Laboratórios remotos: Um Experimento Internacional de Educação em Engenharia

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Co-funded by the Erasmus+ Programme of the European Union
Fundamentos

- **Five Major Shifts in 100 Years of Engineering Education**
  - Froyd, Wankat, and Smith (2012)

- **The Role of the Laboratory in Undergraduate Engineering Education**
  - Feisel and Rosa (2005)

- **Remote Experimentation Network - Yielding an Inter-University Peer-to-Peer e-Service**
  - Alves et al. (2005)

- **Virtual Instrument Systems in Reality** (VISIR)
  - Gustavsson et al. (2006)
Five Major Shifts in 100 Years of EE

1. a shift from hands-on and practical emphasis to engineering science and analytical emphasis
2. a shift to outcomes-based education and accreditation
3. a shift to emphasizing engineering design
4. a shift to applying education, learning, and social-behavioral sciences research
5. a shift to integrating information, computational, and communications technology in education
Five Major Shifts in 100 Years of EE

4. a shift to applying education, learning, and social-behavioral sciences research
   - Educational Objectives, Mastery, and Student Learning Outcomes
   - Student Engagement
   - Inquiry
   - Integrated Approach to Course and Program Design
   - Importance of a Broader Range of Knowledge, Skills, and Attributes
   - Scholarly Approach to Engineering Education through the Scholarship of Teaching and Learning (SoTL) and Engineering Education Research
Five Major Shifts in 100 Years of EE

5. a shift to integrating ICT in education
   - content delivery: television, videotape, and the Internet
   - programmed instruction: individualized student feedback
   - personal response systems (clickers)
   - computational technologies
   - intelligent tutors: second phase of individualized student feedback
     - simulations
     - games and competitions
     - remote laboratories
     - grading
The Role of the Laboratory in Undergraduate EE

• The Fundamental Objectives of Engineering Instructional Laboratories

  • Objective 1: Instrumentation
  • Objective 2: Models
  • Objective 3: Experiment
  • Objective 4: Data Analysis
  • Objective 5: Design
  • Objective 6: Learn from Failure
  • Objective 7: Creativity

  • Objective 8: Psychomotor
  • Objective 9: Safety
  • Objective 10: Communication
  • Objective 11: Teamwork
  • Objective 12: Ethics in the Lab
  • Objective 13: Sensory Awareness
Questões

• Qual o aporte de cada tipo de laboratório (real, virtual, remoto) na prossecução de cada um desses objetivos?

• Qual o impacto do estilo de aprendizado de cada aluno e aluna na seleção da melhor estratégia didática de utilização desses tipos de laboratório?

• Como usar esses recursos (laboratórios) para endereçar a **aprendizagem individual**, i.e. um dos 14 grandes desafios da Engenharia para o séc. XXI?
The ALFA-II-465-A RexNet-yippee project

- Proposal
  - submitted October 2003 – accepted July 2004

- Project
  - Start: January 2005
  - Duration: 24 months
  - Consortium: 10 Institutions of Higher Education (IHE)
    - 5 European (3 countries) and 5 Latin American (3 countries)
  - Total budget: € 174,015,00 (EC contribution: € 129,695,00)

www.rexlab.net
Virtual Instrument Systems in Reality (VISIR)

Welcome

Welcome to the distance electronics laboratory.

Here you will find the resources needed to experiment in electronics via the internet. We have developed a system where you can make electronic experiments, right here in your browser. We supply basic equipment, such as oscilloscope, multimeter, function generator and power supply. With these and a number of electronic components you can build circuits on our virtual breadboard. None of the measurements are simulated. The circuits you build will be formed and measured on, and the real measurement results will be displayed.

Interested? Go to our demo page.

You have any questions about this page or the laboratory, contact the administrator.
Virtual Instrument Systems in Reality (VISIR)
VISIR Laboratories

- University of Deusto, Spain
- FH Campus Wien University of Applied Sciences, Austria
- Blekinge Institute of Technology, Sweden
- Carinthia University of Applied Sciences (CUAS), Austria
- School of Engineering – Polytechnic of Porto, Portugal
- National University for Distance Education, Spain
- Indian Institute of Technology Madras, India
- Batumi Shota Rustaveli State University, Georgia
The GOLC award 2015

Global Online Laboratory Consortium

GOLC 2015 Online Lab Award

The GOLC Online Laboratory Award 2015 in the category

„Remote Controlled Lab‟

is presented to

VISIR (Virtual Instrument Systems in Reality)

Submitted by:

Ingvar Gustavsson, Gustavo Alves, Thomas Fischer, Javier Garcia Zubia, Felix Garcia, Manuel Castro

Awarded during the 12th International Conference on Remote Engineering and Virtual Instrumentation (REV2015) in Bangkok, Thailand

Abül K. M. Azad
President

Michael E. Auer
Secretary General

“20 Anos de REENGE
Caminhos da Engenharia”
Do Erasmus+ ...

- **Erasmus+** is the EU Programme in the fields of education, training, youth and sport for the period 2014-2020.
  - KEY ACTION 2: Cooperation for Innovation and the Exchange of Good Practices
    - Capacity Building in the field of higher education
- Com base nos fundamentos apresentados, submeteu-se uma proposta de projeto ao programa Erasmus+
  - Educational Modules for Electric and Electronic Circuits Theory and Practice following an Enquiry-based Teaching and Learning Methodology supported by VISIR
Módulos Educacionais para a teoria e prática sobre circuitos elétricos e eletrônicos baseados em uma metodologia de ensino e de aprendizagem por indagação, assistidos pelo VISIR.

• O título sintetiza todo o racional e enfoque do projeto
  • Módulos educativos
  • Teoria e prática sobre circuitos elétricos e eletrônicos
  • Metodologia de ensino e de aprendizagem por indagação
  • Laboratório remoto: VISIR
Educational Modules for Electric and Electronic Circuits
Theory and Practice following an Enquiry-based Teaching and Learning Methodology supported by VISIR

Kick-Off Meeting (KOM), Karlskrona, Sweden, 1-3 February 2016
Project Consortium


KOM, Karlskrona, Sweden
Project Consortium

Universidad de Deusto
University of Deusto

POLÍTÉCNICO
DO PORTO

UNSE
Universidad Nacional de Santiago del Estero

IRICE
CONICET
UNR

UNED

Universidad Nacional de Rosaric

ABENGE

Asociación Brasileña de Enseñanza de Ingeniería

TEKNISKA HOGSKOLA

Belle-Lettiska högskolan

FACHHOCHSCHULE

KARNTEN

CARINTHIA

UNIVERSITAT OF APPLIED
SCIENCES

KOM, Karlskrona, Sweden
WP1 [Preparation]
1\textsuperscript{st} training action
Installing VISIR in all LA HEIs, plus local workshops for training technical staff in VISIR configuration issues.

WP2 [Development]
2\textsuperscript{nd} and 3\textsuperscript{rd} training actions
The educational modules development
1\textsuperscript{st} midterm checkpoint (TAEE’16)

WP3 [Quality monitoring]
Data collection and analysis of learning gains
2\textsuperscript{nd} midterm checkpoint (EDUCON’17)

WP4 [Dissemination]
Local and regional dissemination & exploitation

WP5 [Management]
KOM
Pool of missions allocated to the project coordinator
Final project meeting

KOM, Karlskrona, Sweden
Budget (per cost category)

<table>
<thead>
<tr>
<th>Cost category</th>
<th>Actual costs</th>
<th>Unit costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISIR+ budget</td>
<td>€ 195,000.00</td>
<td>€ 265,068.00</td>
<td>€ 668,058.00</td>
</tr>
<tr>
<td>Sub-contracting</td>
<td>€ 5,000.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>€ 118,990.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per diem</td>
<td>€ 84,000.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage

- Equipment: 29.2%
- Sub-contracting: 0.7%
- Travel: 30.4%
- Per diem: 39.7%
- Staff: 100%

Ceiling

- 30% of total grant
- 10% of total grant
- 40% of total grant
Project outcomes

Work Package 1
• Number of local and remote participants in TA1 + satisfaction questionnaires
• Number of local participants in technical workshops run by BTH elements, at each one of the LA HEIs +
• URL of each installed system

Work package 2
• Number of local and remote participants in TA2 and TA3 + satisfaction questionnaires
• Enriched course curricula, lessons plans, contents of the courses LMS pages

Work Package 3
• Results of each pedagogical implementation using VISIR
• To be discussed in detail tomorrow!

Work package 4
• Number of aggregated institutions (associated partners is a 1st step towards)
• Number of news appearing on media, number of scientific publications, seminars, etc.
• Also to be discussed in detail tomorrow!
## Associated partners

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Name of organisation</th>
<th>Type of institution</th>
<th>City</th>
<th>Country</th>
<th>Associated with</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Instituto Federal Catarinense - IFC</td>
<td>Secondary and Tertiary Education</td>
<td>Blumenau</td>
<td>Brazil</td>
<td>IFSC</td>
</tr>
<tr>
<td>A2</td>
<td>Universidade Do Estado de Santa Catarina - UDESC</td>
<td>Higher Education</td>
<td>Joinville</td>
<td>Brazil</td>
<td>IFSC</td>
</tr>
<tr>
<td>A3</td>
<td>Instituto Federal Catarinense - Campus Sombrio</td>
<td>Secondary and Tertiary Education</td>
<td>Campo Sombrio</td>
<td>Brazil</td>
<td>UFSC</td>
</tr>
<tr>
<td>A4</td>
<td>SATC - Associação Beneficente da Indústria Carbonífera de Santa Catarina</td>
<td>Professional, Primary, Secondary and Tertiary Education</td>
<td>Criciuma</td>
<td>Brazil</td>
<td>UFSC</td>
</tr>
<tr>
<td>A5</td>
<td>Universidade do Estado do Rio de Janeiro - UERJ</td>
<td>Higher Education</td>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>PUC-Rio</td>
</tr>
<tr>
<td>A6</td>
<td>Centro Federal de Educação Tecnológica Celso Suckow da Fonseca (CEFET-RJ)</td>
<td>Professional Education</td>
<td>Rio de Janeiro</td>
<td>Brazil</td>
<td>PUC-Rio</td>
</tr>
<tr>
<td>A7</td>
<td>Instituto Politécnico Superior “Gral. San Martín” (IPS)</td>
<td>Secondary and Tertiary Education</td>
<td>Rosario</td>
<td>Argentina</td>
<td>UNR</td>
</tr>
<tr>
<td>A8</td>
<td>Facultad Regional Rosario – Universidad Tecnológica Nacional (UTN FRRO)</td>
<td>Higher Education</td>
<td>Rosario</td>
<td>Argentina</td>
<td>UNR</td>
</tr>
<tr>
<td>A9</td>
<td>Escuela Técnica Nº 8</td>
<td>Secondary Education</td>
<td>Santiago del Estero</td>
<td>Argentina</td>
<td>UNSE</td>
</tr>
<tr>
<td>A10</td>
<td>Universidad Católica de Santiago del Estero</td>
<td>Higher Education (Private)</td>
<td>Santiago del Estero</td>
<td>Argentina</td>
<td>UNSE</td>
</tr>
</tbody>
</table>

• Uma segunda proposta dedicada à criação de uma federação de laboratórios remotos VISIR tem vindo a ser desenvolvida desde 2014.

• Submetida em 2014, 2015, e 2016, foi recentemente selecionada (Julho) pela Agência Espanhola do programa Erasmus+

• Esta primeira rede federada de laboratórios remotos visa o seguinte mote:

  Uma experiência para todos os alunos
  Todas as experiências para um aluno
Laboratórios remotos:
Um Experimento Internacional
de Educação em Engenharia

Obrigado pela atenção
Dúvidas e questões?
SD - Sessão Dirigida 01

LABORATÓRIOS REMOTOS NO ENSINO DE ENGENHARIA

Coordenador: Gustavo Ribeiro Alves – IPP/ISEP – Porto/PT

Relator: Juarez Bento da Silva – UFSC

Dia 28 Setembro – quarta-feira – 14:30 - 17:30
Auditório: Pitomba