CATALA: Moving towards the future of legal expert systems

Liane Huttner[1] · Denis Merigoux[2]

Abstract

Around the world, private and public organizations use software called legal expert systems to compute taxes. This software must comply with the laws they are designed to implement. As such, a bug or an error in a program that leads to tax mis-calculations can have heavy legal and democratic consequences. However, increasing evidence suggests that some legal expert systems may not comply with the law. Moreover, traditional software development processes mean that legal expert systems are difficult to adapt to the continuous flow of new legislation. To prevent further software decay and to reconcile these systems with the growing demand for algorithmic transparency, we argue that there is a need for a new development process for legal expert systems. This new system must be built to comply with the law, in particular the GDPR. It must also respect democratic transparency. For these reasons, we present a solution built by lawyers and computer scientists: CATALA, a new programming language coupled with a pair programming development process.

Keywords Legal expert systems · Formal methods · Literate programming · Algorithmic transparency · Tax law · Social benefits

1 Introduction

How do governments compute taxes and social benefits for their citizens? Many have chosen to solve this complicated task by using computer programs. They have created software, modeled on the law, which computes the amount of tax due and the social benefits to be paid to each citizen.

These programs, called "legal expert systems", are based on the law. In other words, the program and its reference statute ought to be functionally equivalent.

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Moving Towards Expert Systems Globally I

Allen Kent

Moving Towards Expert Systems Globally I:

   The Handbook of Applied Expert Systems Jay Liebowitz,2019-07-23 The Handbook of Applied Expert Systems is a landmark work dedicated solely to this rapidly advancing area of study Edited by Jay Liebowitz a professor author and consultant known around the world for his work in the field this authoritative source covers the latest expert system technologies applications methodologies and practices The book features contributions from more than 40 of the world s foremost expert systems authorities in industry government and academia The Handbook is organized into two major sections The first section explains expert systems technologies while the second section focuses on applied examples in a wide variety of industries Key topics covered include fuzzy systems genetic algorithm development machine learning knowledge representation and much more   **Expertmedia--expert Systems and Hypermedia** Roy Rada,Klaus Tochtermann,1995 ExpertMedia is growing in popularity and brings together the well established disciplines of Human Computer Interaction and Artificial Intelligence ExpertMedia is a neologism from expert systems and hypermedia systems and is intended to synergistically combine the advantages of each of these components Expert System HyperMedia System ExpertMediaKey practitioners in the field have been meeting at the past two World Congresses on Expert Systems 1991 in Orlando and 1994 in Lisbon Their experience in the field is brought together in this book which disseminates information about this innovative area to a large audience The book consists of three different parts The first part introduces ExpertMedia in general the second part focuses on case studies of ExpertMedia and Medical Applications and the last part deals with ExpertMedia and Knowledge based Systems   *Encyclopedia of Library and Information Science* Allen Kent,2000-09-21 This is the 68th volume supplement 31 in a series which examines library and information science

   Knowledge Acquisition: Approaches, Algorithms and Applications Debbie Richards,Byeong-Ho Kang,2009-05-25 This book constitutes the thoroughly refereed post workshop proceedings of the 2008 Pacific Rim Knowledge Acquisition Workshop PKAW 2008 held in Hanoi Vietnam in December 2008 as part of 10th Pacific Rim International Conference on Artificial Intelligence PRICAI 2008 The 20 revised papers presented were carefully reviewed and selected from 57 submissions and went through two rounds of reviewing and improvement The papers are organized in topical sections on machine learning and data mining incremental knowledge acquisition web based techniques and applications as well as domain specific knowledge acquisition methods and applications   **Knowledge-Based Software Engineering** M. Virvou,T. Nakamura,2008-08-15 The papers in this publication address many topics in the context of knowledge based software engineering including new challenges that have arisen in this demanding area of research Topics in this book are knowledge based requirements engineering domain analysis and modeling development processes for knowledge based applications knowledge acquisition software tools assisting the development architectures for knowledge based systems and shells including intelligent agents intelligent user interfaces and human machine interaction development of multi modal

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Modern factories are experiencing rapid digital transformation supported by emerging technologies such as the Industrial Internet of things IIOT industrial big data and cloud technologies deep learning and deep analytics AI intelligent robotics cyber physical systems and digital twins complemented by visual computing including new forms of artificial vision with machine learning novel HMI simulation and visualization This is evident in the global trend of Industry 4 0 The impact of these technologies is clear in the context of high performance manufacturing Important improvements can be achieved in productivity systems reliability quality verification etc Manufacturing processes based on advanced mechanical principles are enhanced by big data analytics on industrial sensor data In current machine tools and systems complex sensors gather useful data which is captured stored and processed with edge fog or cloud computing These processes improve with digital monitoring visual data analytics AI and computer vision to achieve a more productive and reliable smart factory New value chains are also emerging from these technological changes This book addresses these topics including contributions deployed in production as well as general aspects of Industry 4 0 **Knowledge Engineering and Management** Guus Schreiber,2000 Prologue The Value of Knowledge 2 Knowledge Engineering Basics 3 The Task and Its Organizational Context 4 Knowledge Management 5 Knowledge Model Components 6 Template Knowledge Models 7 Knowledge Model Construction 8 Knowledge Elicitation Techniques 9 Modelling Communication Aspects 10 Case Study The Housing Application 11 Designing Knowledge Systems 12 Knowledge System Implementation 13 Advanced Knowledge Modelling 14 UML Notations Used in Common KADS 15 Project Management **Anti-GenetiX** Derrick A. Purdue,2017-11-01 This title was first published in 2000 The development of genetically modified foods has given rise to much widespread and heated debate on the possible consequences both positive and negative of this new technology This book not only addresses the broad issues involved outlining the connections between gene patenting and biotechnology and their impact on international relations but also for the first time examines the social movement emerging against GM food Anti GenetiX traces this movement from its emergence and shows how and why it expanded from a small expert concern to the current huge political uproar It explores the contribution this movement makes to shaping global civil society and argues that such global social movements will become increasingly common in the global age **Database and Expert Systems Applications** A Min Tjoa,Isidro Ramos,2012-12-06 The Database and Expert Systems Application DEXA conferences are mainly oriented to establish a state of the art forum on Database and Expert System applications But Practice without Theory has no sense as Leonardo said five centuries ago In this Conference we try a comprornise between these two complementary aspects A total of 5 sessions are application oriented ranging from classical applications to more unusual ones in Software Engineering Recent research aspects in Databases such as activity deductivity and or Object Orientation are also present in DEXA 92 as weIl as the implication of the new data models such as OO Model Deductive Model etc included in the Modelling sessions Other areas of interest such as Hyper Text and Multimedia application together with the classical field of Information

Retrieval are also considered FinaIly Implementation Apects are reflected in very concrete fields A total of of nearly 200 papers submitted from all over the world were sent to DEXA 92 Only 90 could be accepted A Poster session has also been establishcd DEXA 90 was held in Vienna Austria DEXA 91 in Berlin Germany and DEXA 92 will take place in Valencia Spain where we are celebrating the discovery of thc New World just five centurics ago in Leonardo s age Both the quality of the Conference and the compromise between Practice and Thcory are duc to the credit of all the DEXA 92 authors

Managing Information Technology in a Global Society Mehdi Khosrowpour,1991-01-01 Technological advances in information technology have created many new ways and structures in our lives Organizations now are mastering services of this technology in their business strategies productivity customer services and other managerial functions to stay competitive With a focus on the global issues of IT and its implications on organization this proceedings includes all the presentations of this international conference **Managing Information and Communications in a Changing Global Environment** Information Resources Management Association. International Conference,1995-01-01 Advances of information and communications technologies have created new forces in managing organizations These forces are leading modern organizations to reassess their current structures to become more effective in the growing global economy This Proceedings is aimed at the challenges involved in effective utilization and management of technologies in contemporary organizations

Expert System Fouad Sabry,2023-07-06 What Is Expert System In the field of artificial intelligence an expert system is a type of computer program that simulates the abilities of a human expert to make judgment calls Instead of using typical procedural code expert systems reason through bodies of knowledge which are primarily represented as if then rules This is in contrast to traditional computer programs which tackle complicated issues by writing procedural code In the 1970s the first expert systems were developed and later in the 1980s their use became more widespread Expert systems were one of the earliest forms of artificial intelligence AI software that was actually successful An expert system can be broken down into its two component subsystems which are the knowledge base and the inference engine The knowledge base is a collection of facts and guidelines The inference engine takes the rules and applies them to the known data in order to derive new information The capabilities of explanation and debugging are also sometimes included in inference engines How You Will Benefit I Insights and validations about the following topics Chapter 1 Expert system Chapter 2 Learning classifier system Chapter 3 AI winter Chapter 4 Constraint logic programming Chapter 5 Constraint satisfaction Chapter 6 CLIPS Chapter 7 Mycin Chapter 8 Knowledge engineering Chapter 9 Rule based machine learning Chapter 10 CADUCEUS expert system II Answering the public top questions about expert system III Real world examples for the usage of expert system in many fields Who This Book Is For Professionals undergraduate and graduate students enthusiasts hobbyists and those who want to go beyond basic knowledge or information for any kind of expert system What Is Artificial Intelligence Series The Artificial Intelligence eBook series provides comprehensive coverage in over 200 topics Each ebook covers a specific Artificial

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Policing and Intelligence in the Global Big Data Era, Volume I Tereza Østbø Kuldova,Helene Oppen Ingebrigtsen Gundhus,Christin Thea Wathne,2024-10-17 Policing and Intelligence in the Global Big Data Era Volume I the first of a two volume set presents a rich and unique collection of global perspectives on data driven predictive technologies and the expansion and use of surveillance apparatuses in policing and intelligence both public and private Centered around the notion of algorithmic governance this volume explores various practices of abstract and intelligence led policing within the context of surveillance and regulatory capitalism Each chapter interrogates these concepts as much as realities on the ground as they play out across the globe from Russia USA India Brazil to Denmark Germany and Norway The volume offers a unique insight into the ways in which technologies and data driven practices from facial recognition predictive algorithms to generative AI are reshaping cultures of policing both within and beyond police proper Particular attention is paid to the simultaneous privatization and pluralization policing and intelligence and to the proliferation of new intelligence actors Academics students and readers interested in the fields of criminology social anthropology critical algorithm **Global Business Expansion: Concepts, Methodologies, Tools, and Applications** Management Association, Information Resources,2018-04-06 As businesses seek to compete on a global stage they must be constantly aware of pressures from all levels regional local and worldwide The organizations that can best build advantages in diverse environments achieve the greatest success Global Business Expansion Concepts Methodologies Tools and Applications is a comprehensive reference source for the latest scholarly material on the emergence of new ideas and opportunities in various markets and provides organizational leaders with the tools they need to be successful Highlighting a range of pertinent topics such as market entry strategies transnational organizations and competitive advantage this multi volume book is ideally designed for researchers scholars business executives and professionals and graduate level business students **Database and Expert Systems Applications** A. Hameurlain,A. Min Tjoa,1997-08-20 This book contains the refereed proceedings of the 8th International Conference on Database and Expert Systems Applications DEXA 97 held in Toulouse France September 1997 The 62 revised full papers presented in the book together with three invited contributions were selected from a total of 159 submissions The

papers are organized in sections on modeling object oriented databases active and temporal aspects images integrity constraints multimedia databases deductive databases and knowledge based systems allocation concepts data interchange digital libraries transaction concepts learning issues optimization and performance query languages maintenance federated databases uncertainty handling and qualitative reasoning and software engineering and reusable software **Nematode Identification and Expert System Technology** R. Fortuner,2013-06-29 The need to identify and name organisms is fundamental to any area of biological science basic or applied In order to study or conduct research on an organism or to convey information on this organism to others we must be able to attribute to it a consistent label Attribution of an incorrect label may have dire consequences if dangerous plant parasites are wrongly identified as members of an innocuous genus Traditional aids to nematode identification dichotomous keys use systematic criteria not always well adapted to practical identification Their reliance on dichotomous principlesdoes not allow for intra taxon variability or for missing characters They are difficult to update and they cannot keep pace with rapidly changing classifications As experts in everyday life we recognize a horse or a dog wi thout referring to the taxonomic descriptions of the genera Equus or Canis and their respective species Problems in identification arise when we are not experts in the recognition of a particular organism or group of organisms Then frequently in considerable frustration we reflect on the usefulness of having the advice of an expert in this group Tradi tional identification aids are useful tools for the expert identifiers and for teaching Their use is often difficult for general practitioners in nematology and they may lead to incorrect identification even at the genus level **Economics and Artificial Intelligence** Jean-Louis Roos,2014-05-09 Economics and Artificial Intelligence documents the proceedings of the IFAC IFORS IFIP IASC AFCET Conference held in Aix en Provence France on September 2 4 1986 This book discusses the design of intelligent dialogue in D S S qualitative modeling of economic studies basic propositions for intelligent systems design methods and expert systems for confirmatory data analysis The artificial intelligence for transaction cost economizing knowledge based evaluation of strategic investments and reasoning system for the guidance of technological transfer are also elaborated This text likewise covers the A I impacts on the process of the division of labor using automated techniques to generate expert systems for R and intelligent support to decision making process This compilation is a good reference for students and researchers conducting work on the nature of economics and artificial intelligence

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