Advances in Artificial Intelligence

CIIAM 86

Proceedings of the 2nd International Conference on Artificial Intelligence

Achevé d'imprimer en avril 1987
sur les presses de l'imprimerie Laballery
58500 Clamecy
Dépôt légal : avril 1987
Numéro d'impression : 703111

Advances in Artificial Intelligence

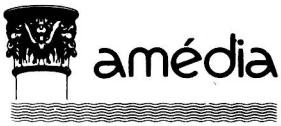
CIIAM 86

Proceedings of the 2nd International Conference on Artificial Intelligence

December 1-5, 1986
Marseille

Kogan Page

Conference organized by



INSTITUT INTERNATIONAL
DE ROBOTIQUE ET
D'INTELLIGENCE
ARTIFICIELLE
DE MARSEILLE

First published in 1986 by Hermes
51 rue Rennequin, 75017 Paris, France

English language edition first published in 1987
by Kogan Page Ltd, 120 Pentonville Road, London N1 9JN

British Library Cataloguing in Publication Data

International Conference on Artificial Intelligence
(2nd : 1986 : Marseilles)
Advances in artificial intelligence : proceedings of the 2nd International Conference on Artificial Intelligence.
1. Artificial intelligence
I. Title
006.3 Q335

ISBN 1-85091-333-1

Printed and bound in France by Imprimerie Laballery.

Conference Chairman

Hubert CURIEN, Professor at Université Paris VI.

Organizing Committee

Chairman
Marc BERGMAN, IIRIAM, Marseille

J.-M. LE DIZES, AMEDIA / CETE / Aix les Milles
F. MORIER, CEA / Centre de Cadarache
J.-C. RAULT, ADI
S. ROBERT, IIRIAM

Program Committee

Chairman
Eugène CHOURAQUI, GRTC/CNRS, Marseille (France)

M. ADAM, IBM, Centre scientifique, Paris (France)
Y. ANZAI, Hokkaïdo Univ. (Japan)
M. ARRIDI, Univ. Stockolm (Sweden)
M. BENGIO, SCHLUMBERGER / Montrouge (France)
M. BERGMAN, IIRIAM / Marseille (France)
M. BIBEL, Univ. München (W. Germany)
A. BONNET, ENST / COGNITECH (France)
P.P. BONISSONE, GENERAL ELECTRIC / Schenect. (USA)
J. CAMPAGNE IBARCQ, COMPAGNIE BANCAIRE (France)
A. COLMERAUER, GIA / Univ. Marseille-Luminy (France)
N. COT, Univ. Paris VI (France)
L. DEMIANS D'ARCHIMBAULD, CIMSA (France)
R. DE MORI, Mc GILL Univ. Montréal (Canada)
H. FARRENY, Univ. Paul Sabatier, Toulouse (France)

F. GALLINO, CSI Piemonte (Italy)
N. GIAMBIASI, LAM / Univ. Aix Marseille III (France)
G. GUIHO, CGE / Marcoussis (France)
G. KAHN, INRIA / Sophia-Antipolis (France)
S. KAIHARA, Univ. Tokyo Hospital (Japan)
H. KANOUI, IIRIAM / Marseille (France)
M. KODRATOFF, LRI / Univ. Paris Sud (France)
R. KOWALSKI, Imperial College / London (U.K.)
D. DE LAPPARENT, CEA / Centre de Cadarache (France)
J.-M. LE DIZES, CETE / Aix les Milles (France)
G. LE GUILLOU, CEA Cadarache / AMEDIA (France)
J. LOWARANCE, AI Center, SRI (USA)
H. MELONI, GIA / Univ. Marseille-Luminy (France)
W. PEIZHUANG, Beijing Normal Univ. (China)
A. PERROT, ELF AQUITAINE (France)
J.C. RAULT, ADI (France)
Ph. ROUSSEL, Cie BULL, CEDIAG (France)
E. SANCHEZ, Lab. Inf. Médicale / Marseille (France)
J. SAULAIS, Avions Marcel Dassault (France)
C. SCHWIND, CNRS / GRTC Marseille (France)
M. SOMALVICO, Politecnico di Milano (Italy)
M. VALETTE, CERT DERI / Toulouse (France)
M. F. VANDAMME, Univ. Gand (Belgium)
W. WAHLSTER, Univ. des Saarlandes / Saarbrücken (W. Germany)
T. YAMAKAWA, Kumamoto Univ. (Japan)
L.A. ZADEH, Univ. California / Berkeley (USA)
M. ZWINGELSTEIN, EDF Chatou (France)

Objectives

The object of this international conference is to encourage scientific exchange between academic reasearchers and industry concerning the development of knowledge based systems.
To assist this transfer of technology, the conference is organised along three main lines :
— Tutorials designed aid professionals to apply these new technologies.
— Presentation of the state of the art in scientific research and the methodologies used in developing applications.
— An exhibition of industrial products, prototypes involved in hardware and software.

Contents

Reasoning

Applications to Social Sciences

Learning

Speech Recognition

Applications to Technical Domains: General Tools

Applications to Technical Domains: Process Control

Man-Machine Communication

Knowledge Acquisition and Representation

The Filtering Process: a Mechanism for Modelling Inheritance in Object Oriented Languages

P. Dugerdil

GRTC / CNRS, Marseille (France)

In this paper, we examine the inheritance process in object-oriented languages in the light of a general mechanism: the filtering process. This approach provides a basis for the analysis and comparison of inheritance processes. We begin with three hypotheses that constitute the axioms of our model and we introduce the notions of the filtering process and the transfer function of a filter. For these notions, we examine the inheritance process between objects. The paper ends with a description of the inheritance mechanisms incorporated in the object-oriented language developed at GRTC.

Introduction

In the object-oriented representation of knowledge, the concepts are represented by classes and relationships between classes. A class contains slots that represent the attributes of the concept described by class. An individual belonging to a concept is said to be an instance of the associated class. Usually a given class can share slots with other classes representing more general concepts. The former is said to be a subclass of the latter, its superclass, and can inherit slots from them through specific relations (Stefik and Bobrow 1986). Although the common case is simple inheritance, ie a class is a subclass of only one class, some artificial intelligence (AI) languages have introduced multiple inheritance (Fikes and Kehler 1985). The sharing of slots between classes is usually total, ie the subclass inherits all the slots of its superclasses. This process can be extended in fact to the case where classes share not all but only some of their slots (Chouraqui and Dugerdil 1986, Wright and Fox 1985). The mechanisms of sharing knowledge between objects can be seen as a filtering process. This view allows the inheritance mechanisms of existing object-oriented languages to be analysed.

The Inheritance Model

The first hypothesis states that a class is allowed to innerit slots from another class only if those slots contribute to the description of its associated concepts.

The second hypothesis states that the slots that describe a concept are those declared in the class representing the concept plus those inherited by this class, ie those belonging to the class.

The third hypothesis states that when an instance is created the slots to which one can assign values are those that belong to its class. One cannot add slots to an instance that is not declared or inherited by its class.

If this hypothesis was not satisfied, then, following the second hypothesis, the concept to which the instance belongs would be different from that of its class.

Many processes have been described to inherit slots in a graph of classes (Bobrow and Winograd 1977, Brachman and Schmolze 1985, Carbonell 1981, Etherington and Reiter, Ferber 1983, Wright and Fox 1985). Here we propose a paradigm to represent slot inheritance by objects: the filtering process. The specification of the inheritance properties for every object is made along two axes that fix the semantics of the corresponding inheritance relation:

1. selection of the objects from which to inherit information;
2. selection of the information inherited.

We model these selections with two filters located in the objects inheriting information:

1. an object filter (FO) whose input set is the set of all class names of the knowledge base;
2. a slot filter (FS) whose input set is the set of all the slots of the classes whose names are selected by FO.

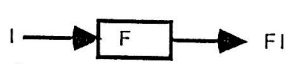
Every inheritance relation can then be replaced by its equivalent FO and FS filters for the study of the inheritance process.

The Filtering Process

Intuitively a filtering process is a selection operation among the elements of a set. The output of this process is the new set of filtered elements. The filtering process is defined as the transfer function f of a filter F over an input set I is a Boolean function f:I->{0,1}. The result returned by this function is such that the output set of the filtering of I through F, denoted FI, is:

$$FI = \{ x \in I \mid f(x) = 1 \}.$$

Graphically, it can represented by:



Connecting filters in series

If filters are connected in such a way that the output set of one filter is the input set of the next filter, then those filters

are said to be serially connected. Let F1 and F2 be two serially connected filters and f1 and f2 be their transfer functions, respectively. The global output set of this filtering process over an input set I, denoted F1F2I, is:

$$F1F2I = \{ x \in I \mid f1(x) \wedge f2(x) = 1 \}$$

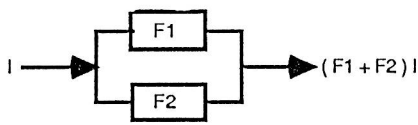
where $\wedge$ is the Boolean product. Graphically, it can represented by:

Connecting filters in parallel

If filters are connected in such a way that the input set is the same for every filter and that the output set is the union of the output sets of all the filters, then those filters are said to be connected in parallel. Let F1 and F2 be two filters connected in parallel and f1 and f2 be their transfer functions, respectively. The global output set of this filtering process over an input set I, denoted (F1+F2)I, is:

$$(F1+F2)I = \{ x \in I \mid f1(x) \vee f2(x) = 1 \}$$

where $\vee$ is the Boolean sum. Graphically, it can be represented by:



Properties

By the properties of the Boolean operators we obtain with regard to the global filtering characteristics:

1. the operation of connecting filters in series is commutative;
2. serial or parallel connections of filters are associative;
3. serial connection is distributive over parallel connection;
4. if the transfer function of a filter is independent of the input sets, then the filtering process is distributive over the union of input sets:

$$F(I \cup J) = FI \cup FJ.$$

The Inheritance Process

The set of slots belonging to a class is the set of slots declared in the class plus the set of slots inherited by the class (second hypothesis). Let the function Slot(c) be the