

SIGGRAPH 1991
18th International Conference
On Computer Graphics and
Interactive Techniques

Las Vegas Convention Center
28 July - 2 August

COURSE NOTES

C22

OBJECT AND CONSTRAINT
PARADIGMS FOR GRAPHICS

Chair

Edwin H Blake
Centre for Mathematics and
Computer Science

Lecturers

Bjorn N Freeman-Benson
University of Washington
Chris Laffra
Software Engineering Research
Center
Peter Wisskirchen
Gesellschaft für Mathematik und
Datenverarbeitung

Object and Constraint Paradigms for Graphics

Speakers:

Edwin H. Blake

Bjorn N. Freeman-Benson

Chris Laffra

Peter Wisskirchen

Course Abstract

Object and Constraint Paradigms for Graphics

Object-oriented techniques are very appropriate for structuring complex designs in computer graphics. The characteristic requirements of graphics have also prompted further developments of this approach. This course covers necessary concepts and the extensions needed for their application to graphics, as well as the implementations of these ideas.

There is a comparison of object-oriented and classical approaches to computer graphics. General techniques are demonstrated by tackling specific problems in graphics, interaction and animation. The solutions derived are interesting in their own right. The course covers constraint-based techniques — a useful extension of object-oriented methods. Highlights of recent progress in object-oriented graphics are also presented. Participants will thus be introduced to important current topics of research and should be able to follow their progress in future.

This is a course for computer graphics professionals who want state-of-the-art techniques for structuring complex graphics systems. It should also be useful for people who are dissatisfied with traditional programming techniques and are interested in new paradigms. It should also serve the needs of those familiar with object-oriented techniques who want to extend the basic framework for use in computer graphics — anyone who would attend both SIGGRAPH and OOPSLA.

A basic knowledge of programming and techniques in some area of graphics is required. Some exposure to object-oriented concepts will be helpful. The course will most benefit participants who are aware of problems with current methods for structuring graphics systems. It covers high-level ideas that are illustrated and motivated with practical examples.

The course will enable participants to design a graphical system using an object-oriented framework and constraint-based techniques. Participants who are already familiar with object-oriented programming will learn of the extensions that are needed for the successful application of object-oriented techniques to graphics. Participants with less practical experience will become aware of the restrictions of current systems and the benefits the extended object-oriented approach has to offer.

SCHEDULE

8:30	INTRODUCTION	Edwin Blake
8:40	Object Oriented Methods for Graphics (I)	Chris Laffra
9:30	Object-Oriented and Classical Approaches (II)	Peter Wisskirchen
10:10	Models and Actors (III)	Edwin Blake
11:00	Introduction to Constraints (IV)	Bjorn Freeman-Benson
11:30	Aspects of Object-Oriented Graphics Systems (V)	Peter Wisskirchen
12:15	LUNCH BREAK	
1:45	Demonstrations and Questions	all
2:45	Object-Oriented Frameworks for Interaction and Graphics (VI)	Chris Laffra
3:30	More about Constraints (VII)	Bjorn Freeman-Benson
4:15	Advanced Techniques (VII)	Edwin Blake
5:00	CLOSE	

Speakers

Edwin H. Blake

Centre for Mathematics and Computer Science (CWI)

Senior Researcher (Interactive Systems Department)

Kruislaan 413

1098 SJ Amsterdam

The Netherlands

Telephone +31 20 5924009

Fax +31 20 5924199

Email edwin@cwi.nl

Edwin Blake is a researcher in the Interactive Systems Department of the Centre for Mathematics and Computer Science (CWI) in Amsterdam, the Netherlands. He is active in designing new architectures for interactive graphics systems. He is also investigating the applicability of object-oriented programming to computer graphics and animation. He received his Ph.D. in 1989 from Queen Mary College, University of London. The work was on adaptive data structuring for computer animation.

He is a joint organiser (with Laffra) of the second Eurographics workshop on Object-Oriented Graphics to be held in 1991. He presented the state of the art report on Object-Oriented Graphics at Eurographics'90.

Bjorn N. Freeman-Benson

University of Washington

Dept of Computer Science &
Engineering

FR-35

University of Washington

Seattle, WA, 98195

USA

Telephone +1 206 543-4226 (office)

+1 206 543-1695 (main #)

Fax +1 206 543-2969

Email bnfb@cs.washington.edu

Bjorn Freeman-Benson is finishing his Ph.D. at the University of Washington. His research areas are programming languages and user interfaces, and his thesis topic is an integration of the imperative object-oriented and the declarative constraint programming paradigms to support building interactive graphical user interfaces. He is implementing a language based on this integration. The language, Kaleidoscope, is described in his 1990 ECOOP/OOPSLA paper. Other related research at the University of Washington includes hierarchical constraint logic programming and constraint-based tools for building user interfaces, such as ThingLab II. In August he will join the Department of Computer Science at the University of Victoria as an Assistant Professor.

Chris Laffra

SERC — Software Engineering Research Center

**P.O Box 424
3500 AK Utrecht
The Netherlands**

**Telephone: +31 30 322640
Fax +31 30 341249
Email laffra@serc.nl**

Chris Laffra is completing a Ph D at Leiden University, The Netherlands. His research in object-oriented languages shows their applicability to user-interface design. He has concluded an implementation of the concurrent object-oriented language Procol of which he is co-designer [see paper OOPSLA'89]. He is also a co-author of an object-oriented framework for interaction based on delegation instead of inheritance [see paper First Eurographics Workshop on Object-Oriented Graphics, Königswinter, 1990].

He is currently working for the SERC, Software Engineering Research Centre, in Utrecht, The Netherlands. Related research performed at SERC includes DIGIS, a direct manipulation tool to design an interactive direct-manipulation application interactively. He is a joint organizer (with Blake) of the Second Eurographics Workshop on Object-Oriented Graphics.

Peter Wisskirchen

Gesellschaft für Mathematik und Datenverarbeitung

Director of Institute for Applied Information Technology

**Schloss Birlinghoven
P O Box 1240
D-5205 St. Augustin 1
Germany**

**Telephone +49 2241 142315
Fax +49 2241 142618
Email wissk@gmdzi.de**

Peter Wisskirchen is a director of the Institute for Applied Information Technology of the GMD (German National Research Center for Computer Science) in St. Augustin, near Bonn, Germany. His research interests include computer graphics, generalized man-machine communication, and integrated office information systems. Wisskirchen is the chairman of the special interest group in Graphics Systems within the German scientific and professional computing organization, "Gesellschaft für Informatik" (GI). He also coordinates the computer graphics activities of Germany's large-scale national research centres (AGF). Wisskirchen is one of the pioneers in the definition of the computer graphics standard GKS. He was a member of the first editorial subgroup, which produced the early specifications for GKS. Wisskirchen received his Ph D in Mathematics from the University of Bonn in 1969.

In his book "Object-Oriented Graphics — From GKS and PHIGS to object-oriented Systems" (Springer Verlag, 1990) Wisskirchen shows the potential of object-oriented system, and he builds a bridge between traditional systems and the object-oriented approach.

Contents

Chapter I	Object Oriented Methods for Graphics <i>Chris Laffra</i>	
	Slides	I-1
	Notes	I-12
Chapter II	Object-Oriented and Classical Approaches <i>Peter Wisskirchen</i>	
	Slides	II-1
	Notes	II-9
Chapter III	Models and Actors <i>Edwin Blake</i>	
	Slides	III-1
	Notes	III-13
Chapter IV	Introduction to Constraints <i>Bjorn Freeman-Benson</i>	
	Slides	IV-1
	Bibliography	IV-9
Chapter V	Aspects of Object-Oriented Graphics Systems <i>Peter Wisskirchen</i>	
	Slides	V-1
	Notes	V-11
	Appendix (Reprints from <i>Object-oriented Graphics</i>).	V-13
Chapter VI	Object-Oriented Frameworks for Interaction and Graphics <i>Chris Laffra</i>	
	Slides	VI-1
	Notes	VI-17
Chapter VII	More about Constraints <i>Bjorn Freeman-Benson</i>	
	Slides	VII-1
	Strength Guided Motion (Lee et al)	VII-15
	An Incremental Constraint Solver (Freeman-Benson et al)	VII-25
	Creating Interactive Techniques by Symbolically Solving Geometric Constraints (Olsen & Allan)	VII-35
	Kaleidoscope (Freeman-Benson)	VII-41

Chapter VIII	Advanced Techniques	
	<i>Edwin Blake</i>	
	Slides	VIII-1
	Notes	VIII-11
Demonstration	A Demonstration and Questions Session of about fifty minutes will be held during the afternoon session.	