

Short presentation of the GLOWA-Danube projects for the website of the GLOWA-Danube Stakeholder project

Title of the project

DANUBIA: A Web Based Modelling and Decision Support System for Integrative Global Change Research in the Upper Danube Basin

Project period

01.10.2000 – 28.02.2007

Institution

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Project coordination

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Brief Description

Tasks. Within the investigation of water related global change scenarios a variety of models, techniques and methods rooted within different parts of natural and socio-ecological sciences are applied. The goal of the project group computer science is to develop and provide an integrated decision support system that will be able to simulate water related issues under ecological and economical aspects.

Methodology. The development of the DANUBIA system is accompanied by methods of object oriented software engineering based on the unified modeling language UML and the programming language Java. In particular the UML was applied by all GLOWA-Danube project groups as a common modelling language to specify the interfaces between the different disciplines. The main tasks during the development of the current DANUBIA system were to design the system architecture, to handle the simulation space, to coordinate time-dependent, distributed and integrated simulations and to realize the system control mechanisms and network communication issues.

Current results. In the first phase of the GLOWA-Danube project a system was developed which integrates the sixteen DANUBIA model implementations which were realized by the different participating disciplines. The DANUBIA system is installed on a cluster consisting of 52 nodes. A number of integrated simulations were carried out whose results were analysed and evaluated by the project partners within the

respective discipline. The evaluations may be found in the particular final reports of the first project phase.

Continuation. In the second project phase of GLOWA-Danube the DANUBIA system will be extended towards a decision support system, which allows to investigate complex environmental scenarios involving deep actor models, i.e. decision making procedures, and to support the user in deciding on a sustainable environmental management. A web based user interface is planned, which provides possibilities to configure and start simulations just like to define and evaluate scenarios.

Publications

The following list provides an overview of the most important publications with participation of the group computer science in the context of GLOWA-Danube.

- Michael Barth, Alexander Knapp: A coordination architecture for time-dependent components. In M. H. Hamza, editor, Proc. 22nd Int. Multi-Conf. Applied Informatics. Software Engineering (IASTED SE'04), 6-11, ACTA Press, 2004.
- Rolf Hennicker, Hubert Baumeister, Alexander Knapp, Martin Wirsing: Specifying component invariants with OCL. In: K. Bauknecht, W. Brauer, T. Mück (eds.): Proc. GI/OCG-Jahrestagung, Bd. 157/I books@ocg.at, 600-607, ÖGI (Austrian Computer Society), Wien, 2001.
- Rolf Hennicker, Michael Barth, Andreas Kraus, Matthias Ludwig: An integrated simulation system for global change research in the upper danube basin. First World Congress on Information Technology in Environmental Engineering, ITEE 2003.
- Rolf Hennicker, Nora Koch: A UML-based methodology for hypermedia design. In: A. Evans, S. Stuart, and B. Selic (editors), UML'2000 - The Unified Modeling Language – Advancing the Standard, Lecture Notes in Computer Science 1939, York, England, October 2000, 410-424, Springer Verlag.
- Rolf Hennicker, Nora Koch: Systematic design of web applications with UML. In: Keng Siau, Terry Halpin (editors), Unified Modeling Language: Systems Analysis, Design and Development Issues, IDEA Group Publishing, 1-20, 2001.
- Nora Koch, Andreas Kraus: Towards a common metamodel for the development of web applications. In Third International Conference on Web Engineering (ICWE 2003). J.M. Cueva Lovelle, B.M. Gonzalez Rodriguez, L. Joyanes Aguilar, J.E. Labra Gayo, M.P. Paule Ruiz, editors, LNCS 2722, Springer Verlag, 497-506, July 2003.
- R. Ludwig, W. Mauser, S. Niemeyer, A. Colgan, R. Stolz, H. Escher-Vetter, M. Kuhn, M. Reichstein, J. Tenhunen, A. Kraus, M. Ludwig, M. Barth, R. Hennicker: Web-based modeling of water, energy and matter fluxes to support decision making in mesoscale catchments - the integrative perspective of GLOWA-Danube. Physics and Chemistry of the Earth 28, 621-634, 2003.
- U. Strasser, M. Weber, W. Mauser, R. Hennicker, M. Kuhn: Integration of expert model components into the object-oriented decision support system DANUBIA - the example of snow modelling. In: Geophysical Research Abstracts, abstracts of the European Geosciences Union 1st General Assembly, Nice, France, 2004.

Project Meetings

The members of the group computer science have participated in the following GLOWA-related events.

2001

12.-16.03.2001: GLOWA-Danube Workshop, Frauenchiemsee

06.07.2001: Meeting of all GLOWA-Danube project groups, Munich

26.-28.10.2001: GLOWA-Danube Workshop, Kleinwalsertal/Austria

14. und 16.11.01: GLOWA-Danube Developer Meeting: Introduction to Java, Munich

15.11.01: GLOWA Workshop „Integrative Methods within the GLOWA Projects”, Munich

2002

04.03.2002: Meeting of all GLOWA-Danube project groups, Munich

14.-15.03.2002: Meeting of all GLOWA-Danube project groups, Munich

06.-08.05.2002: GLOWA Status Conference, München

17.05.2002: Bilateral meeting with the group Farming, Hohenheim

04.-05.07.2002: Meeting of all GLOWA-Danube project groups, Munich

01.-02.08.2002: Meeting of all GLOWA-Danube project groups, Munich

29.-30.08.2002: Meeting of all GLOWA-Danube project groups, Freiburg

19.-20.09.2002: Meeting of all GLOWA-Danube project groups, Stuttgart

2003

17.02.2003: Bilateral meeting with the group Tourism, Munich

23.-27.02.2003: GLOWA-Danube Workshop, Maria Waldrast, Österreich

07.03.2003: Bilateral meeting with the group Farming, Munich

05.05.2003: Bilateral meeting with the group Economy, Munich

06.05.2003: Bilateral meeting with the group Farming, Munich

04.07.2003: Bilateral meeting with the group Household, Saarbrücken

17.-18.07.2003: Meeting of all GLOWA-Danube project groups, Munich

05.09.2003: Meeting of the actor project groups, Kassel

16.-17.09.2003: Meeting of all GLOWA-Danube project groups, Munich

2004

17.-19.03.2004: GLOWA-Danube Developer Meeting: Design and Development of Danubia Components, Munich

31.05.-04.06.2004: GLOWA-Danube Workshop, Frauenchiemsee

12.07.2004: Meeting of the actor project groups, Stuttgart

04.08.2004: Meeting of the actor project groups, Stuttgart

Conferences/International Workshops

The member of the group computer science participated in the following international events, which addressed research aspects relevant for GLOWA-Danube. In most events, talks were given reporting on current research results.

Fifth international conference on "Formal Methods for Open Object-Based Distributed Systems (FMOODS'02)", Enschede (Niederlande), March 2002, Member of the programme committee.

Second international workshop on "Web Oriented Software Technology (IWWOST'02)" held at the conference ECOOP'02 (European Conference on Object-oriented Programming), Malaga (Spain), June 2002, Talk on "The Expressive Power of UML-based Web Engineering".

International conference on "Integrated Design and Process Technology (IDPT'02)", Pasadena (USA), June 2002, Talk on "Generation of Web Applications from UML Models".

International conference on "Information Technologies in Environmental Engineering (ITEE'03)", Gdansk (Polen), Juni 2003, Talk on "An Integrated Simulation System for Global Change Research in the Upper Danube Basin".

Third international conference on "Web Engineering (ICWE'03)" and third international workshop on "Web Oriented Software Technology (IWWOST'03)", Oviedo (Spain), July 2003, with talks on "Towards a Common Metamodel for the Development of Web Applications" (ICWE'03) and "Modeling Web Business Processes with OO-H and UWE" (IWWOST'03).