design course into a two-semester student project design course in order to enable the course sequence to include more topics to be studied in the area of patents, patent prior-art searches and engineering economics.

The first semester of the design course sequence includes many standard final-year student project design topics, such as: 1) An initial Project Development Proposal Stage (including a background history of the intended project design, an estimated cost breakdown of the project, and a detailed outline of the project's objectives scheduling), 2) An Engineering Design and Analysis Stage (including an engineering-based analysis of the original design, as well as detailed engineering drawings of the intended design), and 3) A Prototype Development Stage (including a completed prototype assessment, as well as manufacturing construction drawings and instructions). The second semester of the design course sequence includes newer, more innovative topical areas, which are not usually considered to be part of a final-year capstone student project design course.

Similar to the arrangement of the first semester design course, the second semester course is broken into three separate stages. The first of these stages examines the engineering economics involved in the production and sale of 10,000 of each of the design groups' products. This stage concentrates on teaching the students the economics of production, including the creation of a business plan, facilities planning, tax and government regulation requirements and labor relations. The second stage of instruction is focused on an introduction of the patenting process, which is manifested by having the students initiate a thorough prior-art search of the design project that they are completing to ascertain the product's novelty and unique qualities. The third stage of the instruction in the second semester design course is the actual completion of a patent application, including all of the claims of uniqueness that their product contains.

Overall, the expanded instruction in the second semester, which includes the introduction of engineering economics, prior art search techniques and patent application requirements (especially in the area of patent claims strategy) all assist in strengthening and broadening the students' experience throughout the student design process. The addition of the second semester has been well-received by the students. Experts in the patent application process are also brought in to provide guest lectures on prior art searches, claims design and patent defense.

Jin He
Professor, Peking University, Shenzhen SOC Key Laboratory, China
Guoqin Hu
Peking University, Shenzhen SOC Key Laboratory, China
Bin Xie
Peking University, Shenzhen SOC Key Laboratory, China
Guangjin Ma
Peking University, Shenzhen SOC Key Laboratory, China
&
Xiaomeng He
Peking University, Shenzhen SOC Key Laboratory, China

Study on CMOS Image Sensor Detection of DNA Based on Self-assembled Nano-metallic Particles

This paper reports a study of the CMOS image sensor detection of the DNA based on the self-assembled nano-metallic particles, which are selectively deposited on the surface of passive image sensor. The nano-metallic particles block the optical radiation in the visible spectrum of ordinary light source effectively. When such a technical method is applied for the DNA detection, it eliminates the requirement of special UV light sources in the most popular fluorescence based detection method. The DNA detection methodology has been tested on a CMOS sensor chip fabricated using a standard 0.5mm CMOS process. It was demonstrated that the approach is highly selective to detect even signal-base mismatched DNA targets with extremely low concentration DNA samples down to 10pM under ordinary light source.

Dong-Wook Jerng
Professor, Chung-Ang University, South Korea
&
Jung-jin Bang
Graduate Student, Chung-Ang University, South Korea

Containment Cooling Methods for Safety Enhancement of Nuclear Power Plants

The essential part of the nuclear power plant design is to ensure safety under any accident condition including severe accidents caused by whole loss of eletric power to operate active safety systems. Especially, ensuring the integrity of the containment of nuclear power plants is of utmost importance as it is the last barrier to prevent the radioactive release out of the reactor systems. During the hypothetical nuclear power plant accidents such as large break loss-of-coolant accidents, the high pressure and high temperature coolant which is water in the reactor systems pours to the containment atmosphere, resulting in rapid pressure and temperature spike and it continuously increases due to the decay of nuclear fission fragments. The primary means to control the contanment pressure and temperature is the containment spray system. However, this system relys on the electric power to pump the water to the spray nozzle located at the dome region of the containment. For such accidents as Fukushima Dai-ichi that happended in March 11, 2011, therefore, the containmnent spray system cannot be available if all the electric power is failed. To cope with such situations, we propose a passive type containment cooling system relying only on the gravitional force to supply cooling water to the heat exchanger installed inside of the containment. The supplied water takes heat from the containmnet atmosphere and then returns back to the water resorvoir located at the outside of the containment on a hihger level than the heat exchanger. All the water and water-vapor mixture flow is maintained by natural circulation between the inside heat exchanger and outside water tank.

To design such a passive cooling system, we found that the size of water reservoir, effective heat transfer area of the heat exchanger, and system intiation time. To quatitatively analyze the impavt of these design parameters, we set up a passive containment cooling system model using the GOTHIC computer code. The GOTHIC code is similar to the computaional flud dynamic code in view of mesh generation in 3-dimensional way, but different as it solves the fluid conditions using lumpled parameters averaged over the computational domain, i.e.,

mesh. According to the analyses presented in the paper, the smaller the water reservoir volume, the higher peak pressure and temperature at the intial phase of the accidents. Howerver, due to the faster boiling time which resulted in the better heat transfer inside of the heat exchanger, the containmnet pressure and temperature was found to be arrestable. The increase of heat transfer area of the heat exchaner definitely helps reduce the pressure and temperature hike. However, in the long term cooling phase after initial spike, the effectiveness of the heat transfer area increase was found to be diminished. The passive cooling initiation time which is determined by the plant operator or automatic signal affects the coolimng performance in short range of time, i.e., within one hour after the accidents. In conclusions, we will also discuss about other parameters that may affect the performace of passive system to cool the nuclear power plant containment.

Lluis Jofre
Professor, Polytechnic University of Catalonia (UPC), Spain

Engineering Education: Technological and Social Leading

Actual society is becoming more and more demanding both from the socioeconomic perspective and in terms of quality of life. Engineers are quite well educated in terms of general basic scientific and technological knowledge to contribute with optimized technical solutions to the different social challenges. To afford these social challenges different socioeconomical approaches are first considered where the technical options are mainly considered at the end of the process through a limited analysis.

The increasing scientific and technical complexity of the actual challenges would need instead the participation of our engineers and scientists from the very initial moment, we need to educate professional able not just to contribute with potential solutions but also being able to drive the socioeconomic debate from the initial moments. To be able to conduct this process we need to balance their actual scientific and technological capabilities with a set of transversal skills that may let them to be in the center of the process from the beginning of the requirement definition to the end of the socioeconomic balance.

In this paper we will review the different transversal and sectorial skills that the engineers should acquire and the educational solution we have build-up, in terms of educational nanopills, into a Telecommunication Engineering School combining both socioeconomic oriented contents and emerging market analysis. We explain how we have put a big emphasis into the digital dimension of the approach and will study how the students and professional market valued the approach.

Malgorzata Karczmarzyk
Professor, University of Gdansk, Poland
&
Grażyna Penkowska
Professor, University of Gdansk, Poland

Painting Artist in the Eyes of Children - Semiotic Analysis of the Meanings about Artists Constructed by the Children

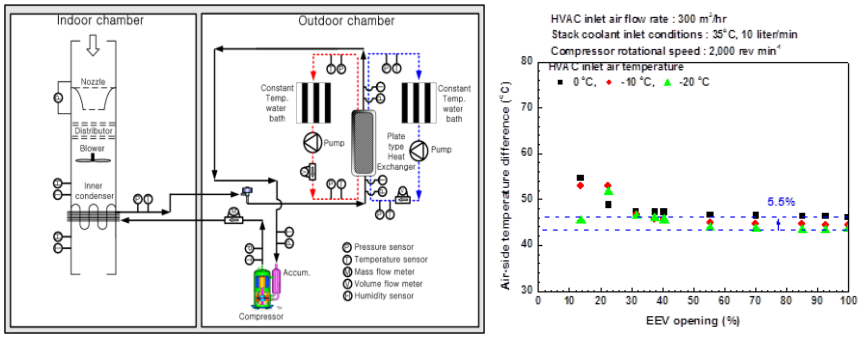
The problem of this study is the contemporary art and person, which is create this art – artist. I would like to focus of the meanings create by the children. Modern vision of the child, too often shows the artist in a distorted, incomplete or reduced way. This kind of naive knowledge, based on the patterns and stereotypes reduces the reflectivity of the child unnecessarily distorts his judgment and closes the road ahead to a full and critical participation in the world.

This text focuses on the theme of transmitting the meanings of the children on the perception by a person he is as an artist. The study comes on the analysis of interviews and children's drawings devoted centered around the perception of the children silhouette artist. But this is a stereotypical vision, and whether the artist is still associated with the person being beyond the pale of "normal" society, it turns out after the analysis of the research material gathered during the study.

Hoseong Lee
Senior Researcher, KATECH (Korea Automotive Technology Institute),
South Korea

Experimental Study on Heating Performance Characteristics of Coolant Heat-Sourced Heat Pump System in a Fuel Cell Electric Vehicle

The objective of this study was to investigate heating performance characteristics of coolant heat-sourced heat pump system in a fuel cell electric vehicle (FCEV). In order to analyze heating performance characteristics of heat pump system with plate type heat exchanger between coolant and a refrigerant, R-134a, each component in the heat pump system was installed and tested under various operating conditions, such as air inlet temperature of inner condenser and compressor speed. Heating performance of tested system was thought to be heating capacity and heating COP(Coefficient of Performance) after various experiments according to FCEV driving conditions. Because tested system had EXV(Electric expansion valve) to control the refrigerant mass flow rate, heating performance was analyzed along with EXV opening. When the air inlet temperature of inner condenser was varied from 0.0℃to –20.0℃heating capacity was found to be similar due to somewhat equal temperature difference between inlet and outlet of inner condenser. However, Heating COP increased until certain EXV opening, especially under 45.0%, because of decreasing power consumption. When the compressor speed was varied from 2,000 to 4,000 RPM, while heating capacity increased, Heating COP decreased by higher refrigerant mass flow rate. In the future works, additional performance characteristics would be analyzed according to stack coolant operating conditions.



Roger Nakad
Assistant Professor, Notre Dame University, Lebanon

Eigenvalue Estimate for the basic Laplacian on Manifolds with Foliated Boundary

In this talk, we give a sharp lower bound for the first eigenvalue of the basic Laplacian acting on basic 1-forms defined on a compact manifold whose boundary is endowed with a Riemannian flow. The limiting case gives rise to a particular geometry of the flow and the boundary. Namely, the flow is a local product and the boundary is η-umbilical. This allows to characterize the quotient of $\mathbb R \times B$ b y some group Γ as being the limiting manifold. Here B denotes the unit closed ball. Finally, we deduce several rigidity results describing the product as the boundary of a manifold.

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Simulation of Extrudate for Wet Powder Masses in Pharmaceutical Process

The simulation of extrusion spheronization in pharmaceutical industry is constructed to develop drug product. This process has four steps: mixing, extrusion, spheronization and drying/coating. The mixing combines water and powder together with high shear until it creates strong bonds to gather powder particles in liquid solution. The work is focused on extrusion of wet powder masses, that can classified as non-Newtonian fluid. The continuous creeping flow motion is explained in term of the Navier-Stokes equation and the rheology behavior is represented by Oldroyd-B constitutive model. The solution is solved with numerical scheme through the semi-implicit Taylor-Galerkin/pressure-correction finite element method in two-dimensional axisymmetric system under the conditions of isothermal, incompressible, laminar flows. In addition, the velocity gradient recovery and the streamline-upwind/Petrov-Galerkin schemes are forced to improve the converge solution. Finally, the swelling ratio of extruded product is presented to compare with the experiment results in drug manufactory.

Amos Olagunju
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A Call for Generalized Aggregation Functions for Modelling Complex Decisions with a Mixture Categorical and Continuous Data

Powerful aggregations functions are necessary in designing tree-based algorithms to support difficult decision making. Boolean operators are inadequate for modeling complicated decisions because they only support complete presence or absence types of decisions. For example, how will an engineer hiring personnel officer specify that a candidate who has earned the required critical engineering skill is the most preferred, next is the candidate with a related engineering skill, and last on list is the candidate who qualifies for skill training in engineering? Ideally, candidates with earned critical skills or related skills or require skill training should be assigned different scores.

Given two criteria, a conjunction operator is useful for specifying a preference for both, and a disjunction permits a preference for either of them to be indicated. To make effective intricate decisions from differently scaled categorical and continuous variables, the engineering personnel officers require more powerful operators to indicate strong conjunction, medium conjunction and conjunction, medium disjunction, and strong disjunction, and should be able to attach weights of importance to decision criteria. Engineering personnel should be able to evaluate the degree of fitness of all candidates in order to compute the global cost-benefit ratings for each candidate, This goal can be achieved by making use of cost and preference aggregation functions such as weighted arithmetic and geometric means, minimum and maximum functions. A logic equation is derived by combining two or more elementary criteria into one using Boolean operators. In the same way that Boolean interpretations can be attributed to logic equations derived from elementary criteria scores, Boolean interpretation can be given to aggregation functions.

The endpoints of the series of aggregation functions defined by the weighted power mean are the logical conjunction and disjunction. Practical applications of a logic scoring of preference and cost model used to evaluate and select job applicants are presented. The model supports the use of a mixture categorical and continuous data for decision making in real-life and artificial intelligence decision making with big data.

Binnur Sagbas
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Additive Manufacturing of Biomedical Implants

Additive Manufacturing (AM) has become one of the most popular technologies for a wide range of industrial area that contains bio medical implant manufacturing sector. It provides the opportunity to produce custom-based implants from 3D digital modeling of the desired prosthesis with expected properties such as surface finish, appearance and strength. Stereolithography, 3D plotting/direct ink writing, laser assisted bioprinting selective laser sintering (SLS), fused depositon modelling (FDM) and electron beam melting (EBM) are the most general technologies of AM processes. Although the research are going on vigorously, there are still some gaps about manufacturing implants in desired surface quality and dimensional accuracy.

In this study different types of AM methods, which used in biomedical implant manufacturing, are explained and application in this area are reviewed in terms of orthopedic prosthesis and dental implants. Moreover, recent trends and future directions about AM for manufacturing more precise and accurate biomedical implants are discussed.

Lidi Wang
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Photovoltaic Power Supply is used to improve the Voltage Level of Distribution Network and its ETAP Implementation

Due to the large power supply radius, heavy load distribution and the shortage of reactive power, the distribution network can easily be led to low voltage level on the terminal power line. How to use photovoltaic power station in achieving the improvement of the voltage level of terminal grid has important significance. Through the analysis of the influence factors of the low voltage of the distribution network, the simulation model of the terminal voltage of the distribution network is established by using the ETAP power system simulation software. The effect of different positions and the different rate of PV station on the power line is analyzed. Based on the analysis of a real 66KV power distribution line system, by both theoretical analysis and simulation system, it can be shown that on the cases of the PV power station capacity closing to the rated load capacity of the connected point, the connect point is nearer to the end of the power grid, or the longer of the power line, the more obvious of the effect of voltage improvement can be achieved. Photovoltaic power station is also suitable for voltage stability with the installation of energy storage equipment such as battery and heat-electrical combination. When the capacity of PV station is higher than the load demand of the connected point, the voltage will appear higher value. Sometimes it should be resolved by the utilization of the cool-heat-electrical combination system. The voltage of distribution power is sensitive to the load and PV station when the power network has relative small energy source. This study has theoretical and practical reference value for the research of the low voltage problem of distribution power network.

Klaus Wuersig
Associate Professor, University of Pittsburgh at Bradford, USA

MatLab, a very Potent Tool to solve many Electrical Engineering Problems

Students are introduced to MatLab in their second semester at the University. Many problems are solved in all areas of Engineering and Mathematics. The ease of writing a program and executing it makes MatLab a perfect contender for solving Electrical Engineering problems in the Sophomore year and beyond. Mesh and Nodal analysis in Linear Circuits I and II can be greatly simplified with just a few lines of code and answers are quickly obtained with left array and right array and left division. Especially in Linear Circuits II with complex number manipulation any order mesh or nodal problem is solved in a few minutes and the same ease of operation applies to LaPlace transform problems. In Design of Electronic circuits Diodes, MOSFETs and BJT's can be modeled and various outputs can be obtained for different inputs.

Qing Yang
Professor, University of Rhode Island, USA

Introducing DPU - Data-storage Processing Unit, Placing Intelligence in Storage

Cloud computing and big data applications require data storage systems that deliver high performance reliably and securely. The central piece, the brain, of a storage system is the central controller that manages the storage. However, all existing storage controllers have their limitations. As the data become larger, more storage technologies emerge, and applications spread wider, the existing controllers cannot keep pace with the rapid growth of big data.

We introduce and are currently building a storage controller with built in intelligence, referred to as DPU for Data-storage Processing Unit, to manage, control, analyze, and classify big data at the place where they are stored. The idea is to place sufficient intelligence closest to the storage devices that are experiencing revolutionary changes with the emergence of storage class memories such as flash, PCM, MRAM, Memristor and so forth. Machine learning logics are a major part of DPU that learns I/O behaviors inside the storage to optimize performance, reliability, and availability. Advanced security techniques are implemented inside a storage device. Deep learning techniques train and analyze big data inside a storage device and reinforcement learning optimizes storage hierarchy. Parallel and pipelining techniques are utilized to process stored data exploiting the inherent parallelism inside SSD. Our preliminary experiment data showed promising results that could potentially change the landscape of storage market.