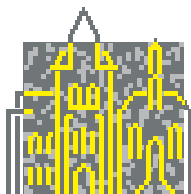H.-D. Ehrich (Univ. Braunschweig, D), J.-J. Meyer (Utrecht, NL),
M. Ryan (Univ. of Birmingham, GB)
(Editors)

Objects, Agents and Features

SCHLOSS DAGSTUHL

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UND FORSCHUNGSZENTRUM
FÜR INFORMATIK

Summary

There are many ways of structuring software, and the seminar focussed on an established one (object-orientation) and two emerging ones (agent-orientation and feature-orientation).

- The object paradigm is now widely used in software technology (with programming languages like C++ and Java, and OO modelling frameworks such as UML). However, the theoretical foundations of the object paradigm are not settled yet, although clean concepts and reliable foundations are more and more demanded not only by academia but also by practitioners. In particular, the precise meaning of UML concepts is subject to wide debate.

- Agents are more special kinds of objects, having more autonomy, and taking more initiative. For this reason, agent-oriented programming is sometimes referred to as 'subject-oriented' rather than 'object-oriented', indicating that an agent is much more in control of itself than an object which is manipulated by other entities (objects). There is some work on investigating typical object notions like inheritance in the context of agents. An interesting question is whether this is a fruitful way to go. Typically, agents are thought of being endowed with 'mental states' involving concepts like knowledge, belief, desires and goals, in order to display autonomous and in particular pro-active behaviour.

- Features are optional extensions of functionality which may be added to a software product, in order to reflect changes in requirements. They also cut across the class structure, because implementing a feature typically involves updating several classes or objects. The more complex the system is, the harder it is to add features without breaking something; this phenomenon has been dubbed the 'feature interaction problem'. Because users like to think of a system as comprising a base system together with a number of features on top, features could potentially be seen as a structuring mechanism rivalling objects and agents.

In recent years, concepts in object-oriented modeling and programming have been extended in several directions, giving rise to new paradigms such as agent-orientation and feature-orientation.

The Dagstuhl seminar explored the relationship between the original paradigm and the two new ones. The participants' reaction was very positive, and we are planning a Springer-Verlag book of the proceedings. See `http://www.cs.bham.ac.uk/~mdr/research/dagstuhl03/cfp`

Presentation and publication

There were approximately 30 oral contributions, of which 15 were from young researchers. There were no keynote presentations and no posters. None of the papers have been

published under the auspices of the Seminar, but a book is planned (as mentioned above). The presentations were wide-ranging and varied.

- **List of Talks (/03081/Proceedings/)**

Scientific highlights

The main highlight was the exploration of the novel theme which ran throughout the seminar, namely the intersection and interaction between the three concepts of the seminar title. Some of the issues are highlighted in the following table.

Objects	*Agents*	*Features*
basic structuring mechanism	structuring mechanism	secondary structuring mechanism; cuts across existing structure
private data & message passing	private data & communication	violates privacy; invades code
reactive	deliberative, reflective, having belief/desire/ intention	"goal oriented" desirable
prescribed behaviour	autonomous	autonomy desirable
monotonic (+ overriding)	non-monotonic	non-monotonic

Participants

- Ahlbrecht, Peter (TU Braunschweig)
- Brass, Stefan (TU Clausthal)
- Bredereke, Jan (-1)
- Calder, Muffy (University of Glasgow)
- Dastani, Mehdi (Utrecht University)
- Depke, Ralph (Universität Paderborn)
- Ehrich, Hans-Dieter (TU Braunschweig)
- Gaston, Christophe (CEA – Gif sur Yvette)
- Guelev, Dimitar (University of Birmingham)
- Guessoum, Zahia (Université Paris VI)
- Harding, Aidan (University of Birmingham)
- Harris, Hannah (University of Birmingham)
- Heisel, Maritta (Universität Duisburg-Essen)
- Himmelspach, Jan (Universität Rostock)
- Hulstijn, Joris (Utrecht University)
- Kollmann, Maik (TU Braunschweig)
- Küster Filipe, Juliana (University of Birmingham)
- Logrippo, Luigi (Université du Québec en Outaouais)
- Margaria, Tiziana (Universität Göttingen)
- Meier, Philipp (LMU München)
- Meyer, John-Jules Ch. (Utrecht University)
- Miller, Alice (University of Glasgow)
- Prehofer, Christian (DOCOMO Euro-Labs – München)
- Ramos Salavert, Isidro (Universidad Politécnica – Valencia)
- Reiff-Marganiec, Stephan (University of Leicester)
- Ricci, Alessandro (University of Bologna)
- Röhl, Mathias (Universität Rostock)
- Ryan, Mark D. (University of Birmingham)
- Saake, Gunter (Universität Magdeburg)
- Schobbens, Pierre-Yves (University of Namur)
- Souquieres, Jeanine (INRIA – Nancy)
- Van Riemsdijk, Birna (Utrecht University)

- von Schwichow, Carsten (TU Ilmenau)
- Wieringa, Roel J. (University of Twente)
- Wirsing, Martin (LMU München)
- Zhang, Nan (University of Birmingham)