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Third Annual International Conference on Engineering, 20-23 June 2016, Athens, Greece

Edited by Gregory T. Papanikos

THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

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(In Alphabetical Order by Author's Family name)

Preface

This abstract book includes all the abstracts of the papers presented at the *3th Annual International Conference on Engineering*, *20-23 June 2016*, organized by the Athens Institute for Education and Research. In total there were 46 papers and over 52 presenters, coming from 21 different countries (Albania, Algeria, Austria, Belgium, Brazil, Canada, France, Germany, India, Iran, Israel, Italy, Portugal, South Africa, South Korea, Russia, Taiwan, the Netherlands, Turkey, UK, and USA). The conference was organized into fourteenth sessions that included areas of Engineering. As it is the publication policy of the Institute, the papers presented in this conference will be considered for publication in one of the books and/or journals of ATINER.

The Institute 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 in Athens and exchange ideas on their research and consider the future developments of their fields of study. Our mission is to make ATHENS a place where academics and researchers from all over the world meet to discuss the developments of their discipline and present their work. To serve this purpose, conferences are organized along the lines of well established and well defined scientific disciplines. In addition, interdisciplinary conferences are also organized because they serve the mission statement of the Institute. Since 1995, ATINER has organized more than 150 international conferences and has published over 100 books. Academically, the Institute is organized into six research divisions and twenty-seven research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

I would like to thank all the participants, the members of the organizing and academic committee and most importantly the administration staff of ATINER for putting this conference together.

Gregory T. Papanikos
President

FINAL CONFERENCE PROGRAM
4th Annual International Conference on Engineering, 20-23 June 2016, Athens, Greece

Conference Venue: Titania Hotel, 52 Panepistimiou Street, 10678 Athens, Greece

Monday 20 June 2016
(all sessions include 10 minutes break)

08:00-08:30 Registration and Refreshments

:30-09:00 Welcome & Opening Address (ROOM B-Mezzanine Floor)

- Gregory T. Papanikos, President, ATINER.
- George Poulos, Vice-President of Research, ATINER & Emeritus Professor, University of South Africa, South Africa.

09:00-10:30 Session I (ROOM G-10th Floor): Engineering the Future I

Chair: Theodore Trafalis, Head, Industrial Engineering Research Unit, ATINER, Professor of Industrial and Systems Engineering & Director, Optimization & Intelligent Systems Laboratory, The University of Oklahoma, USA.

1. *Alex Papadopoulos, Associate Professor, DePaul University, USA. Dreams of Metalized Bodies, Smart Cities, and Evolving Artificial Sentiences: Cyberpunk Speculative Fiction as Herald of Humanity's Twilight.
2. Christianne Heselmans, Lecturer, Fontys Academy for Creative Industries, The Netherlands & Linda Hofman, Lecturer, Fontys Academy for Creative Industries, The Netherlands. Prototyping for a Sustainable Future to tackle the Grand Societal Challenges.
3. Frank Hartmann, Senior Researcher, Technical University of Applied Sciences Wildau, Germany, Markus Lahr, Research Associate, Technical University of Applied Sciences Wildau, Germany & Dana Mietzner, Professor, Technical University of Applied Sciences Wildau, Germany. Maker Movement as a Path for Digital Transformation? Current Understanding and How it may Change the Social and Economic Environment.

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Institutos Lactec/Universidade Federal do Paraná, Brazil, Evandro de Mesquita Silva, Technician, Institutos Lactec, Brazil & Emerson Alberti, Researcher, Centrais Elétricas do Rio Jordao, Brazil. The Use of 1% Nano-Fe_3O_4 and 1% Nano-TiO_2 as Partial Replacement of Cement to Enhance the Chemical Performance of Reinforced Concrete Structures.	

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Technische Hochschule Regensburg, Germany. Transformation of the Mechanical Properties of Fiber Reinforced Plastic Tubes from the Cartesian Coordinate System into the Cylindrical Coordinate System for the Application of Bending Models.	Germany & Ingo Ehrlich, Professor, Ostbayerische Technische Hochschule Regensburg, Germany. Specimen Preparation and Material Characterization of Filament Wound GFRP Composite Tubes. 4. Christian Pongratz, Master Student, Ostbayerische Technische Hochschule Regensburg, Germany, Matthias Schlamp, Ph.D. Student, Ostbayerische Technische Hochschule Regensburg, Germany, Bastian Jungbauer, Laboratory Engineer, Ostbayerische Technische Hochschule Regensburg, Germany & Ingo Ehrlich, Professor, Ostbayerische Technische Hochschule Regensburg, Germany. Detection of Delamination Damages in thin CFRP Composite Plates using Noncontact Measurement of Structural Behaviour. 5. Warda Daranfed, University of Constantine 1, Algeria. Role of Substrate Temperature on the Structural and Morphological Properties of Cu_2ZnSnS_4 Thin Films deposited by Ultrasonic Spray Pyrolysis. 6. *Zohra Ouchiha, Assistant Professor, USTHB, Algeria. Friction and Fast Transitions in Liquid Flow.

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Chair: Christian Schuh, Research Staff, Bayreuth University, Germany, Bernd Rosemann, Chief Executive Engineer, Bayreuth University, Germany

2. Avraham Shtub, Professor, Technion - Israel Institute of Technology, Israel. New Product Development - Experience from Distance Learning and Simulation-Based Training.
1. Jaejin Jang, Associate Professor, University of Wisconsin, Milwaukee, USA & Vijay Viswanathan, Research Associate, University of Wisconsin, Milwaukee, USA. Strategic Inventories under a Commitment Contract in a Supply Chain with Downstream Cournot Duopoly Competition.
2. Beyazit Ocaktan, Industrial Engineer, Balikesir University, Turkey, Aslan Deniz Karaoglan, Assistant Professor, Balikesir University, Turkey & Abdullah Cicibas, Industrial Engineer, BEST Transformers, Turkey. Flow Time and Due Date Estimation for Customer Orders According to Design Criteria: A Case Study of BEST Transformers Company.
3. Ali Namazian, University of Tehran, Iran & Siamak Haji Yakhchali, University of Tehran, Iran. Project Portfolio and Contractor Selection Problem Based on Project Scheduling.

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Chair: Lampros A. Pyrgiotis, Scholar & President, Greek Society of Regional Scientists, Greece.

1. Dr **Miryam Barad**, Professor, Tel Aviv University, Israel.
2. Dr **Rolf Steinbuch**, Professor, Reutlingen University, Germany
3. Dr **Venkatachalam Rapur**, Professor, National Institute of Technology, India.
4. Dr **Ru-Shi Liu**, Professor, National Taiwan University, Taiwan.
5. Dr **Mahmoud Aminlari**, Professor, Shiraz University, Iran.
6. Dr **Ingo Ehrlich**, Professor, Ostbayerische Technische Hochschule Regensburg, Germany.
7. Dr **Theodore Trafalis**, Head, Industrial Engineering Research Unit, ATINER, Professor of Industrial and Systems Engineering & Director, Optimization & Intelligent Systems Laboratory, The University of Oklahoma, USA.

21:00-23:00 Greek Night and Dinner (Details during registration)

Tuesday 21 June 2016

08:00-09:30 Session X (ROOM B- Mezzanine Floor): Production Flexibility

Chair: *Flavio Antonio Santos, Professor, CEFET-MG, Brazil & Danielle de Paula Alvim, Student, CEFET-MG, Brazil.

1. Rahul Patil, Assistant Professor, Shailesh J. Mehta School of Management, IIT Bombay, India. Pricing and Lead Time Competition in the Presence of Process Variability.
2. Hilal Atici, Research Assistant, Balikesir University, Turkey, Demet Gonen, Assistant Professor, Balikesir University, Turkey, Ali Oral, Associate Professor, Balikesir University, Turkey & Bünyamin Kaya, Nursan Wiring Harness R&D Center, Tavsanli – Kutahya, Turkey. Risk Assessment and Its Effects on Sustainability of Production.
3. Julian Popp, Research Assistant, University of Stuttgart, Germany, Christian Kuber, Ph.D. Student, University of Stuttgart, Germany & Karl-Heinz Wehking, Managing Director, University of Stuttgart, Germany. Innovative Production Logistics for a Convertible and Flexible Automotive Production.
4. Adrian Santangelo, Research Assistant, Leibniz Universität Hannover, Germany, Bernd - Arno Behrens, Professor, Leibniz Universität Hannover, Germany & Matthias Dannenberg, Ph.D. Student, Leibniz Universität Hannover, Germany. A New Method for a Production-Adjusted Design of Hot Die Forging Tools.

09:30-11:00 Session XI (ROOM B- Mezzanine Floor): The Future of Engineering Applications	09:30-11:00 Session XII (ROOM C- Mezzanine Floor): Sustainable Futures II
Chair: Avraham Shtub, Professor, Technion - Israel Institute of Technology, Israel.	**Chair:** Frank Hartmann, Senior Researcher, Technical University of Applied Sciences Wildau, Germany
1. *Flavio Antonio Santos, Professor, CEFET-MG, Brazil & Danielle de Paula Alvim, Student, CEFET-MG, Brazil. Verification of Continous Flight Auger Piles Ultimate Load Methods through Dinamic Load Testing. 2. Venkatachalam Rapur, Professor, National Institute of Technology, India, Anirudh R. Iyer, Postgraduate Student, National Institute of Technology, India & Bala Raju, Associate Professor, Madanapally Institute of Technology and Science, Madanapally, India. Dynamic Response of a Semi-Independently Suspended Automobile due to Periodic Pulses. 3. Christian Schuh, Research Staff, Bayreuth University, Germany, Bernd Rosemann, Chief Executive Engineer, Bayreuth University, Germany & Oliver Oechsle, Head of Department, Fraunhofer Project Group Process Innovation, Germany. Collaborative	1. Monica Veeger, Lecturer, Fontys Academy for Creative Industries, The Netherlands. Who wants to Live Forever? Mapping and Analysing Possible Future Consequences of Large Increases of Human Age. 2. Doris Wilhelmer, Engineer & Expert Advice, AIT Austrian Institute of Technology GmbH, Austria. Society in Need of Transformation. Citizen Foresight as a Method to Co-Create Urban Future.

Process Optimization - An Approach to Individual Packaging Hollows. 4. Christian Rohrandt, Ph.D. Student, University of Applied Sciences, Germany, Pay Giesselmann, MSc Student, University of Applied Sciences, Germany, Dr. Ulrich Jetzek, Professor, University of Applied Sciences, Germany & Dr. Franz-Josef Mueller, Head of Laboratory, Zentrum für Integrative Psychiatrie Kiel, Germany. Optimizing DNA-Alignment Algorithms for an Embedded SoC/FPGA Platform. 5. *Luis Evangelista, Associate Professor, University of Stavanger, Norway, Sara Almeida Santos, MSc, Universidade de Lisboa, Portugal, Pedro Raposeiro da Silva, Assistant Professor, Instituto Superior de Engenharia de Lisboa, Portugal & Jorge de Brito, Professor, Universidade de Lisboa, Portugal. Fresh State Properties of Self-Compacting Concrete with Recycled Aggregates.	

11:00-14:00 Educational and Cultural Urban Walk Around Modern and Ancient Athens (Details during registration)
14:00-15:00 Lunch

15:00-16:30 Session XIII (ROOM B- Mezzanine Floor): Engineering the Future II
Chair: : *Ingo Ehrlich, Professor, OTH Regensburg, Germany.

1. Ralf Breede, Professor, Technische Hochschule Köln, Germany & Daniel Liefertz, Scientific Assistant, Technische Hochschule Köln, Germany. Human-Robot-Collaboration: Flexibility in Production Environments.
2. Andrea Margini, Ph.D. Student, University of Modena and Reggio Emilia, Italy, Gaetano Cutrona, Ph.D. Student, University of Modena and Reggio Emilia, Italy & Cesare Fantuzzi, Professor, University of Modena and Reggio Emilia, Italy. Product Service System Design: How to Design Humans.

16:30-18:00 Session XIV (ROOM B- Mezzanine Floor): Special Issues

Chair: Lampros A. Pyrgiotis, Scholar & President, Greek Society of Regional Scientists, Greece.

1. *Maria Cristina Ramos de Carvalho, Professor, CEFET-MG, Brazil. University Campus Architectural / Urban Quality: Research Projects at CEFET-MG – Brazil.
2. Philippe Saey, Lecturer – Researcher, KU Leuven - FIIW - ESAT-ETC, Belgium, Frederic Depuydt, Researcher, KU Leuven - FIIW - ESAT-ETC, Belgium, Stijn Noppe, Researcher, KU Leuven - FIIW - ESAT-ETC, Belgium, Patrick Deconinck, ArcelorMittal Ghent, Belgium & Jos Knockaert, Ghent University, Belgium. Performance Evaluation of Fast Media Redundancy Protocols for Industrial Data Communication.
3. Albana Leti Tota, Lecturer, Polytechnic University of Tirana, Albania, Esmira Shehi, Polytechnic University of Tirana, Albania & Blerina Kolgjini, Polytechnic University of Tirana, Albania. 3D Konica Minolta Scans for Cataloguing Albanian Costume Collections.
4. Andrey Gavrikov, Senior Researcher, Kotel'nikov Institute of Radio Engineering and Electronics, Russia. Method of Measurement of Thermal Impedance of LED Assemblies.

21:00-22:30 Dinner (Details during registration)

Wednesday 22 June 2016
Cruise: (Details during registration)

Thursday 23 June 2016
Delphi Visit: (Details during registration)

Hilal Atici
Research Assistant, Balikesir University, Turkey
Demet Gonen
Assistant Professor, Balikesir University, Turkey
Ali Oral
Associate Professor, Balikesir University, Turkey
&
Bünyamin Kaya
Nursan Wiring Harness R&D Center, Tavsanli – Kutahya, Turkey

Risk Assessment and Its Effects on Sustainability of Production

The quality, the cost and the preferability of products that companies put on the market affect their competitiveness. This can be achieved by continuous improvement activities. By analyzing the current situation, possible risky situations that affect production processes and employees should be determined. Determined risks should be graded and classified. And then the necessary precautions should be taken. So the possible work accidents and occupational diseases can be decreased and even prevented. There are physical, psychological and financial adverse impacts of work accidents and occupational diseases on employees.

There are also negative effects of work accidents and occupational diseases on employer and company. In case of a disability or death as a result of an accident, these effects are psychological pressure, psycho-social effect of losing qualified personnel and loss of reputation and confidence. For the sustainability of companies, these negative influences should be reduced by giving weight to risk assessment activities.

According to the publications of International Labour Organization (ILO), total cost of work accidents and occupational diseases is 4% of the Gross Domestic Product (GDP) in less industrialized countries. This ratio is 1-3% for developed countries. In our country, according to the Turkish Statistical Institute data of 2015 GDP is 443 billion 189 million Turkish Liras. Considering the ILO criteria for Turkey, total cost of work accidents and occupational diseases is calculated as 17 billion Turkish Liras (4% of GDP). It is necessary to minimize accidents to provide the sustainability of production.

In this study, a risk assessment activity was conducted in a company that produces electrical automation panels. Risks were classified and appropriate precautions were proposed depending on their

importance. The purpose was to avoid risks for the work and employee, to reduce job and labour losses, to increase employee performance, to reduce costs by increasing production per unit of time and to ensure sustainable production.

Thomas Attard
Professor, The University of Alabama at Birmingham, USA
&
Zhenhua Shi
Ph.D. Student, The University of Alabama at Birmingham, USA

Application of an Advanced Expansive / Dissipative Composites in Bridge Connection Systems

Miryam Barad
Professor, Tel Aviv University, Israel

Petri Nets – An Adaptable Modeling Approach

Petri nets are an effective tool for modeling and analyzing asynchronous systems with concurrent and parallel activities. A Petri net models the static properties of a discrete event system concentrating on two basic concepts: events and conditions. In a system at a given time, certain conditions hold. For instance, a job is waiting to be processed and a machine is available. The fact that these conditions hold, may cause the occurrence of some events: starting the job processing which may change the state of the system, causing some of the previous conditions to cease holding (the job is no more waiting and the machine is no more available) and other conditions to begin to hold (the job is being processed). Most of the theoretical work on Petri nets is a formal definition of Petri nets structures, which consist of a set of places, representing conditions, a set of transitions, representing events, an input function and an output function. For practical purposes, a graphical representation is more useful. Two types of nodes portray places and transitions. A circle is a place and a bar is a transition.

There is no inherent measure of time in a classical (untimed) Petri net. Our approach considers Timed Petri Nets (TPN) by allowing delays of tokens in places, for representing duration of activities, such as processing or transferring.

The objective of this paper is to show the adaptability of this tool in a variety of circumstances and decision-making scenarios. The paper reviews several of my published examples of this method in different modeling contexts, e.g. evaluating system performance and verifying a simulation model of queueing networks. For instance, evaluation of system performance considers time of processing a part and duration of a machine repair following a failure occurence. The computerized simulation model of a queueing network at steady state is verified by comparing the long-term average utilization of a resource (simulation output) with the resource utilization, calculated through TPN equations.

Ralf Breede
Professor, Technische Hochschule Köln, Germany
&
Daniel Liefertz
Scientific Assistant, Technische Hochschule Köln, Germany

Human-Robot-Collaboration: Flexibility in Production Environments

Besides an increasing productivity a higher need of process flexibility is expected for future productions. Therefore combinations of manual processes performed by production workers together with robot based automations are foreseen to combine the advantages of partners, the worker and the robot. For that Human-Robot-Collaborations (HRC) different collaboration types between both partners can be defined, depending on the grade of possible contact between the worker and the robot. With respect to the operational safety the direct collaboration is the most complex application in industrial environments: the workers processes have to be performed within the same workspace and simultaneously to the automated movements of the robot. Based on this context an experimental environment with an industrial robot was set up to investigate the senseful combination of different sensor types and the integration of their signals into the robot control to realize the operational safety on one hand and the possibility to directly influence the automated movement of the robot by a human impact on the other hand. As a first result it is possible to work within the robots workspace simultaneously to the execution of the robot program in automatic mode without interrupting the process flow. Additionally the worker can directly influence the robots movement by pulling the tool center point out of the programmed path to flexible positions, which is realized as an overlayed movement over the defined path without interrupting the program flow. The prototype application is based on a combination of different sensor systems to monitor the workspace in different zones depending on their position in relation to the robot arm under safety aspects as well as to overlay the programmed robot path (e.g. camera system, force-torque-sensor). Within the next step the quality of 3D-simulations will be analysed to describe and predict the complex behaviour of HRC-environments.

Glen Bright
Professor, University of KwaZulu-Natal, South Africa
&
Anthony Walker
Lecturer, University of KwaZulu-Natal, South Africa

An Industrial Steady State Sequence Disorder Model for Flow Controlled Multi-Input Single-Output Queues in Manufacturing Systems

The challenge faced by manufactures, when producing custom products, is that each product needs exact components. This can cause work-in-process instability due to component matching constraints imposed on assembly cells. Clearing type flow control policies have been used extensively in mediating server access between multiple arrival processes. Although the stability and performance of clearing policies has been well formulated and studied in the literature, the growth in arrival to departure sequence disorder for each arriving job, across a serving resource, is still an area for further analysis.

In this paper a closed form industrial model has been formulated that characterizes arrival-to-departure sequence disorder through stable manufacturing systems under clearing type flow control policy. Specifically addressed are the effects of sequence disorder imposed on a downstream assembly cell in terms of work-in-process instability induced through component matching constraints. Results from a simulated manufacturing system show that steady state average sequence disorder in parallel upstream processing cells can be balanced in order to decrease downstream assembly system instability. Simulation results also show that the closed form model accurately describes the growth and limiting behavior of average sequence disorder between parts arriving and departing from a manufacturing system flow controlled via clearing policy.

Yeora Chae
Senior Researcher, Korea Environment Institute, South Korea

Development of Socio-Economic Scenarios for Climate Change Policy Analysis in Korea

This study developed socio-economic scenarios for climate change policy analysis in Korea. We developed 3 scenarios: SSP1 (low carbon adaptation ready society), SSP2 (Business As Usual Society), and SSP3 (High carbon adaptation not ready society) for demography, economy, land use, and energy. Proxies are selected to represent future conditions for each sector considering data availability demand for potential scenario users. Spatial scale of the scenarios varies depending on proxies. We developed scenarios for 2010, 2020, 2030, 2040, 2050, 2075 and 2100. These scenarios could be used for climate change vulnerability assessment and climate change policy analysis in Koreas.

Tommaso Coppola
Associate Professor, University of Naples, Italy

Economic and Environmental Analysis Relates to Ships and Shore-Side Power

Economic globalization, the rapid growth of international trade and maritime operation played an increasingly significant role in providing international cargo and passenger transportation. Consequently, seaports over the world are suffering from the problem of consumption and exhaust gases coming from ships during their stopover in harbors. Ships at berth generate electricity by means of their auxiliary engines, and emit air pollutants and noise. As a result, ports become an important and growing source of pollution and can create significant risks for the health of nearby communities. Costs involved in the shore-side power program can vary widely among ports. In this paper economic and environmental analysis related to ships, shore-side power has been studied. Additionally, the practicability, costs and benefits of switching from onboard ship auxiliary engines to shore-side power connection for a Ro/ro ship while berthed at Civitavecchia port have been investigated.

Mariana d'Orey Gaivao Portella Braganca
Researcher, Institutos Lactec, Brazil
Kleber Franke Portella
Researcher, Institutos Lactec, Brazil
Camila Marcal Gobi
Researcher, Institutos Lactec/Universidade Federal do Paraná, Brazil
Evandro de Mesquita Silva
Technician, Institutos Lactec, Brazil
&
Emerson Alberti
Researcher, Centrais Elétricas do Rio Jordao, Brazil

The Use of 1% Nano-Fe3O4 and 1% Nano-TiO2 as Partial Replacement of Cement to Enhance the Chemical Performance of Reinforced Concrete Structures

The buildings can be exposed to ionic agents present in environment (soil, water and air), such as chloride and sulfate, or even to those intern ones, added in the dosage process due the usage of some contaminated materials, such as alkalis and Sulphur minerals presented in some aggregates. The contaminants tend to react with the cement hydrates and could modify the concrete or mortar properties, dropping the materials lifetime. Especially in reinforced structures, these agents influence the double layer (concrete/bar) quality, promoting the bar corrosion due the ionic interaction or the modification of the environment alkalinity. Because of this, there is a necessity of stopping or avoiding these chemical reactions between the products of cement hydration and the aggressive agents. Currently, the most promising techniques involve the enhancement of concrete quality, especially from the permeability. Although, there are some advances in the nanoscale compounds studies, which have raised the development of more chemically resistant concretes and also special treatments for the material presented on structures in early stages of degradation. The present article aimed the development of a cause and effect study of distress mechanisms in concrete with and without additions of nano-Fe3O4 and nano-TiO2 in 1% partial cement replacement, used to enhance the material's durability. For that, the nanoscale ceramic oxides were characterized and added in concrete dosages, as partial replacement of cement. The obtained material was analyzed for physical and chemical measurements, to evaluate the structural performance and the durability characteristics under laboratory aggressive exposition. The obtained results showed there was

developed a new kind of concrete, with more homogeneous microstructure produced even in the early ages, by the reaction between the cement hydrates and the nano-materials. It improved the concretes mechanical and physicochemical properties, enabling the dosage of more durable materials.

Warda Daranfed
University of Constantine 1, Algeria

Role of Substrate Temperature on the Structural and Morphological Properties of Cu2ZnSnS4 Thin Films deposited by Ultrasonic Spray Pyrolysis

The influence of substrate temperature on the properties of Cu_2ZnSnS_4 thin films elaborated by spray ultrasonic method has been investigated. Samples are deposited at various substrate temperature ranged from 280 to 360°C about 45 min. the results of X-ray diffraction analyses indicated that Cu_2ZnSnS_4 films have nanocrystalline structure with (112) preferential orientation and reveals the formation of $ZnSnO_3$ and Cu_2ZnSnS_4 phases. The crystalline size is varied from 20 to 45 nm with increasing substrate temperature. The optical films characterization was carried out by the measurement of UV-visible transmission. The optical gap was deduced from the absorption spectra. The photoluminescence spectrum measured at 77 K showed a broad emission around 1.27 eV.

Jerry Davis
Associate Professor, Auburn University, USA
&
Robert E. Thomas
Emeritus Professor, Auburn University, USA

Smoke Hood Design Considerations for Stairwell Evacuation

Alexandre De Bernardinis
Researcher Scientist, IFSTTAR/SATIE TEMA, France

Potentialities of Wide-Band Gap Power Converters for Fuel Cell Hybrid System Design and Continuity of Service within Urban Microgrids

The proposed paper deals with potentialities of wide-band gap power converters for fuel cell hybrid system and continuity of service within urban electrical microgrids (buildings, electric vehicle recharging plants, railway stations). Fuel cell systems powered by hydrogen, or natural gas, are nowadays intended for becoming part of urban microgrids as micro cogeneration systems, or auxiliary power units. Most of the time, the fuel cell generators are coupled with electrochemical batteries, or supercapacitors to be able to deal with power transient requirements, and energy recovery phases. These fuel cell hybrid systems are usually interfaced by power converters in order to manage the delivered and transmitted energy. In case of failure of one subsystem (the fuel cell, or energy storage element), owing to electrical grid constraints, the whole microgrid should be affected and set out of work. The whole power system should be reliable to provide the necessary energy flows and exchanges within the microgrid. The interface power converters play therefore a key role. Indeed besides their function of adapting the different voltage levels, they are able to manage faults of the electrical sources, and enable to provide a continuity of service to the grid at a reduced power. Wide-band gap semiconductors, like Silicon carbide (SiC) ones are a solution for the power converter integration, compact design and performance of complex hybrid power systems. The potentialities of these innovative semiconductor components lead to reduce the cooling circuits, increase the converter's efficiency while dissipating very low losses, having fast transient responses, and adapt the converter temperature to the fuel cell and energy storage systems working ones.

The paper will outline and describe the potentialities of wide-band gap semiconductors in the design, efficiency and their ability to manage a fault of the fuel cell hybrid system and ensure a continuity of service to the microgrid. Power converter topologies based on Silicon carbide transistors will be presented, then active by-pass circuits to the fuel cells and energy storage systems will be detailed, as well as control strategies for enabling a graduated power management in case of fault of the fuel cell (or hybrid system) will be proposed. Wide-band gap

semiconductors properties will be dedicated to the global energetic improvement of the subsystems within the urban microgrid.

Luis Evangelista
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Fresh State Properties of Self-compacting Concrete with Recycled Aggregates

The growing environmental awareness of today's society causes greater concern with the high consumption of natural resources and the waste originated by the activities of the various industries. In particular, the construction industry consumes a large part of those resources and is, currently, the main responsible for the production of waste in Europe, whose dumping and treatment results in severe environmental and economic consequences.

Given that concrete is the most commonly used material in the construction activity, it becomes a significant portion of the construction and demolition waste.

In this context, the work developed intends to present a literature review on the incorporation of recycled aggregates (RA) in the production of self-compacting concrete (SCC).

For each concrete property, the following information was collected: type and physical characteristics of the materials used for SCC production; mix composition; tests results; discussion and conclusions on those tests.

A description of the experimental campaigns performed is first presented. Next, each fresh state property of the SCC is analysed based on the results obtained by the various authors.

The concrete's properties analysed in the fresh state are: slump-flow diameter and slump flow time, V-funnel time, Lbox, J-ring and sieve segregation.

The theme of SCC with RA is of great relevance to society since this increasingly requires the construction industry to adopt new processes that minimize the negative impacts on the environment.

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Method of Measurement of Thermal Impedance of LED Assemblies

Emission efficiency and degradation rate of the semiconductor LEDs depend heavily on the temperature of the crystal active area. Thermal impedance is the parameter determining the p-n junction temperature in a LED. This is very important for high power single LEDs and LED assemblies, which considerable dissipation power can cause crystal overheating followed by negative consequences.This article describes the method and device designed to measure thermal impedance of high power LED assemblies (such as COB (crystal-on-board) matrix). Developed method allows to determine values of thermal resistance of all components of COB LED constructions, which is very suitable for COB LED designers and manufacturers.

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Maker Movement as a Path for Digital Transformation? Current Understanding and how it may Change the Social and Economic Environment

Associated with the digital transformation of the society, the industry and service sector are facing new challenges. The future consequences and impact of the mega trend digitalisation are discussed extensively, dynamically and also controversially in the literature and amongst practitioners and different groups of stakeholders. The corresponding challenges, issues and consequences for future developments with regard to the reorganization of value creation networks, the "Industrial".

"Revolution" labelled as Industry 4.0, the flexibility in manufacturing or new forms of work are subject of foresight processes. At almost the same time, and embedded in the digital world a new phenomenon which is innovating the way we work, learn, produce and consume, the Maker Movement, has emerged and has been attracting increasingly attention since 2011. However, until now, has not yet been comprehensively explored what the Maker Movement as a possible structural shift characterizes, what their drivers are, to which extent the movement establishes itself as a new social practice or which kind of economic and social environment will be shaped by the Maker

Movement. Against this background, the authors draw on the theoretical approach of the multi-level perspective for the investigation of digital transformation processes. Using this transformation approach, we consider the Maker Movement as a specific transformation path, which takes place simultaneously with the digitization in industry. In this context the question has to be answered, which interfaces exist between the two development paths and whether or not they are complementary to each other. Confronted with diverse outcomes, faces and forms of the Maker Movement and its impact on society and economy, the authors assume that the media coverage can

serve as a valuable information source for explanation and a deeper understanding of its future development path. For this reason, they have carried out a category guided qualitative content analysis of the Maker Movement in US, British and German media in the period from 2002 to 2016. The basis of content analysis is constituted by 902 selected media posts, of which 199 were encoded using the software tool atlas.ti. Based on the media analysis we present the key characteristics of the Maker Movement, its routs, effects, linkages to digitalisation in industry and possible future perspectives with respect to society and economy.

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Product Development Process Requirements in non-Electrical Explosion Protection Require Innovations

Explosion protection is an important part of our every-day lives. In many process the materials used and the presence of oxygen can cause potentially explosive atmospheres to arise, in which the addition of an ignition source can cause a dangerous explosion. Various electrical and non-electrical explosion measures exist to reduce this hazard in the areas concerned.

The activities for developing and using these measures are supported by standards and directives. In particular, product development focuses on health and safety and freedom from hazards. To ensure this, defined tests must be performed by the test bodies named in the directives. The weakpoints of the product are pointed out. They can result due to defects in the design, lack of knowledge of explosion protection and procedures in production. The products must be optimised with the help of iterative processes during the product development phase; however, these result in increased work and effort. Each weakpoint discovered at a later date causes rising costs.

Present day product development is based on procedures described in the VDI Guidelines 2221 and 2222. In addition, design guidelines exist, which serve as orientation and recommendations for the design engineers. Basically, however, the specific explosion protection requirements are not taken into account and the current product development process cannot be optimised with regard to explosion protection.

In this context, non-electrical explosion protection requires particular attention. Compared to electrical explosion protection, this young field has only a small number of product development aids. For this reason the objective of this project is the adjustment of the design methodology, which is especially applicable to non-electrical explosion protection, in order to cut time and costs. Specific and innovative tools must be worked up, which represent aids for the activities in the

product development process. The aids must be developed on the basis of the relevant standards. To achieve these objectives the non-electrical explosion protection requirements in the product development process must be described clearly and transparently. As this step is a basis for further development of the product development process, we would like to present this topic at the 4th Annual International Conference on Industrial, Systems and Design Engineering.

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Prototyping for a Sustainable Future to tackle the Grand Societal Challenges

The Grand Societal Challenges (GSC), as formulated in the European Horizon 2020 program, require a different way of looking to the future in which there should be more room for sustainability in a broad sense (i.e. also taking into account societal issues) and more interactivity with a possible future. To meet these requirements a foresight model was designed based on the 'prototyping for a sustainable future'-model (Illstad and Wangel, 2015) and the value framework-model (Den Ouden, 2015).

In particular, the prototyping for a sustainable future'-framework has the added value of using the backcasting-method to ensure that the future has sufficient specificity to provide guidelines for how to deal with possible futures in the present. In addition, the value framework-model pays attention to different types of values (social, psychological, economical, and ecological) that are present on different societal levels (individual, organization, eco).

To develop and test the combined foresight model, a research project has been carried out in close cooperation with students. The foresight model consists of two phases. In the first phase a possible future is imagined in which one or more GSCs are tackled. The framework helps to see if it will be really a future perspective with added value to the different values and systems. In the second phase of the model the consequences in the present are being determined and possible solutions are created.

The framework aims to both converge (how does a possible future with one or more GSCs look like?) and diverge (which possible solutions could deal with that challenging future?). In addition, to make the solutions more specific concepts are developed that are relevant to the GSCs taken into account. In both phases the 'value framework'-model be able is used to asses that various values and societal levels are considered which means that various stakeholders participate in the concepting process. The first results and experiences with this foresight model are quite positive. Not only with regard to the quality of the

concepts themselves but students increase their future consciousness and realize that they can influence possible futures.

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An Experimental Investigation on Effect of Internally Cooled Cutting Tools in the Machining of Difficult-to-Cut Materials

This paper presents a cooling method to be used in metal cutting, based on a tool holder with a closed internal cooling system with cooling fluid circulating inside. Hence, a green cooling method that is efficient in removing heat from the cutting zone was developed. Nickel-based superalloys such as Waspaloy are difficult-to-cut materials used for engine components that call for considerable strength and corrosion resistance at high operating temperatures. For this study, a series of cutting trials were performed on Waspaloy AMS5708 superalloy samples. A CVD-coated CNMG 190604-IC907 carbide insert was used during the turning process. The results clearly showed that with the reduced cutting temperature of the internal cooling, it was possible to control the temperature and thus prevent reaching the critical cutting temperature during the turning process. The tool cooled from inside produced exhibited longer tool life.

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Strategic Inventories under a Commitment Contract in a Supply Chain with Downstream Cournot Duopoly Competition

Strategic Inventories are inventories held for purely strategic reasons by a firm in the absence of any the traditional reasons to hold inventory like economies of scale, demand uncertainty, seasonality, pipeline delays, etc. Recently, its role in a supply chain got more attention in the literature, especially where there are competitions among the entities in the supply chain. Anand et al. (2008) find that Strategic Inventories are relevant in a supply chain over multiple selling seasons and under a wide range of demand conditions when a supply chain has one manufacturer supplying a product to one downstream retailer and they compete for profit. They also find that a commitment contract, under which a manufacturer commits the wholesale prices of all periods at the beginning of the very first period, completely eliminates Strategic Inventory over two selling seasons. We study a similar supply chain, but with downstream retailer competition, i.e., there is a competing downstream of Cournot Duopoly retailers, instead of just a single retailer monopoly downstream. From a game theoretic analysis of the problem, we find that a commitment contract does not eliminate SI carriage like in the monopoly downstream case over two selling seasons.

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Specimen Preparation and Material Characterization of Filament Wound GFRP Composite Tubes

Filament wound composite structures are wildly used in the field of pressure vessels, tubes, pipelines or rocket cases. Due to manufacturing induced imperfections and a different layup sequence the mechanical behavior of these structures is typically different from those of flat laminated structures. However design and analysis issues require the same engineering data as used for laminated structures in general. Therefore, it has become necessary to establish an accompanying quality assurance procedure following the production process to identify the material properties of the manufactured tubes. Consequently there are two different approaches of determining Young's module and strengths of a filament wound laminate. Either specimens are taken directly out of the curved tube or standardized flat specimens are produced under differing production conditions. Both approaches entail disadvantages, whether in terms of geometry and load direction or quality and layup sequence.

This study presents the discrepancy in the determination of mechanical properties of a filament wound GFRP tube on curved respectively cylindrical specimens and flat specimens produced to meet the specifications of international standards. In order to receive material properties not only axial but also in tangential direction of the tubes the so-called split disc tensile test modeled after ASTM Standard D 2290 is used with tube segments.

Both procedures of specimen production and preparation are described in detail. Material properties such as the fiber volume and void content of the composite specimen are carried out and compared in order to consider the quality and production differences. Finally tensile tests are executed and the results are compared and discussed.

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The Future of Sustainable Water Resource Development and Management in South Africa

There are a wide range of issues that stem from the inadequate access to, and the unsustainable management of water resources, which can lead to ecological and human crises. With the increasing demand for clean water for drinking and sanitation, coupled with population growth, aging infrastructure, and climate change, many of the regions within South Africa face a complex set of threats when dealing with their water resources and the management thereof. If current trends in water management continue and government does not intervene with what has been an unequal society, even in terms of the division of water, it will continue to lose ground in its development and sustaining of water resources. "The objective of managing the quantity, quality and reliability of the nation's water resources is to achieve optimum, long-term, environmentally sustainable social and economic benefit for society from their use" - Principle 7 of the National Water Policy. The aim of the research was to determine water availability and usage in South Africa, based on data on water consumption and availability in a number of regions across the country, an extensive literature review was utilised to categorise the regions with specific characteristics from a hydrogeological point of view, and place these into distinct water 'zones'. The Causal Layered Analysis (CLA) future studies technique was utilized in investigating the way water has been managed and developed, and the strategies and worldviews that have had an influential role on the relationship between water and its use in South Africa. The 'Seven Outlying Socio-Economic and Hydrogeological Sustainable Development Zones' defined within the study, were then used to derive strategies for a positive outcome in water resource development and management in South Africa.

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3D Konica Minolta Scans for Cataloguing Albanian Costume Collections

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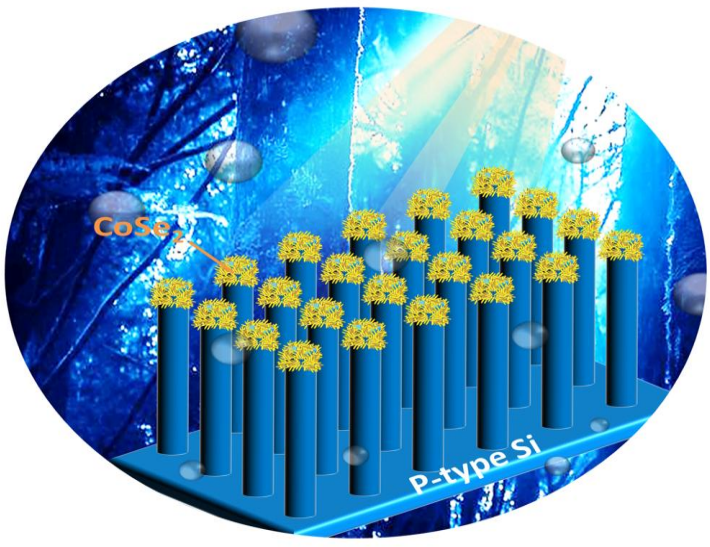
Engineered Heterostructure of Si and CoSe2 or CoS2: Promising Photocathodes Based on Nonnoble Metal Catalysts for Photoelectrochemical Hydrogen Evolution

Development of a solar water splitting device requires design of a low-cost, efficient, and non-noble metal compound as alternative to noble metals. Here we showed that $CoSe_2$ and CoS_2 can function as co-catalyst in phototoelectrochemical hydrogen production. We designed a heterostructure of p-Si and marcasite-type $CoSe_2$ and pyrite-type CoS_2 for solar-driven hydrogen production. $CoSe_2$ and CoS_2 successively coupled with p-Si can act as a superior photocathode in solar-driven water splitting reaction. Photocurrents up to 9 mA/cm2 were achieved at 0 V vs. reversible hydrogen electrode. Electrochemical impedance spectroscopy showed that the high photocurrents can be attributed to low charge transfer resistance between the Si and $CoSe_2$ and CoS_2 interfaces and that between the $CoSe_2$ and CoS_2 and electrolyte interfaces. Our results suggest that this $CoSe_2$ and CoS_2 is a promising alternative co-catalyst for hydrogen evolution.

Figure 1. *Heterostructure of Semi-Metallic CoSe2 Nanorods and p-Si MWs Behave as an Efficient Photocathode for Solar Driven Hydrogen Evolution Reaction*



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Product Service System Design: How to Design Humans

A three step methodology is proposed to support development teams in product-service system (PSS) development projects. The methodology specifically addresses the problem of designing humans as part of the system. The human presence is a matter of fact when it comes to PSSs. They are the soft system delivering the service part of the PSS, which is also the most value adding for stakeholders. Furthermore many manufacturing companies are moving towards the integration of products and services. Many structured approaches exist to support the design of software and tangible objects, i.e. the hard system. However there is a lack of guidance when it comes to the human presence design and integration with the hard system. The methodology aims at filling that gap. It was validated in a PSS development project within a company with a strong focus in product development. Hence it had to fit to an already in place product development framework. The findings were used to further refine the methodology. The methodology resulted to be fully applicable within that specific framework. However further validation runs are necessary to ensure its generality. The methodology will support the shift from pure manufacturer to product-service deliverer for those companies willing to change the rules of competition and to deliver more value to their customers.

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Conducting an Innovation/Issues Change Tracking and Forecasting Term Project in an Undergraduate Futures Studies Course

During the past two years, I have taught four sections of Introduction to Global Futures Studies, a new course that, at the end of 2013, I had proposed to teach at the Hankuk University of Foreign Studies (in both the Seoul and Global campuses). In all three sections I initiated an "Innovations/Issues Change Tracking and Forecasting Term Project" that had to be completed by the end of the semester. This group project (5-7 in a group) included individual reports and a "summary of results" presentation by each group. The report, as a group, was divided into three sections: (1) past changes, (2) present changes, and (3) forecasts of 3-5 scenarios.

First, from STEEP categories, each group brainstormed innovations or issues to consider for tracking changes through time. For past changes, one student would research and report about the origin of the innovation/issue within the time range of 5-25 years ago and the changes tracked until the year 2014. Then, regarding present time monitoring of impacts and changes to the chosen innovation/issue, another student in the group would track and report about changes during the year of 2014. Finally, for the forecasting stage, the other three to five students brainstormed and wrote 3-5 scenarios (one each) ranging from either 5, 10, 15, 20, or 25 years in the future (choosing ONE of those time frames for the forecast – not all), continuing to track anticipated changes (from STEEP categories) within the selected time frame as a basis for the scenarios. One scenario was a conservative, base-line scenario, one a "wild card" scenario, and the others alternative futures scenarios.

This paper will report about the stages of development, student experiences, and the results of this Introduction to Global Futures Studies term project, especially drawing from the project that is scheduled to be implemented in the course I am currently teaching this fall semester of 2015.

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Project Portfolio and Contractor Selection Problem Based on Project Scheduling

In this paper a new formulation of the project portfolio selection problem based on the project schedules have been proposed. The project portfolio selection models usually disregard the project scheduling, whereas is an element of the project selection process. On the other hand, except those cases which only one project is active in each period, the prioritization of the selected projects will not be optimal unless the scheduling of the projects is considered.

In this paper, we study a condition, in which between available projects a number of them should be selected and scheduled. The decision-makers must select and schedule a subset of the projects with respect to the constraints associated with contractor selection and the predecessor relationships between activities of the different projects. In other words, we investigate a project portfolio selection problem based on the schedule of the projects, so that the minimum expected profit will be met in the shortest possible time period. Finally, a linear programming model is developed for the problem, where the results indicated the validity of the presented model.

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Flow Time and Due Date Estimation for Customer Orders According to Design Criteria: A Case Study of BEST Transformers Company

In the electro-mechanics industry, the manufacturing is performed by project type production and most of the sales are performed by tender offers. Because of project based manufacturing, the most of the transformers are produced for the first time and the processing times for these orders are unknown. In this case it is important to estimate the cost of the customer order before the production at bidding stage for accurate price offer and win the tender. In this labor-intensive sector; accurate estimation of the labor cost has great importance to give realistic price offer. Therefore, it is important to estimate flow time and due date with a low variance. In this study, the manufacturing process of a transformer company is simulated by using ARENA software, and the technical specifications indicated in the customer orders are used as simulation inputs for the transformers to be produced for the first time.

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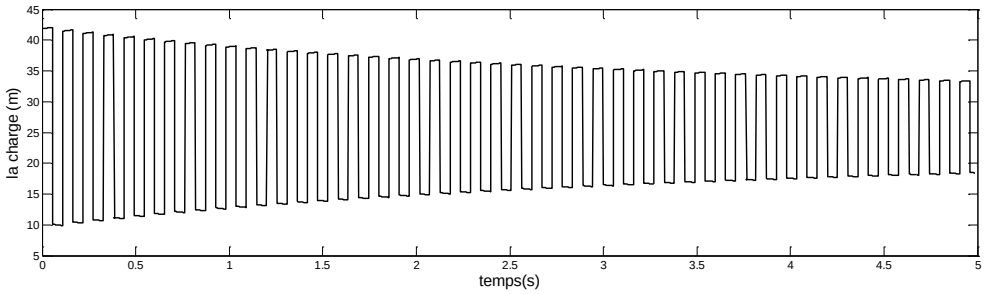
Friction and Fast Transitions in Liquid Flow

The occurrence of sound waves in the air, and the wave propagation in shallow water and the blood flow in arteries have interested many observers. However, prior to 1897 all these problems had not been strictly solved because of the lack of recognition of the importance of theory of elasticity, the lack of the means of calculation and of treatment of the partial differential equations. In 1897, Joukowsky published the fundamental concept of the theory of water hammer, taking into account the elasticity of the fluid and the material properties of the pipe.

The water hammer problem is usually illustrated experimentally by considering a conduit that is connected at one end to a large tank while its other end is controlled with a closure valve. The liquid water flow is disrupted by the sudden closure of a gate valve, resulting in a water hammer phenomenon. The shock occurs at the end valve and spreads, in forward and backward directions, along the line between the valve and the reservoir.

Computational modeling of the water hammer phenomenon is still not easy; however, accurate and less computationally burdensome methods are available at this time, including the method of characteristics (MOC), to handle the waving pressure. We apply the MOC technique to water hammer phenomenon in a pipeline. Particular attention is paid to the effect of friction, which is often neglected for simplification, or when compared to the dramatic effect of the pressure forces materialized by waves carrying the peaks of the pressure within the pipe. Our present study assesses the influence of friction on the flow behavior.



Piezometric load versus time at a downstream position.

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Dreams of Metalized Bodies, Smart Cities, and Evolving Artificial Sentiences: Cyberpunk Speculative Fiction as Herald of Humanity's Twilight

Speculative fiction filters and mirrors our anxieties: about death (and our yearning for immortality through technological means), about our desire for planetary communion with other beings (whilst fearing enslavement or annihilation), and about a dream of a life of plenty, free of the toil of work (though also fearing losing control to machines—and in the era of the singularity, possibly, to thinking machines). Among sub-genres of sci-fi, cyberpunk constructs literary visions—almost always dystopian—of the intersection of momentous transformations of our age: the accelerating development of IT; our ability to become trans-human or post-human, through bio-modifications; the decadence of the state paralleling the ascendancy of corporations as planetary and social regulators and paragons of society's hyper-commodification; the collapse of personal liberty and privacy through the proliferation of networks and surveillance; the collapse of the world of work (the hacker being the iconic denizen of the cyberpunk universe – not the *Google* software engineer), and, lastly, the emergence of rogue super-empowered individuals who pull the strings of dystopian, post-industrial societies for profit, revenge, or out of sheer boredom and malice. It is reasonable to link the birth of cyberpunk sci-fi with the emergence of neoliberalism in the last quarter of the 20th century. Among cyberpunk's pioneers, William Gibson, and his groundbreaking novel *Neuromancer*, crystalize both actual and speculative intersections of futurist technological innovation and an out-of-control global finance capitalism. Drawing on Gibson's worlds, I study cyberpunk's geographies and the "what if" of transhumanism and late-capitalist accumulation in the age of network ubiquity.

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Pricing and Lead Time Competition in the Presence of Process Variability

For make to order firms, tardiness penalties are typically very high. Hence, lead time quotation becomes an extremely important decision for such firms as shorter lead times can increase the tardiness costs while longer lead times can reduce the probability of winning customer orders. Earlier research on lead time quotation has offered useful insights regarding capacity and pricing decisions. However, because this work has used M/M/1 queuing system to model firm's operations, it has not been able to explicitly investigate in detail the influence of different types of demand and service process variability on lead time and pricing decisions and subsequently on profits. This prior work has also not studied the influence of variability in the presence of competition. So, we believe that it would be interesting to study the behavior of lead time and pricing policies of a high variability firm (like USPS) in the presence of low variability firm (like FEDEX) under different markets.

In this research, we consider two make to order firms that want to decide both price and lead time quotations to maximize profits in the presence of demand and service process variability. We use a G/G/1 queue to represent the firm's operations and a linear demand curve to model marketing characteristics.We use contraction mapping and super modular methods to prove the existence and uniqueness of Nash equilibrium. We then investigate the strategic response of firms having different processing variability via numerical experiments and show how the variability influences pricing and lead time decisions.

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Detection of Delamination Damages in thin CFRP Composite Plates using Noncontact Measurement of Structural Behaviour

Plate shaped composite structures are typically implemented in a variety of applications related to the aeronautics or automotive industry. Subjected to real environmental conditions, those structures may be burdened by impact loading. Low velocity impacts in particular are a high safety issue as they can cause barely visible or invisible damages inside the structure. The caused defects range from notches and cracks to delaminations underneath the surface. Their common consequence is a significant reduction of compression and fatigue strength. To determine the integrity of composite structures, different principles like permanent structural health monitoring or ultrasonic testing can be used. Because these methods are typically time consuming, a faster and more easily applied integral test method might offer advantages. Therefore a closer analysis of the vibrational behaviour of a composite plate seems reasonable as it possesses that property. Using the vibrational analysis approach, not only the response frequencies are considered, but also other modal properties, especially the modal damping. The lone measurement of response frequencies might proof an insufficient damage indication, as their frequency shift is subtle and strongly dependent on its present bearing. By using structural dynamics measurements and analysis, intact and by impact damaged plates are measured. For the contactless measurements of the vibrating specimen, a laser scanning vibrometer is used. The specimen plates are set in oscillation by acoustic excitation. The necessary bearing is realized in the style of a suspended, or more generalized, a free boundary condition. Thus minimizing any hampering of the evolving modes of vibration. The obtained results of the conducted measurement are compared and discussed.

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Innovative Production Logistics for a Convertible and Flexible Automotive Production

Today's automobile production features small batches due to a wide range of variants. In an extreme example only two of 1.1 million Mercedes A-Class were identical types [Schlott (2005)]. This leads to a situation in which there is no longer sufficient space available at the assembly lines in order to store and provide the required material in its variations. To solve this problem, many solutions have been brought up in the field of automotive production logistics, for example, the concept of JIS-delivery: Supermarkets store large amounts of materials and provide JIS-sets. The provision of JIS-carriers is very costly and allows little flexibility for short-term changes to the planned production process because the material orders are fix after the sets leave the supermarkets.

At the ARENA2036 research campus in Stuttgart (Germany) there is the idea to omit tact or fixed conveyors; instead the production of vehicles takes place on modular, convertible platforms which feature customizable routes through the production environment. Accordingly, the processes of logistics need to be adaptable. The logistics working group in ARENA2036 developed three new, flexible logistics concepts and tested them for feasibility within the scope of simulations using real production data. The concepts were defined as modules and the selection of the most appropriate module, regarding minimal costs, was done using product restrictions, such as component weight and size, variance, as well as installation quota.

The actual selection process takes place using three steps. Firstly product-related restrictions lead to the selection of potential logistics modules, which brings down the number of possible modules. In the second step, the number of modules is reduced further by allowing only reasonable module combinations to deliver the components at each station. In the last step the remaining module concepts are ranked based on total cost and the most economical is selected.

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University Campus Architectural / Urban Quality: Research Projects at CEFET-MG – Brazil

In Brazil, between 2002 and 2014, there was an increase in the number of undergraduate and graduate students of over 100%. Although higher-education institutions have experienced significant growth, the lack of technical standards is noticeable for planning, management and evaluation of its campus spaces. Technical diagnoses of university spaces and identification of urban and architectural influence on the quality of life of the academic community may support master-plan guidelines for the sustainable development of university campuses. One research project employing post-occupancy evaluation tools collected data on the users' and experts' perspective. Other project employed thermographic validation to point out possible causes related to the urban heat-island phenomenon by following mitigated systemized strategies. Data images were generated using a TD FLIR T300 camera. Another proposed a method of analyzing the wind behavior in a micro urban environment on the basis of geometric models and computational numerical simulations. It took into consideration that a numerical simulation technique applied to the study of natural ventilation effects provides ways to quantify and qualify the air flow around the buildings. These research projects developed by a research group at CEFET-MG are expected to generate evidence that may guide future expansions and renovations at universities campuses.

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Dynamic Response of a Semi-Independently Suspended Automobile due to Periodic Pulses

Suspension system of an automobile not only supports the body of the vehicle, engine and passengers but also absorbs shocks arising from the roughness of the road. Most of the present day cars are provided with independent suspension for the front wheels and conventional suspension for the rear wheels. Such a suspension system may be referred to as semi-independent suspension system. When the automobile is moving, the roughness of the road keeps giving excitations to the suspension system through tyres. The frequency of excitation is directly proportional to the velocity of the vehicle and inversely proportional to the distance between two undulations of the road. In this paper, it is attempted to study the behaviour of the system due to pulse inputs given by the roughness of the road.

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Optimizing DNA-Alignment Algorithms for an Embedded SoC/FPGA Platform

Massively parallel sequencing technologies – often referred to as next-generation sequencing (NGS) technologies - recently revolutionized the field of biomedicine. Questions in human development, disease and recovery, which seemed to be unresolvable a few years ago, can now be answered with widely available and affordable sequencing datasets. With a growing administration of these datasets, the computational challenges associated with processing of NGS data is increasingly a bottleneck limiting scientific progress.

To be able to process NGS datasets today at least a powerful desktop computer is needed. For processing more than a few samples, the researcher needs to have access to a computer cluster and storage systems.

Future use cases for NGS technologies may be even the use of sequencing in the field in humanitarian crises following armed conflicts, natural or technological disasters, for example to detect, identify and treat Ebola strains in a region where infrastructure resource such as electricity has completely broken down. In this situation, today the DNA sample needs to be taken to a place where the required infrastructure exists. As a consequence potentially lives saving measures get delayed.

As DNA analysis becomes a more and more commonly applied diagnostic method for diseases the demand for a field-deployable, portable and ideally hand-held analysis device is increasing. For enabling such a futuristic technology, far more efficient ways to align sequencing reads to a reference genome without the availability of large scale computer resources have to be developed. Consequently, the development of a hardware platform and optimization of the software running on it is the next step.

This hardware platform will incorporate a mobile processor system, presumably based on the ARM architecture, paired with an FPGA. This way the energy efficiency of an embedded mobile platform can be combined with the flexibility and computational performance of a programmable logic.

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Performance Evaluation of Fast Media Redundancy Protocols for Industrial Data Communication

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A New Method for a Production-Adjusted Design of Hot Die Forging Tools

Changing market situations and customer demands require quick reactions in accordance with the framework conditions of production. In order to avoid an inefficient use of production equipment and prevent bottlenecks in the process of hot die forging, production-specific information about available machines and related design-relevant information must be known in an early design stage. In this context, a methodology including machine and production specific information, e.g., dimensional parameters and availability, has been developed. Within the methodical approach, the design parameters of the forging tool as well as machine parameters were analyzed in order to identify the factors influencing the design parameters of the forging tool. Based on this, a production-adjusted design catalogue can be set up consisting of important design parameters and their values which are influenced by respective machine characteristics. An indicator system gives the designer a fast overview about relevant production-related machine information. This constitutes the theoretical basis for a VBA-based software application that has been developed within the framework of a conventional CAD software system. The application allows for an improved interaction of process planning and design. Based on generic tool design, a fast and machine-specific automatic adaptation of the forging tools to different machines can be achieved. In addition, the software application assists in selecting suitable machines and contributes to reducing design faults.

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Verification of Continous Flight Auger Piles Ultimate Load Methods through Dinamic Load Testing

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Collaborative Process Optimization – An Approach to Individual Packaging Hollow

The increasing number of variants in plastic packaging market leads to problems especially for small enterprises (SEs). With increasing customer needs, like individualized products, small lot sizes and short product life cycles, it becomes necessary to work more efficient and effective, especially across enterprise borders. Product Lifecycle Management (PLM) enables companies to handle complexity and variants in their product development process. Therefore, this established PLM-approach is extended in its usage for SEs and as an operational platform between specialized companies, so called "works-flow".

In prevalent approach expert enterprises for each part of the value chain for plastic packaging hollows have established and work at new products separately. Results of this traditional way are delays, high costs and low efficiency. Therefore, this interrupted value chain is closed and the expert enterprises are brought together. This is the goal of "works-flow", a disruptive approach for an integrated and digital value chain network. To solve the leading problems there are four main issues. Reducing the interface problems by using an integrated and digital product model for the whole value chain network. Establishing base knowledge for the process - design, construction, production - to build individual packaging hollows. Developing a modularized systematic for the product and its tool-set based upon a pre-designed parametric CAD model. Reducing the ramp up time for the production by handling process data knowledge and automatic processes for the construction of tool-sets. Therefore, connecting and enabling the separated SEs for design, tooling and production to an integrated operational process chain leads to cost reduction in the whole process chain, a shorter Time-to-market and an earlier Start-of-production. Furthermore, it enables a non-before achieved process quality and process stability. The initial usage of the "works-flow"-approach leaded

to a reduction in the Time-to-market up to 60% and a higher product quality.

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New Product Development - Experience from Distance Learning and Simulation-Based Training

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Transformation of the Mechanical Properties of Fiber Reinforced Plastic Tubes from the Cartesian Coordinate System into the Cylindrical Coordinate System for the Application of Bending Models

Fiber reinforced plastic tubes are used in many different industries, such as electrical engineering and pipeline construction. The tubes are frequently subject to bending depending on the application. For a dimensioning of the pipes is ensured in this stress effect, are analytical models such as bending by Jolicoeur and Cardou used to calculate the stresses, strains and displacements in the individual layers of the laminate occurring. This allows by choosing an appropriate failure criterion a statement about the failure of the fiber-reinforced pipe. To use this bending model, it is necessary to understand the respective underlying theory by Lekhnitskii which provides the basis for the mathematical description of the mechanical properties of a single-pipe and to use the correct relationships between the stresses and strains that occur in the cylindrical coordinate system for this calculation step. For this reason a redefinition of the compliance matrix of the transformation to the winding angle to the cylindrical coordinate system and modifying the stress and strain vectors in the form of Lekhnitskii is necessary. The switching causes an exchange of entries in the compliance matrix, which remain in the correct relationship between the particular stress and strains. This step is not specified in the methods of calculation and may lead to incorrect results due to the incorrect entry of compliances. The present publication refers to sketch now on this issue and represent a simplification of the changeover to the level required by the bending models notation of vectors according to Lekhnitskii in the form of a permutation. In addition, a new name for the pre-acquisition of the redefined compliances introduced by Lekhnitskii, so that there is no confusion when entering the material law of a bending model. Finally, the permuted and redefined compliances are used in a bending model to prove their accuracy.

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Virtual Hybrid - and Meta-Optimization of Forming Processes

Today the optimization of metal forming processes is done using advanced simulation tools in a virtual process, e.g. FEM-studies. The modification of the free parameters represents the different variants to be analysed. So experienced engineers may derive useful proposals in an acceptable time if good initial proposals are available. As soon as the number of free parameters growths or the total process takes long times and uses different succeeding forming steps it might be quite difficult to find promising initial ideas.

In metal forming another problem has to be considered. The optimization using a series of local improvements, often called a gradient approach may find a local optimum, but this could be far away from a satisfactory solution. Therefore non-deterministic approaches, e.g. Bionic Optimization have to be used. These approaches like Evolutionary Optimization or Particle Swarm Optimization are capable to cover large ranges of high dimensional optimization spaces and discover many local optima. So the chance to include the global optimum increases when using such non-deterministic methods.

Unfortunately these bionic methods require large numbers of studies of different variants of the process to be optimized. The number of studies tends to increase exponentially with the number of free parameters of the forming process. As the time for one single study might be not too small as well, the total time demand will be inacceptable, taking weeks to months even if high performance computing will be used.

Therefore the optimization process needs to be accelerated. Among the many ideas to reduce the time and computer power requirement Meta- and Hybrid Optimization seem to produce the most efficient results.

Hybrid Optimization often consists of global searches of promising regions within the parameter space. As soon as the studies indicate that there could be a local optimum, a deterministic study tries to identify this local region. If it shows better performance than other optima found until now, it is preserved for more detailed analysis. If it performs worse than other optima the region is excluded from further search.

Meta-Optimization is often understood as the derivation of Response Surfaces of the functions of free parameters. Once there are enough studies performed, the optimization is done using the Response Surfaces as representatives e.g. for the goal and the restrictions of the optimization problem. Having found regions where interesting solutions are to be expected, the studies available up to now are used to define Response Surfaces. In many cases low degree polynomials are used, defining their coefficients by least square methods.

Both proposals Hybrid Optimization and Meta-Optimization, sometimes used in combination often help to reduce the total optimization processes by large numbers of variants to be studied. In consequence they are highly recommended when dealing with time consuming optimization studies.

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Equipment Failure Prediction using Genetic Algorithms: A Study of an Underground Mine Hoist

Due to increase of highly mechanized equipment in the mining industry, a well-planned maintenance schedule has proven to be a key in reducing machine down time. Preventive maintenance before a failure occurs can significantly reduce costs compared to reactive maintenance after a failure occurs. The fundamental factor that contributes to the success of a preventive maintenance strategy is quantification of failure characteristics. In this paper, the authors aim to use time between failures, genetic algorithms and statistical tools to characterize historical failure data and predict future failure modes. The underlying hypothesis is that various factors that contribute to machine failures resemble the biological evolution process. Based on this assumption, a software tool called GenRel has been developed and updated at Laurentian University Mining Automation Laboratory for the purpose of failure data analysis for mining equipment. This paper discusses the theoretical background of this software and presents a case study of an underground hoist system from a hard-rock mine in the Sudbury mining area in Canada using this tool.

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Who wants to Live Forever? Mapping and Analysing Possible Future Consequences of Large Increases of Human Age

An ageing population can be considered a true future societal wicked problem. It is expected that in In 2050 25% of the Dutch population than 65 years old, which will lead to problems such as rising costs of health care and uncertain financial sustainability of pension systems. In addition, given the expected technological developments, it is reasonable that we become even far more older in the future, raging up to 130 in 2050.

The demographic, economic, social, technological, ecological and political consequences of this development will be huge and should be mapped and understood timely. For instance, what will longevity mean for the social definition of the quality of life and meaningful live? By using the Delphi-method (with brainstorming, literature search, and interviews as supporting tools) an overview is made of possible consequences.

The preliminary conclusionis a tendency towards a dichotomy in society between the healthy rich and the unhealthy poor, a charged view on the concept of life and the concept of meaningful live, a less hectic lifestyle, overall a huge consequence for society. The outcomes can be used to develop strategies and to mobilise political will.

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Society in Need of Transformation. Citizen Foresight as a Method to Co-Create Urban Future

Create shared values and democratic civil society! The European Commission highlights that negotiating interests among communities and citizens, to create shared values and democratic citizenship. is a today's requirement to answer challenges of urbanization and demographic change in Europe. Emphasis should be placed on understanding citizens' needs, ensuring equal access to services of public goods such as health, education etc. The awareness about the necessity of inclusion of vulnerable groups, for instance elderly or migrants is still a substantial deficit in research on the inclusion of economically disadvantaged urban populations.

As a matter of principle future cannot be forecasted.[1] The most effective way to foresee future is to jointly shape it! The complementary Citizen Foresight offers a neutral room and a multi-method coordination framework for detecting accessible as well as tacit knowledge enhancing societal transformation. In Co-Creation citizens, experts and civil servants gain new insights into complex interdependencies allowing mutual learning and behaviour in rehearsal for transition. Answering the need of today's crises and disruptive changes internal novel as well as traditional images and stories are used as grammatical principles for constructing reality in a new way allowing positive sense making as well as jointly shaping of urban futures. Societal change is in need of powerful, collective pictures serving self-confidence and self-responsibility of citizens concerned and engaged.

First, we describe the specific complementary, participatory Foresight approach. Second, we highlight preconditions for learning and societal change based on constructivism and brain research. Third, we define success criteria for Citizen Foresight and selection criteria for methods aiming at transforming mental images, maps and behaviour. Fourth, we show how this can work in reality by shortly outlining two Citizen Foresight cases with elder lies.

[1]Drucker, Peter F. Managing in the next society 1994; Publisher St. Martin's Griffin, New York 2003.

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Life Cycle Assessment of Biochar Applied Rice Paddy Soil

As greenhouse gas emission from agricultural sector contributes the 10-14% of global emission, many agricultural management practices and technologies to mitigate climate change have been developed. In rice paddy, which is the largest greenhouse gas emitter in agriculture, application of organic materials is a common practice to improve soil structure and nutrient supply. However, this practice has increased methane emission because of the anaerobic metabolism of fresh organic matter. As a substitute for organic matter input, biochar application to rice paddy soils has been suggested as a promising option to reduce greenhouse gas emission. Biochar is a by-product from pyrolysis of organic materials, which has high porosity and chemical resistance. Due to its high content of stable carbon, application of it to rice paddy soil has a high carbon sequestration potential. To verify the sustainability of this practice, life cycle assessment of biochar-applied-rice paddy-system is urgently required because there are additional energy usage and greenhouse emission during biochar pyrolysis process. The objective of this study is to conduct life cycle assessment of biochar-applied-rice paddy-system in Korea using field and laboratory scale data. The scope of this study includes pre-processing of raw materials (rice chaff), pyrolysis, and application to the rice paddy soils. The baseline scenario is the conventional rice cultivation with application of raw rice chaff, while the target scenario is a new cultivation system with application of rice chaff pyrolysis. The method of life cycle assessment follows ISO14040 and the analysis tool was the TOTAL 4.1.5. developed by Korean Ministry of Environment. The global warming potential (GWP) of the baseline system was 31.09 while that of the biochar system was -12.32, which means biochar system is sequestering atmospheric carbon within the system. Our results imply that biochar application to rice paddy soils has a great potential to mitigate climate change.