
TRENDS IN COMPUTER AIDED INNOVATION

IFIP – The International Federation for Information Processing

IFIP was founded in 1960 under the auspices of UNESCO, following the First World Computer Congress held in Paris the previous year. An umbrella organization for societies working in information processing, IFIP's aim is two-fold: to support information processing within its member countries and to encourage technology transfer to developing nations. As its mission statement clearly states,

IFIP's mission is to be the leading, truly international, apolitical organization which encourages and assists in the development, exploitation and application of information technology for the benefit of all people.

IFIP is a non-profitmaking organization, run almost solely by 2500 volunteers. It operates through a number of technical committees, which organize events and publications. IFIP's events range from an international congress to local seminars, but the most important are:

- The IFIP World Computer Congress, held every second year;
- Open conferences;
- Working conferences.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is small and by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is less rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

Any national society whose primary activity is in information may apply to become a full member of IFIP, although full membership is restricted to one society per country. Full members are entitled to vote at the annual General Assembly, National societies preferring a less committed involvement may apply for associate or corresponding membership. Associate members enjoy the same benefits as full members, but without voting rights. Corresponding members are not represented in IFIP bodies. Affiliated membership is open to non-national societies, and individual and honorary membership schemes are also offered.

TRENDS IN COMPUTER AIDED INNOVATION

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Preface

It is a great honor and pleasure to welcome you to Brighton on the occasion of the 2nd IFIP Working Conference on Computer Aided Innovation.

As we started with the first ideas of organizing an international conference on Computer Aided Innovation 5 years ago, we got different answers that went from skepticism up to curiosity and enthusiasm. The 1st Conference took place in Ulm, Germany in November 2005 and the 2nd Working Conference Computer Aided Innovation in Brighton, Michigan is now a reality. More than 40 contributions from all over the world were received from which 23 have been selected for being published after a thorough reviewing process. The Working Group 5.4 Computer Aided Innovation has now 34 members from 13 different countries.

The design of products and systems is becoming more demanding and complex as the amount of new products and newly developed interdisciplinary technologies increase exponentially. The product and process development must now take into account the entire lifecycle while avoiding environmental damage and facilitating the use of new technologies and physical principles. A structured and goal-oriented innovation process is nowadays mandatory for innovation success. Therefore, innovation supporting software becomes a key factor for the innovation process that guides the project teams through the complexity of the market.

Computer aided simulations are becoming more acknowledged as efficiency and effectiveness of the innovation process is becoming a key competitive advantage. Computational simulations related to the compatibility of novel ideas introduced in a computational social group that suggest acceptance or rejection are being also researched. This new kind of simulations produces insights that provide innovators with new tools to enhance their performance and effectiveness.

The transition from resource-based products to knowledge-based products is compelling the New Product Development process to be more innovative and efficient, making innovation processes even more challenging. Methods for structural and topological optimization, based on generative algorithms, are now used by practitioners to obtain optimal geometrical solutions that were earlier only possible after costly and time consuming trial and error approaches. As Product Life Cycle Management is being integrated with Knowledge Management methods and tools, new alternatives arise regarding the creation of new paradigms of the Engineering Desktop. New Knowledge-Based Engineering systems support innovators' activity through rules and knowledge re-use, thus reducing the product development time while increasing its functionality, quality and reducing environmental damage.

Some existing ideas and concepts of Computer Aided Innovation (CAI) focus on assisting product designers in their creative stage, however a more comprehensive vision conceives more comprehensive CAI systems that begin at the creative stage of perceiving business opportunities and customer demands, that also offer support for developing inventions and also provide help for turning inventions into successful innovations in the market. It is now accepted that computers have an important role to play in helping innovators to find the direction and solutions for new products and processes. In order to achieve higher performance in product and process innovation the Theory of Inventive Problem Solving (TRIZ) is being integrated into CAI Systems. As a result new methods and tools are taking shape under the name of Computer Aided Innovation that are now helping engineers and technicians to find innovative solving approaches. CAI therefore stands out as being a break from the usual trends.

The 2nd IFIP Working Conference on Computer Aided Innovation will play an important role in clarifying the essential factors characterizing these new arising methods and tools for bridging the gap between the traditional methods and current trends in search of efficient innovation. The Conference provides a forum for presenting and discussing current research and recent advancements in all fields of supporting innovation with computer tools for product and process development.

The aims of the papers presented at the conference are:

- Making contributions for clarifying the role of computer aided innovation tools.

- Contributing to the further development of the Engineer's Desktop focusing on end-to-end product creation process with methods and tools to ensure the feasibility and success of innovations in early stages of the innovation process product-related validation (e.g. requirements processing, simulation) process-related validation (e.g. frontloading).
- Enhancing the engineering innovation activity with computer tools and methods.
- Discussing organizational, technological and cognitive aspects of the application of CAI methods and tools, and also contributing to the evaluation of their effectiveness and efficiency.
- Developing the theoretical foundations of CAI.

The contributions published in this proceeding represent the state of the art in research, development and implementation in these fields. They include:

- Research Papers describing contributions and latest results of fundamental investigations;
- Industrial Papers presenting applications of CAI experiences and methods;
- Speculative Papers advancing experiences with new theories, approaches and methods, without necessarily offering validated results;
- Engineering Creativity and Innovation Papers on new experiences from education, training, teamwork and case examples.

The contributions are focused on following topics:

- The innovation process;
- Engineering design and innovation;
- TRIZ, CAI and Artificial Intelligence;
- Basic definitions to CAI;
- Fundamental approaches: CAD/CAE and CAI software;
- Optimization and innovation;
- Shape and topology generators and optimization;
- Integration of CAI methods and tools into engineering processes;
- Innovation in collaborative networks of enterprises;
- Social impact of innovations.

We would like to extend our sincere thanks and appreciation to the International Program Committee for their reviewing efforts and to the Local Organizing Committee for their hard work toward making this Working Conference a success.

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