

# From the Editor

This is the first issue of our new “**International Journal of Online engineering**” (iJOE).

**The objective of the journal** is to publish and discuss fundamentals, applications and experiences in the field of remote engineering, virtual instrumentation and online simulations. The use of virtual and remote controlled devices and remote laboratories is one of the future trend developments for advanced teleworking/e-working environments.

I am very glad that a great number of internationally well-known experts working in this field have agreed to join the editorial board, always eager to provide interesting and up to date issues on a high scientific level.

**Online Engineering is the future trend** in engineering and science. It covers working directions such as remote engineering, virtual instrumentation, simulation techniques and others.

Due to:

- the growing complexity of engineering tasks,
- more and more specialized and expensive equipment as well as software tools and simulators,
- the necessary use of expensive equipment and software tools/simulators in short time projects,
- the application of high tech equipment also in SME's,
- the need of high qualified staff to control recent equipment,
- the demands of globalization and division of labour,

it is increasingly necessary to allow and organize a shared use of equipment or highly specialized software as for example simulators.

**Contributions to the journal** are solicited in the following areas, but are not limited to it:

- Architectural issues,
- Present and future trends, including social and educational aspects,
- Support of collaborative work in virtual engineering environments,
- Standards, standardization proposals,
- Virtual and remote laboratories,
- Mixed-reality environments,
- Intelligent remote control,
- Remote measurement technologies,
- Telerobotics,
- Networking and grid technologies,
- Human computer interfaces, usability, reusability,
- Economic aspects,
- Solutions for SME's,
- Inclusion in teleworking environments,
- Social impacts of teleworking,
- Demands in education and training, e-learning and ODL,
- Innovative organizational and educational concepts for remote engineering,
- Applications and experiences, products.

Let's have a look at **some selected working fields** in relation to online engineering.

**Laboratories** are important elements in science, engineering and technical education, but more and more also in other subjects as for example business administration and language learning. They allow the application and testing of theoretical knowledge in practical learning situations. Active working with experiments and problem solving does help learners to acquire applicable knowledge that can be used in practical situations. In general, the nowadays online-lab-solutions are stand-alone-solutions, which are time and cost expensive. Often the result of one experiment could be the input for a further experiment. For a better understanding we will give you a short example:

One institution A has set up an online-lab with measuring devices like a digital multimeter and an oscilloscope and another institute B has set up an online lab for learning how to program microcontrollers. Due to the development of standardized metadata, standardization of workflows and rules for setting up online labs in the near future it should be possible to measure the results on the microcontroller board (location B) with the multimeter located in A. This opens unimagined possibilities not only for educational institutions especially in less developed countries but also in research laboratories of SME's. Nowhere a solution for solving this complex problem has been mentioned. So we can cover online laboratories – that are on the one hand laboratories made up of remote laboratories, where users and devices are at different locations and on the other hand virtual laboratories containing software simulations, pictures, video and pre-recorded measurements. Also a combination of both of them would be possible.

One of the main goals of future developments in online engineering will be the development of unified **user-interfaces**. This requirement is based on the fact, that on the one hand users should be able to concentrate only on the content and on the other hand for lecturers even those, who are not familiar with Internet technologies, obstacles should be eliminated for an easy adoption of their learning contents into the grid. Therefore we have to develop new, intelligent, adaptable and exchangeable platform independent "on-the-fly" user interfaces, to ensure a maximum of user-friendliness and usability. This goal should ensure the acceptance of online labs.

Online engineering introduces a **global view of** ubiquitous, remote access technical and productivity promoting **resources** to allow individual access to these resources, reducing the impact of existing technical limitations. Furthermore, it proposes the development and/or the integration of technology enhanced workplaces and learning environments allowing individual users to access resources in a transparent, interoperable and collaborative form. In a general sense, more flexible access to these resources means that more citizens across the world will be able to use information due to communication technologies, even those that require special accessibility conditions or assisted use.

Additionally online engineering will **reduce inequalities between regions**, where less developed partners will benefit from the developments and research in the most advanced ones. An all-inclusive approach will allow other institutions, enterprises and individuals to be called to contribute providing experience and know-how to complement existing expertise.

It should be stressed, that currently existing online engineering solutions either in companies or in conjunction with e-learning activities of universities and schools have been developed, without joint efforts with a view to combining and integrating them. Furthermore these systems aren't able to interact with each other. So we have to combine advanced cognitive and knowledge-based approaches with multimedia support e.g. with online collaboration and

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simulation, meeting the objectives of taking account of technological, pedagogical as well as organizational aspects.

Together with intelligent content management systems online engineering is an important input for growing networked research activities in the world.

From the **commercial point of view** the use of high-end equipment and special infrastructure in a remote/virtual manner over the network will on the one hand enforce investments for such infrastructure because it can be offered as a service and will enable more attractive business models for the return on investment aspect. On the second hand it will be possible to use cost intensive lab and other equipment by an online working environment. This is a clear advantage especially for SME's. They will get access to a broader scientific resource pool and can so strengthen their innovation and knowledge assets.

Furthermore the research activities should be concentrated on the following areas concerning **standardization**:

- Metadata description models for remote laboratory and experiment repositories
- Data models considering the specific demands on networked experiments and remote labs
- Taxonomy and semantic web standards considering the specific demands on networked experiments and remote labs
- User Interface standards for integrated online laboratories and remote experiments
- Standards regarding integration of existing and new tools and systems
- Lab Open Brokerage Architecture (LOBA)
- Technology enhanced learning standards considering the specific demands on networked experiments and remote labs

These are some of the future trend developments in the field of online engineering which will definitely be emphasized in our journal.

I would like to thank everyone having been involved in the preparation of this journal, especially the members of the editorial board.

I am glad to say that some well known colleagues and good friends are the authors of this first issue.

Michael E. Auer