A Framework for Organization-Aware Agents

Open systems are characterized by the presence of a diversity of heterogeneous and autonomous agents that act according to private goals. Organizations, such as those used in real-life to structure human activities such as task allocation, coordination and supervision, can regulate the agents' behavior space and describe the expected behavior of the agents. Assuming an open environment, where agents are developed independently of the Organizational structures, agents need to be able to reason about the structure, so that they can deliberate about their actions and act within the expected boundaries and work towards the objectives of the organization. In this paper, we present the AORTA reasoning framework and show how it can be integrated into typical BDI-agents. We provide operational semantics that enables agents to make organizational decisions in order to coordinate and cooperate without explicit coordination mechanisms within the agents. The organizational model is independent of that of the agents, and the approach is not tied to a specific organizational model, but uses an organizational metamodel. We show how AORTA helps agents work together in a system with an organization for choosing the best tender for a building project.
An Approach for Hospital Planning with Multi-Agent Organizations

The background for this paper is a development that the Danish hospitals are undertaking which requires the establishment of a common emergency department. It is uncertain exactly what and how many resources the department needs and so resources are assigned dynamically as seen necessary by the staff. Such dynamic adjustments pose a challenge in predicting what consequences these adjustments may lead to. We propose an approach to deal with this challenge that applies simulation with intelligent agents and logics for organizational reasoning. We present some of the expected obstacles with this approach and potential ways to overcome them.

General information
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Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Larsen, J. B. (Intern), Villadsen, J. (Intern)
Pages: 454-465
Publication date: 2017
An Approach for Hospital Planning with Multi-Agent Organizations

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Larsen, J. B. (Intern), Villadsen, J. (Intern)
Pages: 393-385
Publication date: 2017

First-Order Logic According to Harrison
We present a certified declarative first-order prover with equality based on John Harrison's Handbook of Practical Logic and Automated Reasoning, Cambridge University Press, 2009. ML code reflection is used such that the entire prover can be executed within Isabelle as a very simple interactive proof assistant. As examples we consider Pelletier's problems 1-46.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Jensen, A. B. (Intern), Schlichtkrull, A. (Intern), Villadsen, J. (Intern)
Pages: 1-66
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Main Research Area: Technical/natural sciences

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Links:
https://www.isa-afp.org/entries/FOL_Harrison.shtml
Source: PublicationPreSubmission
Source-ID: 128473186
Publication: Research - peer-review › Journal article – Annual report year: 2017
Formalization of Many-Valued Logics
Partially is a key challenge for computational approaches to artificial intelligence in general and natural language in particular. Various extensions of classical two-valued logic to many-valued logics have been investigated in order to meet this challenge. We use the proof assistant Isabelle to formalize the syntax and semantics of many-valued logics with determinate as well as indeterminate truth values. The formalization allows for a concise presentation and makes automated verification possible.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Villadsen, J. (Intern), Schlichtkrull, A. (Intern)
Pages: 219-256
Publication date: 2017

Formalizing a Paraconsistent Logic in the Isabelle Proof Assistant
We present a formalization of a so-called paraconsistent logic that avoids the catastrophic explosiveness of inconsistency in classical logic. The paraconsistent logic has a countably infinite number of non-classical truth values. We show how to use the proof assistant Isabelle to formally prove theorems in the logic as well as meta-theorems about the logic. In particular, we formalize a meta-theorem that allows us to reduce the infinite number of truth values to a finite number of truth values, for a given formula, and we use this result in a formalization of a small case study.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Villadsen, J. (Intern), Schlichtkrull, A. (Intern)
Pages: 92-122
Publication date: 2017
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Journal: LNCS Transactions on Large-Scale Data- and Knowledge-Centered Systems
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BFI (2016): BFI-level 1
BFI (2015): BFI-level 1
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Original language: English
Paraconsistent logic, Many-valued logic, Formalization, Isabelle proof assistant, Inconsistency, Paraconsistency
Electronic versions:
TLDKS.pdf
DOIs:
10.1007/978-3-662-55947-5_5
Source: PublicationPreSubmission
Source-ID: 138261719
Publication: Research - peer-review › Journal article – Annual report year: 2017
Leading the Teacher Team - Balancing Between Formal and Informal Power in Program Leadership

This continuous research within Nordic engineering institutions targets the contexts and possibilities for leadership among engineering education program directors. The IFP-model, developed based on analysis of interviews with program leaders in these institutions, visualizes the program director’s informal and formal power. The model is presented as a tool for starting a shared discussion on the complexities of the leadership of engineering program development. The authors liken program development to hunting in teams. Each individual expert in the program is needed, and all experts will need to work and collaborate for the same target. This calls for strategic and long-term thinking of engineering education development. Institutions should support the development of both formal structures as well as informal leadership skills among their program directors, but never fall for the temptation to see the program director as the only actor on the stage.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, KTH - Royal Institute of Technology, Aalto University
Authors: Högfeldt, A. (Ekstern), Malmi, L. (Ekstern), Kinnunen, P. (Ekstern), Jerbrant, A. (Ekstern), Strömberg, E. (Ekstern), Berglund, A. (Ekstern), Villadsen, J. (Intern)
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Journal: Tertiary Education and Management
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Scopus rating (2013): CiteScore 0.71 SNIP 0.899 SJR 0.682
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Scopus rating (2011): CiteScore 0.4 SNIP 0.417 SJR 0.383
Scopus rating (2010): SNIP 0.608 SJR 0.369
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Scopus rating (2008): SNIP 0.547 SJR 0.359
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Scopus rating (2004): SNIP 0.474 SJR 0.153
Scopus rating (2003): SNIP 0.898 SJR 0.296
Scopus rating (2002): SNIP 1.087 SJR 0.283
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DOIs:
10.1080/13583883.2017.1384052
Source: PublicationPreSubmission
Source-ID: 138295862
Publication: Research - peer-review › Journal article – Annual report year: 2017

NaDeA: A Natural Deduction Assistant with a Formalization in Isabelle
We present a new software tool for teaching logic based on natural deduction. Its proof system is formalized in the proof assistant Isabelle such that its definition is very precise. Soundness of the formalization has been proved in Isabelle. The tool is open source software developed in TypeScript / JavaScript and can thus be used directly in a browser without any further installation. Although developed for computer science bachelor students who are used to study and program concrete computer code in a programming language we consider the approach relevant for a broader audience and for other proof systems as well.

General information
A Framework for Organization-Aware Agents: JAAMAS Extended Abstract

This short paper introduces and summarizes the AORTA reasoning framework that can be integrated into BDI-agents to enable organizational decision-making. This work has recently been published in the Journal of Autonomous Agents and Multi-Agent Systems (JAAMAS), as [3].

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Delft University of Technology
Authors: Jensen, A. S. (Intern), Dignum, V. (Ekstern), Villadsen, J. (Intern)
Pages: 1133-1134
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p1133.pdf
Links:
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Bibliographical note

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Source: PublicationPreSubmission
Source-ID: 127721309
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2016

Code Generation for a Simple First-Order Prover

We present Standard ML code generation in Isabelle/HOL of a sound and complete prover for first-order logic, taking formalizations by Tom Ridge and others as the starting point. We also define a set of so-called unfolding rules and show how to use these as a simple prover, with the aim of using the approach for teaching logic and verification to computer science students at the bachelor level.
Paraconsistency

Paraconsistency is about handling inconsistency in a coherent way. In classical and intuitionistic logic everything follows from an inconsistent theory. A paraconsistent logic avoids the explosion. Quite a few applications in computer science and engineering are discussed in the Intelligent Systems Reference Library Volume 110: Towards Paraconsistent Engineering (Springer 2016). We formalize a paraconsistent many-valued logic that we motivated and described in a special issue on logical approaches to paraconsistency (Journal of Applied Non-Classical Logics 2005). We limit ourselves to the propositional fragment of the higher-order logic. The logic is based on so-called key equalities and has a countably infinite number of truth values. We prove theorems in the logic using the definition of validity. We verify truth tables and also counterexamples for non-theorems. We prove meta-theorems about the logic and finally we investigate a case study.

ProofJudge: Automated Proof Judging Tool for Learning Mathematical Logic

Today we have software in many artefacts, from medical devices to cars and airplanes, and the software must not only be efficient and intelligent but also reliable and secure. Tests can show the presence of bugs but cannot guarantee their absence. A machine-checked proof using mathematical logic provides strong evidence for software correctness but it is requires advanced knowledge and skills. We have developed a tool which helps the student to practice their skills and also allows a better conceptual understanding of state-of-the-art proof assistants. Previously the proofs has been carried out using pen and paper because no adequate tool was available. The learning problem is how to make abstract concepts of logic as concrete as possible.

ProofJudge is a computer system and teaching approach for teaching mathematical logic and automated reasoning which augments the e-learning tool NaDeA (Natural Deduction Assistant). We believe that automatic feedback on student assignments would allow the students to enhance their skill in natural deduction proofs which are fundamental in formal verification and artificial intelligence applications. The teachers will benefit too and can put more emphasis on the semantics. Natural deduction is taught at most if not all universities but few tools exist. Initially we plan to have former
students on the course to evaluate ProofJudge and later it will be employed in the course.

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Authors: Villadsen, J. (Intern)
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Title of host publication: Proceedings of the ETALEE 2015 Conference: Exploring Teaching for Active Learning in Engineering Education
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Main Research Area: Technical/natural sciences
E-Learning, Automated Tool, Mathematical Logic, Computer Science
Electronic versions:
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Links:
Source: PublicationPreSubmission
Source-ID: 127747276
Publication: Research - peer-review › Article in proceedings – Annual report year: 2016

**Running a Prover in a Prover - Isabelle as a Meta-Logic**
Isabelle provides a foundation of mathematics and I show how you can run your own verified prover directly in the Isabelle prover or as a stand-alone program. I describe the formalization of syntax and semantics and discuss the proof of soundness and completeness for a simple prover for first-order logic.

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Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Villadsen, J. (Intern)
Number of pages: 1
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Event: Abstract from CADILLAC Workshop, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
Villadsen.pdf
Source: PublicationPreSubmission
Source-ID: 127747358
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2016

**Verification of an LCF-Style First-Order Prover with Equality**
We formalize in Isabelle/HOL the kernel of an LCF-style prover for first-order logic with equality from John Harrison’s Handbook of Practical Logic and Automated Reasoning. We prove the kernel sound and generate Standard ML code from the formalization. The generated code can then serve as a verified kernel. By doing this we also obtain verified components such as derived rules, a tableau prover, tactics, and a small declarative interactive theorem prover. We test that the kernel and the components give the same results as Harrison’s original on all the examples from his book. The formalization is 600 lines and is available online.

**General information**
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Jensen, A. B. (Intern), Schlichtkrull, A. (Intern), Villadsen, J. (Intern)
Number of pages: 15
Publication date: 2016

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Title of host publication: Proceedings of the Isabelle Workshop 2016
Main Research Area: Technical/natural sciences
Interfacing Agents to Real-Time Strategy Games

In real-time strategy games players make decisions and control their units simultaneously. Players are required to make decisions under time pressure and should be able to control multiple units at once in order to be successful. We present the design and implementation of a multi-agent interface for the real-time strategy game STARCAST: BROOD WAR. This makes it possible to build agents that control each of the units in a game. We make use of the Environment Interface Standard, thus enabling different agent programming languages to use our interface, and we show how agents can control the units in the game in the Jason and GOAL agent programming languages.

Meta-Logical Reasoning in Higher-Order Logic

The semantics of first-order logic (FOL) can be described in the meta-language of higher-order logic (HOL). Using HOL one can prove key properties of FOL such as soundness and completeness. Furthermore, one can prove sentences in FOL valid using the formalized FOL semantics. To aid in the construction of the proof an interactive proof assistant like Isabelle can be used. The proof assistant can even automate simple proofs using the formalized FOL semantics.
NaDeA: A Natural Deduction Assistant with a Formalization in Isabelle

We present a new software tool for teaching logic based on natural deduction. Its proof system is formalized in the proof assistant Isabelle such that its definition is very precise. Soundness of the formalization has been proved in Isabelle. The tool is open source software developed in TypeScript / JavaScript and can thus be used directly in a browser without any further installation. Although developed for undergraduate computer science students who are used to study and program concrete computer code in a programming language we consider the approach relevant for a broader audience and for other proof systems as well.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Villadsen, J. (Intern), Jensen, A. B. (Intern), Schlichtkrull, A. (Intern)
Pages: 253-262
Publication date: 2015

Plan-Belief Revision in Jason

When information is shared between agents of unknown reliability, it is possible that their belief bases become inconsistent. In such cases, the belief base must be revised to restore consistency, so that the agent is able to reason. In some cases the inconsistent information may be due to use of incorrect plans. We extend work by Alechina et al. to revise belief bases in which plans can be dynamically added and removed. We present an implementation of the algorithm in the AgentSpeak implementation Jason.

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State: Published
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Authors: Jensen, A. S. (Intern), Villadsen, J. (Intern)
Pages: 182-189
Publication date: 2015
Affect the agent's autonomy, which contradicts our main goal. We propose a model that solves this problem by adding a

In the last part, we discuss a potential issue with our framework. The possibility to commit to organizational objectives can show various properties of an implementation of agents and of the system in general.

Providing evidence for its use a general tool for organization-awareness. Furthermore, we use practical verification to various agent platforms. We show that the same configuration of the component can be used for different agent platforms, reasoning phases (using transition rules), and it makes the implementation of the system quite straightforward.

Formal, rigid description of the behavior of the component during execution. This enables us to precisely specify each

Reasoning about norms and organizational options, and by the reasoning rules specified by the designer to act upon

The reasoning component is characterized by being completely decoupled from the cognitive agent, by its automated

Framework, which consists of semantics of norms, an organizational metamodel, and the AORTA reasoning component.

This thesis presents the AORTA reasoning framework, which is a practical component (founded in logic) that enriches

Intelligent agents are entities defined by, among other things, autonomy. In systems of many agents, the agents’ individual autonomy can lead to uncertainty since their behavior cannot always be predicted. Usually, this kind of uncertainty is accommodated by imposing an organization upon the system; an organization that defines expected behavior of the agents and attempts to restrict the agents’ behavior to let it match the expectations. Restrictions can lead to a decrease in autonomy, contradicting one of the pillars of intelligent agents.

This thesis presents the AORTA reasoning framework, which is a practical component (founded in logic) that enriches intelligent agents with organizational reasoning capabilities. We take the agent’s perspective by devising a component that integrates with the agent’s usual reasoning mechanisms in a non-intrusive way. This results in agents that are both organization-aware and autonomous. The reasoning component makes them organization-aware, and their autonomy is intact because the component does not change the existing reasoning mechanisms. As such, it allows the agents to decide whether to adhere to the system’s expectations.

The ability to reason about organizations has previously been successfully integrated into agent programming languages. However, the operationalization of an organization is usually tailored to a specific language. This makes it hard to apply the same approach to other languages and platforms. The AORTA reasoning framework distinguishes itself by being a generic framework that allows different kinds of agents to reason about different kinds of organizations.

We present our results in three main parts. In the first part, we present the theoretical foundations for the AORTA framework, which consists of semantics of norms, an organizational metamodel, and the AORTA reasoning component. The reasoning component is characterized by being completely decoupled from the cognitive agent, by its automated reasoning about norms and organizational options, and by the reasoning rules specified by the designer to act upon norms and options. We specify the reasoning component using structural operational semantics providing us with a formal, rigid description of the behavior of the component during execution. This enables us to precisely specify each reasoning phases (using transition rules), and it makes the implementation of the system quite straightforward.

The second part moves from theory to practice: we present an implementation of the framework and integrate it into various agent platforms. We show that the same configuration of the component can be used for different agent platforms, providing evidence for its use a general tool for organization-awareness. Furthermore, we use practical verification to show various properties of an implementation of agents and of the system in general.

In the last part, we discuss a potential issue with our framework. The possibility to commit to organizational objectives can affect the agent’s autonomy, which contradicts our main goal. We propose a model that solves this problem by adding a
filter to the agent’s decision procedure that takes consequences of fulfilling a goal into account before deciding to commit to it. By considering both the agent’s preferences and the expected outcome of fulfilling the goal, we show that it was possible for the agents to make qualified context-dependent decisions.

We claim that by using the AORTA reasoning framework, agents become organization-aware. The reasoning component provides capabilities to reason about organizations and our decision procedure ensures that the autonomy of the agents is still intact.

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Authors: Jensen, A. S. (Intern), Villadsen, J. (Intern)
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Electronic versions: 
phd372_Jensen_AS.pdf
Publication: Research › Ph.D. thesis – Annual report year: 2015

Combining Formal Logic and Machine Learning for Sentiment Analysis
This paper presents a formal logical method for deep structural analysis of the syntactical properties of texts using machine learning techniques for efficient syntactical tagging. To evaluate the method it is used for entity level sentiment analysis as an alternative to pure machine learning methods for sentiment analysis, which often work on sentence or word level, and are argued to have difficulties in capturing long distance dependencies.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Technical University of Denmark
Authors: Petersen, N. C. (Ekstern), Villadsen, J. (Intern)
Pages: 375-384
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Editors: Andreasen, T., Christiansen, H., Cubero, J., Ras, Z.
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Volume: 8502
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Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 96583152
Publication: Research - peer-review › Article in proceedings – Annual report year: 2014

Constraints and Language

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic
The AORTA Architecture: Integrating Organizational Reasoning in Jason

Open systems are characterized by a diversity of heterogeneous and autonomous agents that act according to private goals, and with a behavior that is hard to predict. They can be regulated through organizations similar to human organizations, which regulate the agents' behavior space and describe the expected behavior of the agents. Agents need to be able to reason about the regulations, so that they can act within the expected boundaries and work towards the objectives of the organization. In this paper, we propose the AORTA architecture for making agents organization-aware. It is designed such that it provides organizational reasoning capabilities to agents implemented in existing agent programming languages without being tied to a specific organizational model. We show how it can be integrated in the Jason agent programming language, and discuss how the agents can coordinate their organizational tasks using AORTA.
The AORTA Architecture: Integrating Organizational Reasoning in Jason
Open systems are characterized by a diversity of heterogeneous and autonomous agents that act according to private goals, and with a behavior that is hard to predict. They can be regulated through organizations similar to human organizations, which regulate the agents’ behavior space and describe the expected behavior of the agents. Agents need to be able to reason about the regulations, so that they can act within the expected boundaries and work towards the objectives of the organization. In this paper, we describe the AORTA (Adding Organizational Reasoning to Agents) architecture for making agents organization-aware. It is designed such that it provides organizational reasoning capabilities to agents implemented in existing agent programming languages without being tied to a specific organizational model. We show how it can be integrated in the Jason agent programming language, and discuss how the agents can coordinate their organizational tasks using AORTA.

A Comparison of Organization-Centered and Agent-Centered Multi-Agent Systems
Whereas most classical multi-agent systems have the agent in center, there has recently been a development towards focusing more on the organization of the system, thereby allowing the designer to focus on what the system goals are, without considering how the goals should be fulfilled.

We have developed and evaluated two teams of agents for a variant of the well-known Bomberman computer game. One team is based on the basic Jason system, which is an implementation in Java of an extension of the logic-based agent-oriented programming language AgentSpeak. The other team is based on the organizational model Moise+, which is combined with Jason in the middleware called J-Moise+.

We have investigated whether taking the organization-oriented approach had any clear advantages to the classical way of implementing multi-agent systems. Although not decisive the investigation did indicate that the agent-oriented approach has a number of advantages when it comes to game-like scenarios with just a few different character types.
Belief Revision in the GOAL Agent Programming Language

Agents in a multiagent system may in many cases find themselves in situations where inconsistencies arise. In order to properly deal with these, a good belief revision procedure is required. This paper illustrates the usefulness of such a procedure: a certain belief revision algorithm is considered in order to deal with inconsistencies and, particularly, the issue of inconsistencies, and belief revision is examined in relation to the GOAL agent programming language.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Technical University of Denmark
Authors: Spurkeland, J. S. (Ekstern), Jensen, A. S. (Intern), Villadsen, J. (Intern)
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Volume: 2013
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BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
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10.1155/2013/632319

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Copyright © 2013 Johannes Svante Spurkeland et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
Publication: Research - peer-review › Journal article – Annual report year: 2013
Engineering a Multi-Agent System in GOAL
We provide a brief description of the GOAL-DTU system, including the overall design, the tools and the algorithms that we used in the Multi-Agent Programming Contest 2013. We focus on a description of the strategies and on an analysis of the matches. We also evaluate our experiences with the GOAL agent programming language. Our strategies worked well in general and we earned a second place in the contest only losing to the winning team. Finally we provide some suggestions for future contests.

Formalizing Theatrical Performances Using Multi-Agent Organizations
Theatrical performances usually follow strict scripts and actors are not allowed to deviate. A Danish theatrical group, Theater 770° Celsius, has invented a new method called In Real Life, in which only certain events in the storyline are specified and the actors are supposed to improvise to reach these events. The method bears a resemblance to multi-agent systems and we show how it can be formalized using the multi-agent organizational model OperA.
Java to C: A Primer
This book is designed to be used as a quick introduction to C for programmers already familiar with Java. It is not a replacement for a reference book on C but is instead a supplement.

For the programmer already familiar with Java, the typical book on C requires the reader to wade through many details of already-familiar material. In this book, we quickly present the main concepts needed to begin writing serious programs in C, highlighting the differences between C and Java.

Multi-Agent Programming Contest 2013: The Teams and the Design of Their Systems
Five teams participated in the Multi-Agent Programming Contest in 2013: All of them gained experience in 2012 already. In order to better understand which paradigms they used, which techniques they considered important and how much work they invested, the organisers of the contest compiled together a detailed list of questions (circa 50). This paper collects all answers to these questions as given by the teams.
Program Leadership from a Nordic Perspective - Program Leaders’ Power to Influence Their Program
In this paper a continuation research at five technical universities in Nordic countries (N5T network) in 2012 is presented, where the aim was to find out how the program leaders conceived their function, role and mandate, and the work situations between the universities were compared. The previous research demonstrated that program leaders have quite different positions, strategies and methods when it comes to monitoring and developing their programs. In this paper, a deeper investigation is carried out of the (im-) possibilities to make real influence on the study courses that constitutes the respective Engineering study programs. Eight program leaders from the five N5T universities have been interviewed, and the analysis of these studies, has culminated in a model for the analysis of program leadership for Engineering education development.

General information
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Organisations: Office for Study Programmes and Student Affairs, Department of Applied Mathematics and Computer Science, Algorithms and Logic, KTH - Royal Institute of Technology, Aalto University, Chalmers University of Technology, Norwegian University of Science and Technology
Authors: Högfeldt, A. (Ekstern), Strömberg, E. (Ekstern), Jerbrant, A. (Ekstern), Berglund, A. (Ekstern), Hussmann, P. M. (Intern), Villadsen, J. (Intern), Kinnunen, P. (Ekstern), Malm, L. (Ekstern), Malmqvist, J. (Ekstern), Baggerud, B. (Ekstern)
Number of pages: 11
Publication date: 2013

Reimplementing a Multi-Agent System in Python
We provide a brief description of our Python-DTU system, including the overall design, the tools and the algorithms that we used in the Multi-Agent Programming Contest 2012, where the scenario was called Agents on Mars like in 2011. Our solution is an improvement of our Python-DTU system from last year. Our team ended in second place after winning at least one match against every opponent and we only lost to the winner of the tournament. We briefly describe our experiments with the Moise organizational model. Finally we propose a few areas of improvement, both with regards to our system and to the contest.

General information
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Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Technical University of Denmark
Authors: Villadsen, J. (Intern), Jensen, A. S. (Intern), Etienne, M. B. (Intern), Vester, S. (Intern), Andersen, K. B. (Ekstern), Frøsig, A. (Ekstern)
Pages: 67-84
Publication date: 2013
Reimplementing a Multi-Agent System in Python

We provide a brief description of our Python-DTU system, including the overall design, the tools and the algorithms that we used in the Multi-Agent Programming Contest 2012, where the scenario was called Agents on Mars like in 2011. Our solution is an improvement of our Python-DTU system from last year. Our team ended in second place after winning at least one match against every opponent and we only lost to the winner of the tournament. We briefly describe our experiments with the Moise organizational model. Finally we propose a few areas of improvement, both with regards to our system and to the contest.

Engineering Multiagent Systems - Reflections

In the first part I look at a theater performance by artistic director Troels Christian Jakobsen as a multiagent system. It is designed as a self-organising critical system using a framework where within its borders but without a script there is real interaction between the elements of the performance. In the second part I discuss the ideas behind my recent monograph on propositional attitudes and inconsistency tolerance. Natural language sentences are parsed using a categorial grammar and correctness of arguments are decided using a paraconsistent logic. In the third part I present a curriculum for the MSc in Computer Science and Engineering program at the Technical University of Denmark with a focus on multiagent systems. As the director of studies I have observed that the students are working hard and with much creativity in advanced courses and projects involving intelligent agents, in particular in the agent contest 2009-2012.
Implementing a Multi-Agent System in Python

We describe the solution used by the Python-DTU team in the Multi-Agent Programming Contest 2011, where the scenario was called Agents on Mars. We present our auction-based agreement, area controlling and pathfinding algorithms and discuss our chosen strategy and our choice of technology used for implementing the system. Finally, we present an analysis of the results of the competition as well as propose areas of improvement.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Department of Informatics and Mathematical Modeling, Algorithms and Logic
Authors: Ettienne, M. B. (Intern), Vester, S. (Intern), Villadsen, J. (Intern)
Pages: 147-179
Publication date: 2012

Host publication information
Title of host publication: Multi-Agent Programming Contest 2011 Edition Evaluation and Team Descriptions
Publisher: Technische Universität Clausthal
Editors: Behrens, T., Dix, J., Köster, M., Schlesinger, F.
Series: IfI Technical Report Series
Number: IfI-12-02
ISSN: 1860-8477
Main Research Area: Technical/natural sciences
Links:
http://www.in.tu-clausthal.de/fileadmin/homes/techreports/ifi1202behrens.pdf
Publication: Research - peer-review › Report chapter – Annual report year: 2012

Implementing a Multi-Agent System in Python with an Auction-Based Agreement Approach

We describe the solution used by the Python-DTU team in the Multi-Agent Programming Contest 2011, where the scenario was called Agents on Mars. We present our auction-based agreement algorithm and discuss our chosen strategy and our choice of technology used for implementing the system. Finally, we present an analysis of the results of the competition as well as propose areas of improvement.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Algorithms and Logic, Department of Informatics and Mathematical Modeling, Algorithms and Logic, Computer Science and Engineering
Authors: Ettienne, M. B. (Intern), Vester, S. (Intern), Villadsen, J. (Intern)
Pages: 185-196
Publication date: 2012

Host publication information
Title of host publication: Programming Multi-Agent Systems : 9th International Workshop, ProMAS 2011 Taipei, Taiwan, May 3, 2011 Revised Selected Papers
Publisher: Springer
ISBN (Print): 978-3-642-31914-3
ISBN (Electronic): 978-3-642-31915-0
Series: Lecture Notes in Artificial Intelligence
Volume: 7217
ISSN: 0302-9743
BFI conference series: International Workshop on Programming Multi-Agent Systems (5000476)
Main Research Area: Technical/natural sciences
Workshop: 9th International Workshop on Programming Multi-Agent Systems, ProMAS2011, Taipei, Taiwan, Province of China, 03/05/2011
Multi-Agent Programming Contest 2012 - The Python-DTU Team
We provide a brief description of the Python-DTU system, including the overall design, the tools and the algorithms that we plan to use in the agent contest.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Algorithms and Logic, Department of Applied Mathematics and Computer Science, Algorithms and Logic, Technical University of Denmark
Authors: Villadsen, J. (Intern), Jensen, A. S. (Intern), Etienne, M. B. (Intern), Vester, S. (Intern), Balsiger Andersen, K. (Ekstern), Fresig, A. (Ekstern)
Number of pages: 4
Publication date: 2012

Publication information
Publisher: Technical University of Denmark (DTU)
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions:
1210.0437v1.pdf
Links:
http://arxiv.org/pdf/1210.0437v1
http://multiagentcontest.org/
Source: dtu
Source-ID: u::6505
Publication: Research - peer-review › Report – Annual report year: 2012

Paraconsistent Computational Logic
In classical logic everything follows from inconsistency and this makes classical logic problematic in areas of computer science where contradictions seem unavoidable. We describe a many-valued paraconsistent logic, discuss the truth tables and include a small case study.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Algorithms and Logic
Authors: Jensen, A. S. (Intern), Villadsen, J. (Intern)
Pages: 59-61
Publication date: 2012

Host publication information
Title of host publication: 8th Scandinavian Logic Symposium : Abstracts
Editors: Blackburn, P., Jørgensen, K. F., Jones, N., Palmgren, E.
Main Research Area: Technical/natural sciences
Conference: 8th Scandinavian Logic Symposium, Roskilde, Denmark, 20/08/2012 - 20/08/2012
Links:
Source: dtu
Source-ID: u::6506
Publication: Research - peer-review › Article in proceedings – Annual report year: 2012

Program Leadership from a Nordic Perspective - Managing Education Development
In this paper we focus on university educational development issues by investigating the program leadership at five Nordic technical universities. Specifically, the paper compares definitions, views and experiences of education leadership in the Nordic Five Tech (N5T) universities. The paper does this by, first, reviewing the definitions of roles and responsibilities for program directors at each university, and second, by presenting results from a survey carried out in March 2012 among program directors at the N5T universities. Based on this data, we analyze how program directors experience their role, their possibilities to lead, and their opportunities of learning to lead. How is time for reflection and development as leaders handled at the different universities? The paper goes on to consider what impact the mandate of the leadership role has on the possibilities for developing educational programs. For instance, how can program directors ensure that learning objectives concerning generic skills and abilities are reached? How can program directors drive implementation of integrative and value-oriented topics such as sustainable development, innovation and entrepreneurship?
Improving Multi-Agent Systems Using Jason

We describe the approach used to develop the multi-agent system of herders that competed as the Jason-DTU team at the Multi-Agent Programming Contest 2010. We also participated in 2009 with a system developed in the agent-oriented programming language Jason which is an extension of AgentSpeak. We used the implementation from 2009 as a foundation and therefore much of the work done this year was on improving that implementation. We present a description which includes design and analysis of the system as well as the main features of our agent team strategy. In addition we discuss the technologies used to develop this system as well as our future goals in the area.
Multi-Agent Programming Contest 2011 - The Python-DTU Team

We provide a brief description of the Python-DTU system, including the overall design, the tools and the algorithms that we plan to use in the agent contest.

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling, Department of Applied Mathematics and Computer Science, Algorithms and Logic
Authors: Villadsen, J. (Intern), Ettienne, M. B. (Intern), Vester, S. (Intern)
Number of pages: 4
Publication date: 2011

Publication information
Publisher: Technical University of Denmark (DTU)
Original language: English
Main Research Area: Technical/natural sciences
Electronic versions: 4D93Ed01.pdf
Links:
http://arxiv.org/abs/1110.0105
http://multiagentcontest.org/
Proceedings of the 6th International Workshop on Constraints and Language Processing: Preface

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Blache, P. (ed.) (Ekstern), Christiansen, H. (ed.) (Ekstern), Dahl, V. (ed.) (Ekstern), Villadsen, J. (Intern)
Number of pages: 68
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the 6th International Workshop on Constraints and Language Processing
Place of publication: Roskilde
Publisher: Roskilde University

SyntaxTrain: Relieving the pain of learning syntax
SyntaxTrain parses a Java program and displays the syntax diagrams associated with a syntax error.

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling, Technical University of Denmark, Weizmann Institute of Science
Authors: Moth, A. L. A. (Ekstern), Villadsen, J. (Intern), Ben-Ari, M. (Ekstern)
Publication date: 2011

Host publication information
Title of host publication: ITiCSE’11 - Proceedings of the 16th Annual Conference on Innovation and Technology in Computer Science
ISBN (Print): 9781450308878
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 316385
Publication: Research › Book chapter – Annual report year: 2011

Building Multi-Agent Systems Using Jason
We provide a detailed description of the Jason-DTU system, including the used methodology, tools as well as team strategy. We also discuss the experience gathered in the contest. In spring 2009 the course “Artificial Intelligence and Multi-Agent Systems” was held for the first time on the Technical University of Denmark (DTU). A part of this course was a short introduction to the multi-agent framework Jason, which is an interpreter for AgentSpeak, an agent-oriented programming language. As the final project in this course a solution to the Multi-Agent Programming Contest from 2007, the Gold Miners scenario, was implemented. Finally we decided to participate in this year’s contest with an implementation made in Jason as well.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Algorithms and Logic, Technical University of Denmark
Multi-Agent Programming Contest 2010 - The Jason-DTU Team

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling, Technical University of Denmark
Authors: Villadsen, J. (Intern), Boss, N. S. (Ekstern), Jensen, A. S. (Intern), Vester, S. (Intern)
Number of pages: 4
Publication date: 2010

Publication information
Publisher: Technical University of Denmark (DTU)
Main Research Area: Technical/natural sciences

Nabla: A Linguistic System Based on Type Theory

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Number of pages: 232
Publication date: 2010

Publication information
Publisher: LIT Verlag Dr. Wilhelm Hopf
ISBN (Print): 9783825892753
Main Research Area: Technical/natural sciences

Nominalistic Logic

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Pages: 84-85
Publication date: 2010

Host publication information
Title of host publication: World Congress and School on Universal Logic
Main Research Area: Technical/natural sciences
Conference: World Congress and School on Universal Logic, 01/01/2010
Source: orbit
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2010

Developing Artificial Herders Using Jason

General information
Infinite-Valued Propositional Type Theory for Semantics

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Pages: 277-297
Publication date: 2009

Host publication information
Title of host publication: Dimensions of Logical Concepts
Place of publication: Campinas, Brazil
Publisher: UNICAMP
Editors: Béziau, J., Costa-Leite, A.
ISBN (Print): 978-85-86497-05-6
Series: Coleção CLE
Number: 54
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 256986
Publication: Research - peer-review › Book chapter – Annual report year: 2009

Logik, computere og kunstig intelligens

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Bolander, T. (Intern), Nilsson, J. F. (Intern), Villadsen, J. (Intern)
Pages: 218-233
Publication date: 2009

Host publication information
Title of host publication: Matematiske horisonter
Place of publication: Kgs. Lyngby
Publisher: Technical University of Denmark, DTU Informatics, Building 321
ISBN (Print): 978-87-643-0453-4
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 247205
Publication: Education › Book chapter – Annual report year: 2009

Nominalistic Logic (Extended Abstract)

General information
State: Published
Nominalistic Logic: From Naive Set Theory to Intensional Type Theory

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Number of pages: 196
Pages: 57-85
Publication date: 2008

Host publication information
Title of host publication: New Approaches to Classes and Concepts — Studies in Logic
Volume: 14
Publisher: College Publications
Editor: Robering, K.
ISBN (Print): 978-1-904987-85-7
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 233581
Publication: Research - peer-review › Book chapter – Annual report year: 2008

Proceedings of the 5th International Workshop on Constraints and Language Processing (CSLP 2008)

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling, Roskilde Universitet
Authors: Villadsen, J. (ed.) (Intern), Christiansen, H. (ed.) (Ekstern)
Number of pages: 94
Publication date: 2008

Publication information
Publisher: Roskilde University
Original language: English
Series: Computer Science Research Reports
Number: 122
ISSN: 0109-9779
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 235827
Publication: Research - peer-review › Report – Annual report year: 2008

Many-Valued Modal Logic

General information
State: Published
Organisations: Computer Science and Engineering, Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Publication date: 2007
Preface: For the proceedings of the International Workshop on Hybrid Logic 2006 (HyLo)

General information
State: Published
Organisations: Algorithms and Logic, Department of Informatics and Mathematical Modeling
Authors: Blackburn, P. (Ekstern), Bolander, T. (Intern), Braüner, T. (Ekstern), de Paiva, V. (Ekstern), Villadsen, J. (Intern)
Pages: 1–2
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Electronic Notes in Theoretical Computer Science
Volume: 174
Issue number: 6
ISSN (Print): 1571-0661
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.256 SNIP 0.609 CiteScore 0.66
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.373 SNIP 0.781 CiteScore 0.67
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.382 SNIP 0.771 CiteScore 0.6
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.323 SNIP 0.72 CiteScore 0.55
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.386 SNIP 0.608 CiteScore 0.55
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.325 SNIP 0.582 CiteScore 0.57
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.408 SNIP 0.567
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.419 SNIP 0.689
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.407 SNIP 0.619
Scopus rating (2007): SJR 0.419 SNIP 0.611
Scopus rating (2006): SJR 0.377 SNIP 0.649
Scopus rating (2005): SJR 0.373 SNIP 0.633
Scopus rating (2004): SJR 0.406 SNIP 0.713
Scopus rating (2003): SJR 0.343 SNIP 0.56
Scopus rating (2002): SJR 0.464 SNIP 0.661
Scopus rating (2001): SJR 0.435 SNIP 0.679
Scopus rating (2000): SJR 0.348 SNIP 0.556
Scopus rating (1999): SJR 0.365 SNIP 0.683
Original language: English
Natural Language Processing Using Lexical and Logical Combinators

**General information**
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Ortiz, J. F. (Ekstern), Villadsen, J. (Intern)
Pages: 444-446
Publication date: 2006

**Host publication information**
Title of host publication: International Conference on Logic Programming
Volume: Lecture Notes in Computer Science, vol. 4079
Main Research Area: Technical/natural sciences
Conference: International Conference on Logic Programming, 01/01/2006

Nominalization in Intensional Type Theory

**General information**
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern)
Publication date: 2006

**Host publication information**
Title of host publication: IEEE Symposium on Logic in Computer Science - Short Presentation
Main Research Area: Technical/natural sciences
Conference: IEEE Symposium on Logic in Computer Science - Short Presentation, 01/01/2006

Proceedings of the International Workshop on Hybrid Logic: Federated Logic Conference, Seattle, USA

**General information**
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Publication date: 2006

**Publication information**
Publisher: Federated Logic Conference, Seattle, USA
Original language: English
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 195730
Publication: Research - peer-review › Book – Annual report year: 2006
Supra-logic: using transfinite type theory with type variables for paraconsistency

We define the paraconsistent supra-logic $P_\sigma$ by a type-shift from the booleans $\sigma$ of propositional logic $P_\sigma$ to the supra-booleans $\sigma$ of the propositional type logic $P$ obtained as the propositional fragment of the transfinite type theory $Q$ defined by Peter Andrews (North-Holland Studies in Logic 1965) as a classical foundation of mathematics. The supra-logic is in a sense a propositional logic only, but since there is an infinite number of supra-booleans and arithmetical operations are available for this and other types, virtually anything can be specified. The supra-logic is a generalization of Lukasiewicz's three-valued logic, with the intermediate value duplicated many times and ordered such that none of the copies of this value imply other ones, but it differs from Lukasiewicz's many-valued logics as well as from logics based on bilattices. There are several automated theorem provers for classical higher order logic (finite type theory) and it should be possible to modify these to our needs.
A Paraconsistent Higher Order Logic

Abstract. Classical logic predicts that everything (thus nothing useful at all) follows from inconsistency. A paraconsistent logic is a logic where an inconsistency does not lead to such an explosion, and since in practice consistency is difficult to achieve there are many potential applications of paraconsistent logics in knowledge-based systems, logical semantics of natural language, etc. Higher order logics have the advantages of being expressive and with several automated theorem provers available. Also the type system can be helpful. We present a concise description of a paraconsistent higher order logic with countable infinite indeterminacy, where each basic formula can get its own indeterminate truth value (or as we prefer: truth code). The meaning of the logical operators is new and rather different from traditional many-valued logics as well as from logics based on bilattices. The adequacy of the logic is examined by a case study in the domain of medicine. Thus we try to build a bridge between the HOL and MVL communities. A sequent calculus is proposed based on recent work by Muskens. Many non-classical logics are, at the propositional level, funny toys which work quite good, but when one wants to extend them to higher levels to get a real logic that would enable one to do mathematics or other more sophisticated reasonings, sometimes dramatic troubles appear.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling
Authors: Villadsen, J. (Intern), Decker, H. (ed.) (Ekstern)
Pages: 33-49
Publication date: 2004

Host publication information
Title of host publication: International Workshop on Paraconsistent Computational Logic
Series: Roskilde University, Computer Science, Technical Reports
Volume: 95
Main Research Area: Technical/natural sciences
Links:
Source: orbit
Source-ID: 58231
Publication: Research - peer-review › Article in proceedings – Annual report year: 2004
A Paraconsistent Higher Order Logic
Classical logic predicts that everything (thus nothing useful at all) follows from inconsistency. A paraconsistent logic is a logic where an inconsistency does not lead to such an explosion, and since in practice consistency is difficult to achieve there are many potential applications of paraconsistent logics in knowledge-based systems, logical semantics of natural language, etc. Higher order logics have the advantages of being expressive and with several automated theorem provers available. Also the type system can be helpful. We present a concise description of a paraconsistent higher order logic with countably infinite indeterminacy, where each basic formula can get its own indeterminate truth value. The meaning of the logical operators is new and rather different from traditional many-valued logics as well as from logics based on bilattices. Thus we try to build a bridge between the communities of higher order logic and many-valued logic. A case study is studied and a sequent calculus is proposed based on recent work by Muskens.

General information
State: Published
Organisations: Roskilde Universitet
Authors: Villadsen, J. (Intern)
Pages: 38-51
Publication date: 2004

Host publication information
Title of host publication: A Paraconsistent Higher Order Logic : Artificial Intelligence and Symbolic Computation
Publisher: Springer
ISBN (Print): 978-3-540-23212-4
Series: Lecture Notes in Computer Science
Volume: 3249
ISSN: 0302-9743
BFI conference series: Artificial Intelligence and Symbolic Computation (5000044)
Main Research Area: Technical/natural sciences
DOIs:
10.1007/978-3-540-30210-0_5
Source: dtu
Source-ID: n:oai:DTIC-ART:isi/247595341::25162
Publication: Research - peer-review › Article in proceedings – Annual report year: 2004

Paraconsistent Assertions
Classical logic predicts that everything (thus nothing useful at all) follows from inconsistency. A paraconsistent logic is a logic where inconsistency does not lead to such an explosion. We argue that paraconsistent logics are especially advantageous in order to deal with assertions made by intelligent agents. Other propositional attitudes like knowledge and beliefs can in principle be treated along the same lines. We propose a many-valued paraconsistent logic based on a simple notion of indeterminacy. The proposed paraconsistent logic has a semantics that extends the one of classical logic and it is described using key equalities for the logical operators. A case study is included. We briefly compare with logics based on bilattices. We finally investigate how to translate the paraconsistent logic into classical predicate logic thereby allowing us to make use of automated deduction of classical logic in the future. We base our initial translation on recent work by Muskens. Our final translation is polynomial in the size of the translated formula and follows the semantics for the paraconsistent logic directly. © Springer-Verlag Berlin Heidelberg 2004.

General information
State: Published
Organisations: Roskilde University
Authors: Villadsen, J. (Intern)
Pages: 99-113
Publication date: 2004

Host publication information
Publisher: Springer
ISBN (Print): 978-3-540-23222-3
Series: Lecture Notes in Computer Science
Volume: 3187
ISSN: 0302-9743
BFI conference series: Multiagent System Technologies (5000420)
Main Research Area: Technical/natural sciences
Operational Semantics of an Imperative Language in Definite Clauses

We present the “big-step” operational semantics of a small programming language NIL (Natural Imperative Language) in definite clauses, thus building on the fixpoint semantics of logic programs. NIL operates on a state which is just a sequence of counters. As basic statements NIL has incrementation, decrementation and test for null. NIL allows for sequential composition and non-deterministic choice of statements as well as mutually recursive definitions of procedures, which we find support our long-term aim of formalizing and reasoning about specific actions and planning tasks for rational agents. A novelty is the use of the de Bruijn notation instead of names. To our knowledge the operational semantics of an imperative language like NIL have not been given in definite clauses, although it is well-known that it is possible.

User Interfaces for Automated Reasoning Systems

The ease of use of automated reasoning systems is perhaps lower than for any other type of computing system available! In general, while anyone can use a word processor, almost no one but an expert can use a proof checker to check a difficult theorem. Perhaps this can be explained by the fact that the designers of such systems have had to put so much of their energies and attention into rigor, that they simply did not have enough energy left for good interface design.

International Workshop on Paraconsistent Computational Logic

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling

Combinators for Paraconsistent Attitudes

In order to analyse the semantics of natural language sentences a translation into a partial type logic using lexical and logical combinators is presented. The sentences cover a fragment of English with propositional attitudes like knowledge, belief and assertion. A combinator is a closed term of the lambda calculus possibly containing lexical and/or logical constants. Such combinators seem promising from both a cognitive and computational point of view. There is approximately one lexical combinator for each word, but just eleven logical combinators for the present fragment. The partiality is only used for embedded sentences expressing propositional attitudes, thereby allowing for inconsistency without explosion (also called paraconsistency), and is based on a few key equalities for the connectives giving four truth values (truth, falsehood, and undefinedness with negative and positive polarity; only the first truth value is designated, i.e. yields the logical truths).

General information
Hospital Staff Planning with Multi-Agent Goals
Department of Applied Mathematics and Computer Science
Period: 01/09/2016 → 31/08/2019
Number of participants: 4
Phd Student: Larsen, John Bruntse (Intern)
Supervisor: Carstens, Niels (Ekstern) Holst, Carsten Kehler (Ekstern)
Main Supervisor: Villadsen, Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Industrial PhD
Project: PhD

Composec: Secure Composition of Distributed Systems
Department of Applied Mathematics and Computer Science
Period: 01/10/2015 → 30/09/2018
Number of participants: 3
Phd Student: Hess, Andreas Viktor (Intern)
Supervisor: Villadsen, Jørgen (Intern)
Main Supervisor: Mødersheim, Sebastian Alexander (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD

Formalization of Algorithms and Logical inference Systems in Proof Assistants
Department of Applied Mathematics and Computer Science
Period: 15/09/2015 → 14/09/2018
Number of participants: 4
Phd Student: Schlichtkrull, Anders (Intern)
Supervisor: Blanchette, Jasmin Christian (Ekstern) Bolander, Thomas (Intern)
Main Supervisor: Villadsen, Jørgen (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Organization-Oriented Programming in Multi-Agent Systems
Department of Applied Mathematics and Computer Science
Period: 15/03/2012 → 21/09/2015
Number of participants: 5
Phd Student: Jensen, Andreas Schmidt (Intern)
Main Supervisor: Villadsen, Jørgen (Intern)
Examiner:
Bolander, Thomas (Intern)
Christiansen, Henning (Ekstern)
Hindriks, Koen V. (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU)
Project: PhD

Formal Ontologies + Natural language semantics = Ontological semantics

Department of Informatics and Mathematical Modeling
Period: 01/10/2007 → 22/06/2011
Number of participants: 6
Phd Student:
Szymczak, Bartlomiej Antoni (Intern)
Supervisor:
Jensen, Per Anker (Ekstern)
Main Supervisor:
Nilsson, Jørgen Fischer (Intern)
Examiner:
Villadsen, Jørgen (Intern)
Dybkjær, Hans (Ekstern)
Lenci, Alessandro (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: DTU, Samfinansiering
Project: PhD

Geodata-Infrastruktur

Department of Informatics and Mathematical Modeling
Period: 01/02/2002 → 01/08/2007
Number of participants: 8
Phd Student:
Christensen, Jesper Vinther (Intern)
Supervisor:
Bjørner, Dines (Intern)
Frederiksen, Poul (Intern)
Jacobi, Ole Illum (Intern)
Main Supervisor:
Nilsson, Jørgen Fischer (Intern)
Examiner:
Villadsen, Jørgen (Intern)
Andreasen, Troels (Ekstern)
Östman, Anders (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Ansat eksternt
Project: PhD

Meta-logiske teorier i datalogien

Department of Informatics and Mathematical Modeling
Period: 01/09/1989 → 06/09/1995
Number of participants: 3
Phd Student:
Villadsen, Jørgen (Intern)
Main Supervisor:
Nilsson, Jørgen Fischer (Intern)
Examiner:
Jensen, Hans Siggård (Intern)

**Financing sources**
Source: Internal funding (public)
Name of research programme: DTU-stipendium
Project: PhD