

Heather D. Pfeiffer Timothy E. Nagle (Eds.)

Conceptual Structures: Theory and Implementation

7th Annual Workshop

Las Cruces, NM, USA, July 8-10, 1992

Proceedings

Springer-Verlag

Berlin Heidelberg New York

London Paris Tokyo

Hong Kong Barcelona

Budapest

Lecture Notes in Artificial Intelligence

754

Subseries of Lecture Notes in Computer Science

Edited by J. Siekmann

Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis



Series Editor

Jörg Siekmann

University of Saarland

German Research Center for Artificial Intelligence (DFKI)

Stuhlsatzenhausweg 3

D-66123 Saarbrücken, Germany

Volume Editors

Heather D. Pfeiffer

Computing Research Laboratory, New Mexico State University

Box 30001/3 CRL, Las Cruces, NM 88003-0001, USA

Timothy E. Nagle

Center for Research in Learning, Perception and Cognition

at the University of Minnesota, and Unisys Corporation

1641 E Old Shakopee Road, Bloomington, MN 55425, USA

CR Subject Classification (1991): I.2, G.2.2, H.2.1

ISBN 3-540-57454-9 Springer-Verlag Berlin Heidelberg New York

ISBN 0-387-57454-9 Springer-Verlag New York Berlin Heidelberg

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1993

Printed in Germany

Typesetting: Camera ready by author

Printing and binding: Druckhaus Beltz, Hemsbach/Bergstr.

45/3140-543210 - Printed on acid-free paper

Preface

This book was drawn from the papers presented at the Seventh Annual Workshop on Conceptual Graphs. The workshop was held at New Mexico State University in Las Cruces, New Mexico, USA and was sponsored by the American Association for Artificial Intelligence and the NMSU Computer Science Department. The authors were invited to submit expanded versions of their papers for this book. The contents of this volume roughly generalize into the areas of: representation issues, reasoning, data modeling and databases, algorithms and tools, and applications and natural language.

One of the highlights of this workshop was the landmark meeting of the first PEIRCE Project Workshop. The PEIRCE Project was announced earlier this year and its participants gathered this summer for the first time to discuss their work and the project. The PEIRCE Project aims to "... build a state-of-the-art, industrial strength conceptual graphs workbench. PEIRCE is integrating the conceptual graphs development efforts that are taking place around the world." (Ellis & Levinson, this volume).

The workshop as a whole was successful in viewing what is currently being explored in several areas of research in Conceptual Structures. The areas of active research include: sharing and structuring knowledge, graph matching and projection algorithms, constraint propagation, type hierarchy processing, uncertain and plausible reasoning, and natural language issues. As demonstrated by the PEIRCE project, there is also significant interest in the practical application of Conceptual Structures. Included are reports on the PEIRCE project, bridging accounting and business planning, open systems interconnection notation and the analysis of radiology reports. In all, this volume is fairly well rounded, covering several dimensions with both theoretical and practical papers.

Heather Pfeiffer
Timothy E. Nagle
September, 1993

Table of Contents

Knowledge Representation Issues - General	1
The Scope of Coreference in Conceptual Graphs John W. Esch	3
Using World Structures for Factoring Knowledge Bernard Moulin and Guy W. Mineau	13
Sharing Knowledge: Starting with the Integration of Vocabularies Guy W. Mineau	34
A Conceptual Graphs Approach to Information Systems Design Linda Cambell and Peter Creasy	46
 Knowledge Representation Issues - Special	 57
Representing Knowledge about Substances William M. Tepfenhart	59
Representing Temporal Knowledge in Discourse: an Approach Extending the Conceptual Graph Theory Bernard Moulin	72
Towards a Semantics of Inchoative and Causation Events in Conceptual Graphs Pavel Kocura	96
Does Every Difference Make a Difference? Jonathan C. Oh and Stephen Graham	113
An Exploration into Semantic Distance Harry S. Delugach	119

Reasoning	125
A Reconstruction of Conceptual Graphs on Top of a Production System	127
Jacques Bouaud and Pierre Zweigenbaum	
On Uncertainty Handling in Plausible Reasoning with Conceptual Graphs	137
Sung H. Myaeng and Christopher Khoo	
Expert Humans and Expert Systems: Toward a Unity of Uncertain Reasoning	148
Weldon Whipple	
Knowledge Fusion	158
Brian John Garner and Dickson Lukose	
Databases and Modeling	169
Using Conceptual Structures to Translate Data Models: Concepts, Context and Cognitive Processes	171
Gary Berg-Cross	
Towards Deductive Object-Oriented Databases Based on Conceptual Graphs	188
Vilas Wuwongse and Bikash C. Gosh	
AERIE: Database Inference Modeling and Detection Using Conceptual Graphs	206
Hary S. Delugach and Thomas H. Hinke	
Tools and Algorithms	217
The Birth of PEIRCE: A Conceptual Graphs Workbench	219
Gerard Ellis and Robert Levinson	
Specialization: Where Do the Difficulties Occur?	229
M. Chein and M. L. Mugnier	

Polynomial Algorithms for Projection and Matching M. L. Mugnier and M Chein	239
CGMA: A Novel Conceptual Graph Matching Algorithm Gi-Chul Yang, Young Bae Choi and Jonathan C. Oh	252
An X-Windows Toolkit for Knowledge Acquisition and Representation Based on Conceptual Structures Michel Wermelinger and Jose Gabriel Lopes	262
 Natural Language and Applications	 273
Assembly of Conceptual Graphs from Natural Language by Means of Multiple Knowledge Specialists Graham A. Mann	275
A System that Translates Conceptual Structures into English Sait Dogru and James R. Slagle	283
Knowledge Based Analysis of Radiology Reports Using Conceptual Graphs Martin Schroeder	293
Open Systems Interconnection Abstract Syntax Notation: ASN.CG Timothy R. Hines	303
Bridging Accounting and Business Strategic Planning Using Conceptual Graphs Simon Polovina	312
Skeletal Plans Reuse: A Restricted Conceptual Graph Approach Wu Zhaohui, Bernardi Ansgar and Klauck Christoph	322