Adapting the Accreditation Procedures to a New Educational Technology

The FP7 PELARS project deals with the problem of developing a new educational technology for practical activities. As it is stated into the project proposal [1], the project produces and evaluates technology designs for analytic data generation for constructivist learning scenarios in Science, Technology, Engineering and Math (STEM) topics, including: technology solutions, infrastructure, activities, assessment, curricula, and classroom furniture and environment designs. The project addresses three different learning contexts (post-secondary design studios, post-secondary engineering sciences classrooms, and secondary-level high school STEM learning environments) across four national settings in the EU. In the upper defined context, this paper deals with the problem of adapting the accreditation of the engineering programs to the new educational technologies.

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Although Silicon Nanowire biological Field-Effect Transistors (SiNW-bioFETs) have steadily demonstrated their ability to detect biological markers at ultra-low concentration, they have not yet translated into routine diagnostics applications. One of the challenges inherent to the technology is that it requires an instrumentation capable of recovering ultra-low signal variations from sensors usually designed and operated in a highly-resistive configuration. Often overlooked, the SiNWbioFET/instrument interactions are yet critical factors in determining overall system biodetection performances. Here, we carry out for the first time the system-level sensitivity analysis of a generic SiNW-bioFET model coupled to a custom-design instrument based on the lock-in amplifier. By investigating a large parametric space spanning over both sensor and instrumentation specifications, we demonstrate that systemwide investigations can be instrumental in identifying the design trade-offs that will ensure the lowest Limits-of-Detection. The generic character of our analytical model allows us to elaborate on the most general SiNW-bioFET/instrument interactions and their overall implications on detection performances. Our model can be adapted to better match specific sensor or instrument designs to either ensure that ultra-high sensitivity SiNW-bioFETs are coupled with an appropriately sensitive and noise-rejecting instrumentation, or to best tailor SiNW-bioFET design to the specifications of an existing instrument.
Warlike and Peaceful Societies: The Interaction of Genes and Culture

Are humans violent or peaceful by nature? We are both.

In this ambitious and wide-ranging book, Agner Fog presents a ground-breaking new argument that explains the existence of differently organised societies using evolutionary theory. It combines natural sciences and social sciences in a way that is rarely seen.

According to a concept called regality theory, people show a preference for authoritarianism and strong leadership in times of war or collective danger, but desire egalitarian political systems in times of peace and safety. These individual impulses shape the way societies develop and organise themselves, and in this book Agner argues that there is an evolutionary mechanism behind this flexible psychology. Incorporating a wide range of ideas including evolutionary theory, game theory, and ecological theory, Agner analyses the conditions that make us either strident or docile. He tests this theory on data from contemporary and ancient societies, and provides a detailed explanation of the applications of regality theory to issues of war and peace, the rise and fall of empires, the mass media, economic instability, ecological crisis, and much more.

Warlike and Peaceful Societies: The Interaction of Genes and Culture draws on many different fields of both the social sciences and the natural sciences. It will be of interest to academics and students in these fields, including anthropology, political science, history, conflict and peace research, social psychology, and more, as well as the natural sciences, including human biology, human evolution, and ecology.

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Distance Protection Impedance Measurement for Inhomogeneous Multiple-Circuit 400/150 kV Transmission Lines with Shared Towers

Combined transmission lines where different voltage levels shares same towers are used in transmission systems in order to save way of right. Faults between different voltage levels results in complex fault current distributions due to mutual couplings and the fact that the faulted phases no longer are interconnected in a simple way but via transformers and infeed from remaining parts of the network. Distance relay measured fault loop impedance shows wide ranges of variations for both phase-phase loops as well as phase-earth loops. No simple relations exist. Simulation models can be used to study fault loop impedance for combined faults and thereby shed light on relay trips. This study uses actual fault records, analytical method and PSCAD simulation studies to analyse combined faults in an existing 400 and 150 kV transmission line owned by Danish TSO Energinet.dk. The results clearly show that an accurate modelling followed by fault loop impedance calculation is possible. Selected results show that fault loop impedance can be located in unexpected regions of the complex R-X plane.

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Evolvable Smartphone-Based Platforms for Point-Of-Care In-Vitro Diagnostics Applications

The association of smart mobile devices and lab-on-chip technologies offers unprecedented opportunities for the emergence of direct-to-consumer in vitro medical diagnostics applications. Despite their clear transformative potential, obstacles remain to the large-scale disruption and long-lasting success of these systems in the consumer market. For instance, the increasing level of complexity of instrumented lab-on-chip devices, coupled to the sporadic nature of point-of-care testing, threatens the viability of a business model mainly relying on disposable/consumable lab-on-chips. We argued
recently that system evolvability, defined as the design characteristic that facilitates more manageable transitions between system generations via the modification of an inherited design, can help remedy these limitations. In this paper, we discuss how platform-based design can constitute a formal entry point to the design and implementation of evolvable smart device/lab-on-chip systems. We present both a hardware/software design framework and the implementation details of a platform prototype enabling at this stage the interfacing of several lab-on-chip variants relying on current- or impedance-based biosensors. Our findings suggest that several change-enabling mechanisms implemented in the higher abstraction software layers of the system can promote evolvability, together with the design of change-absorbing hardware/software interfaces. Our platform architecture is based on a mobile software application programming interface coupled to a modular hardware accessory. It allows the specification of lab-on-chip operation and post-analytic functions at the mobile software layer. We demonstrate its potential by operating a simple lab-on-chip to carry out the detection of dopamine using various electroanalytical methods.

Prototyping Feedback for Technology Enhanced Learning
The development of new educational technologies, in the area of practical activities is the main aim of the FP7 PELARS project. As part of the constructivist learning scenarios, according to the project proposal, the development and evaluation of technology designs are envisaged, for analytic data generation for Science, Technology, Engineering and Mathematics (STEM) subjects, such as: technology solutions, infrastructure, activities, assessment, curricula, and classroom furniture and environment designs. Inside four EU national settings, three separate learning contexts are being dealt with – from secondary-level high school STEM learning environments to post-secondary level engineering classes and design studios. Given this experience and framework, the present paper provides a perspective on the importance of using such research experience and iterative prototyping in real learning environments for engineering students.

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Supporting Robotics Education in STEM with Learning Analytics

There is concern amongst policy makers and employers that students are not graduating with the required skills in STEM subjects (Science, Technology, Engineering, and Mathematics), especially when we look at the exposure to robotics. It is argued that learners must go beyond the acquisition of discipline-specific facts and skills, to develop an integrated understanding of STEM disciplines within an authentic context of collaborative problem solving. Robotics provides this authentic context for developing the skills, processes, and theories. This integrated approach to STEM teaching is at the heart of instructional practices that center on collaborative, hands-on, engineering design problems. The use of hands-on engineering design problems for robotics in classroom teaching are facilitated by physical computing kits, such as programmable microcontrollers like Arduino, and other platforms. These kits provide building blocks that make technology development more accessible to novices, thus allowing them to work on more complex problems. A fine-grained analysis of the collaborative problem-solving process, using learning analytics tools, can provide insight into learning to support both teachers and learners. However, it is hard to track and interpret learner activity in engineering design problems, due to the hands-on and open-ended nature of such tasks. This abstract presents work that begins to address these challenges. We discuss the development of an intelligent learning environment for exploring hands-on STEM activities, using physical computing kits, which use multi-modal learning analytics. The system provides specially designed furniture and the integration of computer vision, log files from the hardware and software, and learner and teacher rich-media input to help understand the complexities of collaborative problem solving that can support robotics education.
Supporting STEM knowledge and skills in engineering education – PELARS project

experimental scenarios for engineering students with the use of learning analytics. We accomplish this through teacher and learner engagement, user studies and evaluated trials, performed at UCV (University of Craiova, Romania) and DTU (Technical University of Denmark). The PELARS project (Practice-based Experiential Learning Analytics Research And Support) provides technological tools and ICT-based methods for collecting activity data (moving image-based and embedded sensing) for learning analytics (data-mining and reasoning) of practice-based and experiential STEM. This data is used to create analytics support tools for teachers, learners and administrators, providing frameworks for evidence-based curriculum design and learning systems. The PELARS project creates behavioral recording inputs, proving a new learning analytic that is scalable in application, and bridge qualitative and quantitative methods through reasoning and feedback from input data. The project serves to better understand learners' knowledge in physical activities in laboratory and workshop environments, as well as informal learning scenarios. PELARS traces and helps assess learner progress through technology enhancement, in novel ways building upon current research. The project results in learning analytics tools for practice-based STEM learning that are appropriate for real-world learning environments.

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Training Engineering Disciplines and Skills through Robot Projects

The popularity of robots in educational activities increased the last 10-15 years. Engineering education all over the world includes courses and projects involving design, use and programming of robots in a variety of programs at technical colleges and universities. At the same time there is a growing interest to work with robots. Robotic skills are also highly requested in industrial companies. At the Technical University of Denmark, DTU Diplom, we have several projects involving building and programing robots in our bachelor programs in Electronics, Computer Science, IT and Mechanical Engineering. This presentation deals with our experience in robotic activities in different programs in order to enhance understanding of mathematics, physics and different technical disciplines in the named programs. We also observed the increased motivation for learning theory when we combine traditional theoretical courses with robotics projects. Teamwork is also very important skill today for engineering students; they need to be trained to tackle engineering projects by teamwork. Problem oriented education and teamwork increases the motivation of our engineering students to learn the theoretical parts of the curriculum, especially those who are interested in a practical approach to mechanics, electronics or software. We organize also robot-competitions at the end of the semester and this is additionally a substantial motivation factor for our students. The need to function on an engineering team is widely recognized in engineering education and in particular using contests seems to be an effective training exercise and measure of teamwork skills. Some cases of robot projects’ influence on students’ learning and achievements are presented. Students’ own conclusions what impact the
robotic projects have had on their abilities and understanding of different disciplines, theoretical and more practical engineering skills, will be also presented.

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A Smart Mobile Lab-on-Chip-Based Medical Diagnostics System Architecture Designed For Evolvability

Unprecedented knowledge levels in life sciences along with technological advances in micro- and nanotechnologies and microfluidics have recently conditioned the advent of Lab-on-Chip (LoC) devices for In-Vitro Medical Testing (IVMT). Combined with smart-mobile technologies, LoCs are pervasively giving rise to opportunities to better diagnose disease, predict and monitor personalised treatment efficacy, or provide healthcare decision-making support at the Point-of-Care (PoC). Although made increasingly available to the consumer market, the adoption of LoC-based PoC In-Vitro Medical Testing (IVMT) systems is still in its infancy. This attrition partly pertains to the intricacy of designing and developing complex systems, destined to be used sporadically, in a fast-pace evolving technological paradigm. System evolvability is therefore key in the design process and constitutes the main motivation for this work.

We introduce a smart-mobile and LoC-based system architecture designed for evolvability. By propagating LoC programmability, instrumentation, and control tools to the highlevel abstraction smart-mobile software layer, our architecture facilitates the realisation of new use-cases and the accommodation for incremental LoC-technology developments. We demonstrate these features with an implementation allowing the interfacing of LoCs embedding current- or impedance-based biosensors such as Silicon Nanowire Field Effect Transistors (SiNW-FETs) or electrochemical transducers. Structural modifications of these LoCs or changes in their specific operation may be addressed by the sole reengineering of the mobilesoftware layer, minimising system upgrade development and validation costs and efforts.

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**Pseudo-Random Number Generators for Vector Processors and Multicore Processors**

Large scale Monte Carlo applications need a good pseudo-random number generator capable of utilizing both the vector processing capabilities and multiprocessing capabilities of modern computers in order to get the maximum performance. The requirements for such a generator are discussed. New ways of avoiding overlapping subsequences by combining two generators are proposed. Some fundamental philosophical problems in proving independence of random streams are discussed. Remedies for hitherto ignored quantization errors are offered. An open source C++ implementation is provided.

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for a generator that meets these needs.

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Building a shared understanding of the skills and competences in order to respond to the current global technical challenges

A pan-European team, including the representatives from 45 European universities, is working on an EU supported project to firstly explore and then provide models for ways in which Higher Education Institutions of Europe in the Electrical and Information Engineering disciplines can respond to current challenges. This paper presents the objectives and actual results of the EU supported project which runs from October 2012 to November 2015, named SALEIE - Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions. We describe in this paper the preliminary results of the project's work packages WP3 (Global Challenges) and WP4 (Widening Participation and Student Support).

SALEIE: An EU project aiming to propose new EIE curricula oriented to key global technical challenges

For the last two decades The European Association for Education in Electrical and Information Engineering (EAEIE) has been dedicated and continue to support the Electrical and Information Engineering (EIE) education in Europe. SALEIE (Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions) is one of its new EU projects which coagulate a global team aiming to provide higher education models in the EIE disciplines that can respond to the key global technical challenges. The SALEIE project's work package WP3 (Global Challenges) is related to: state-of-the-art in implementation of the Bologna recommendation for Bachelor and Master, EIE connected technical, existing models in EIE higher education and their degree of response to key global technical challenges as well as some examples of curriculum models which see the day light during the SALEIE workshops. That is the subject that the proposed paper deals on.
Trends and EIE higher education response to the current global technical challenges

The European Association for Education in Electrical and Information Engineering (EAEEIE) has been for 20 years and still is dedicated to supporting Electrical and Information Engineering (EIE) across Europe. Its new Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions (SALEIE), an EU supported project, gathers together a global team aiming to provide higher education models in the EIE disciplines that can respond to the key global technical challenges. This paper deals with findings within the SALEIE project's work package WP3 (Global Challenges), namely: state-of-the-art in implementation of the Bologna recommendation for Bachelor and Master, technical challenges that the EIE higher education faces nowadays, and existing models in EIE higher education and their degree of response to key global technical challenges.

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Main Research Area: Technical/natural sciences
Conference: 25th Annual Conference on European Association for Education in Electrical and Information Engineering, Izmir, Turkey, 30/05/2014 - 30/05/2014

electrical engineering, further education, Communication, Networking and Broadcast Technologies, Components, Circuits, Devices and Systems, Engineering Profession, General Topics for Engineers, Robotics and Control Systems, Signal Processing and Analysis, Bologna, EAEEIE, Education, EIE higher education, EIE higher education response, electrical and information engineering, EU supported project, Europe, European Association for Education in Electrical and Information Engineering, global technical challenges, learning outcomes, Nanotechnology, SALEIE, Strategic Alignment of Electrical and Information Engineering in European Higher Education Institutions
DOIs:
10.1109/EAEEIE.2014.6879388
Source: FindIt
Source-ID: 270178784
Publication: Research - peer-review › Article in proceedings – Annual report year: 2014
Branch prediction in the Pentium family
How the branch prediction mechanism in the Pentium has been uncovered with all its quirks, and the incredibly more effective branch prediction in the later versions.

General information
State: Published
Organisations: Center for Bachelor of Engineering Studies, Afdelingen for El-teknologi
Authors: Fog, A. (Intern)
Number of pages: 5
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: Dr. Dobb's Journal
ISSN (Print): 1044-789X
Ratings:
Scopus rating (2012): SJR 0.101 SNIP 0
Scopus rating (2011): SJR 0.101 SNIP 0
Scopus rating (2010): SJR 0.13 SNIP 0.103
Scopus rating (2009): SJR 0.111 SNIP 0
Scopus rating (2008): SJR 0.12 SNIP 0
Scopus rating (2007): SJR 0.109 SNIP 0.197
Scopus rating (2006): SJR 0.104 SNIP 0.341
Scopus rating (2005): SJR 0.111 SNIP 0.477
Scopus rating (2004): SJR 0.124 SNIP 0
Scopus rating (2003): SJR 0.108 SNIP 0
Scopus rating (2002): SJR 0.109 SNIP 0.268
Scopus rating (2001): SJR 0.101 SNIP 0.327
Scopus rating (2000): SJR 0.101 SNIP 0
Scopus rating (1999): SJR 0.104 SNIP 0.214
Original language: English
Source: PublicationPreSubmission
Source-ID: 133704403
Publication: Research - peer-review › Journal article – Annual report year: 2017

Projects:

Big Data Applications in Energy Optimization, Smart City and Agriculture
Goal of the project is to bring together employees, external partners and students in the exploitation of Big Data applications in a number of fields:
- Energy optimization (saving of energy)
- Smart city (traffic monitoring)
- Agriculture, weeding (automated mechanical weeding)
- Agriculture, weather forecast (weather stations)
In all the cases Big Data from many sensors, including historical data, can be applied in data fusion algorithms in the search for more efficient and cheaper solutions. The exploitation will end up in the definition of new research projects and possibly the submission of project proposals for attracting externals funds, e.g., Horizon 2020 proposals.

Center for Bachelor of Engineering Studies
Afdelingen for Informatik
Afdelingen for El-teknologi
Period: 01/01/2017 → 01/01/2018
Number of participants: 7
Project participant:
Blaszczyk, Tomasz (Intern)
Kaur, Bipjeet (Intern)
Bridgwood, Ian (Intern)
Bechmann, Henrik (Intern)
Friesel, Anna (Intern)
**ForwardCom CPU instruction set architecture**
Proposal for an open CPU instruction set architecture for vector processors

Center for Bachelor of Engineering Studies
Afdelingen for El-teknologi
Period: 27/12/2015 → …
Number of participants: 1
CPU, instruction set architecture, ISA, vector processors, open standard, forward compatible computer system
Acronym: ForwardCom
Project participant:
Fog, Agner (Intern)

**Development of Smart Sensor for flow & gas concentration measurement**

Center for Bachelor of Engineering Studies
Afdelingen for Informatik
Department of Chemistry
NanoChemistry
Afdelingen for El-teknologi
Donghua University
Period: 01/09/2015 → 31/12/2017
Number of participants: 6
Acronym: SmartSensorFlow
Project ID: 97254
Contact person:
Andersen, Flemming Højskov (Intern)
Project participant:
Hou, Chengyi (Intern)
Sørensen, John Aasted (Intern)
Andersen, Birger (Intern)
Maack, Lars (Intern)
Project Manager, organisational:
Blaszczyk, Tomasz (Intern)

**Bæredygtig Produktion**

Center for Bachelor of Engineering Studies
Afdelingen for Byggeri og Infrastruktur
Afdelingen for El-teknologi
Afdelingen for Produktionsudvikling
Afdelingen for Maskin og Design
Period: 01/04/2015 → 31/10/2017
Number of participants: 5
Project participant:
Hørby, Maria (Intern)
Maack, Lars (Intern)
Hundebøll, Peder M. (Intern)
Nielsen, Kjeld (Intern)
Vector Class Library
This is a collection of C++ classes, functions and operators that makes it easier to use the the vector instructions (Single Instruction Multiple Data instructions) of modern CPUs without using assembly language. Supports the SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, AVX, AVX2, AVX512, FMA, and XOP instruction sets. Includes standard mathematical functions. Can compile for different instruction sets from the same source code.

Software optimization resources
Five online manuals:
1. Optimizing software in C++: An optimization guide for Windows, Linux and Mac platforms
2. Optimizing subroutines in assembly language: An optimization guide for x86 platforms
3. The microarchitecture of Intel, AMD and VIA CPUs: An optimization guide for assembly programmers and compiler makers
4. Instruction tables: Lists of instruction latencies, throughputs and micro-operation breakdowns for Intel, AMD and VIA CPUs
5. Calling conventions for different C++ compilers and operating systems
These manuals are not static, but updated regularly.

Cost efficient Quality Management in Microbreweries
Period: 2016
Axel Grøndahl Kristiansen (Invited speaker)
Center for Bachelor of Engineering Studies
Afdelingen for Byggeri og Infrastruktur
Afdelingen for EI-teknologi
Afdelingen for Forretningsudvikling
Afdelingen for Informatik
Afdelingen for Maskin og Design
Afdelingen for Produktionsudvikling

Description
A guide is offered how to provide basic Quality Assurance and - Management even for the smallest Breweries with limited economic resources.
Documents:
21 Cost efficient QM in microbreweries agk

Related event

**Nordic Meeting on Brewing Technology**
19/05/2016 → 21/05/2016
Finland
Activity: Talks and presentations › Conference presentations

Optimizing software performance using vector instructions
Agner Fog (Invited speaker)
Center for Bachelor of Engineering Studies
Afdelingen for El-teknologi

Description

Links:
http://ccccspeed.win.tue.nl/ (Speed-B)

Related event

**SPEED-B: Software performance enhancement for encryption and decryption, and benchmarking**
19/10/2016 → 21/10/2016
Utrecht, Netherlands
Activity: Talks and presentations › Conference presentations

Basic Beer style parameters, Quality Control by basic means
Period: 19 Sep 2016 → 20 Sep 2016
Axel Grøndahl Kristiansen (Participant)
Center for Bachelor of Engineering Studies
Afdelingen for Byggeri og Infrastruktur
Afdelingen for EI-teknologi
Afdelingen for Forretningsudvikling
Afdelingen for Informatik
Afdelingen for Maskin og Design
Afdelingen for Produktionsudvikling

Description
EBC Symposium of raw materials and brewhouse work
Documents:
Basic Beer style parameters, Quality control by basic means

Related event

Basic Beer style parameters, Quality Control by basic means
19/09/2016 → 20/09/2016
Wroclaw, Poland
Activity: Attending an event › Participating in or organising workshops, courses, seminars etc.

4th CERN openlab Numerical Computing Workshop
Period: 5 May 2014 → 6 May 2014
Agner Fog (Invited speaker)
Center for Bachelor of Engineering Studies
Afdelingen for EI-teknologi

**Description**
Agner Fog will speak about vector classes and instruction throughput measurements (w/hands-on labs)

**Documents:**
CERN openlab - 4th CERN openlab Numerical Computing Workshop - 2014-04-09

**Links:**

**Related event**

**4th CERN openlab Numerical Computing Workshop**
05/05/2012 → 06/05/2014
Geneve, Switzerland
Activity: Talks and presentations › Conference presentations

**Advanced microprocessor optimization**
Period: 21 Aug 2007
Agner Fog (Lecturer)

Center for Bachelor of Engineering Studies
Afdelingen for EI-teknologi

**Description**
Invited lecture

University of Kampala, Uganda

**Documents:**
Advanced microprocessor optimization

**Related external organisation**

**Unknown external organisation**
Activity: Talks and presentations › Conference presentations