Curriculum vitae for Erik Sandewall

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General

Affiliation:

Department of Computer and Information Science
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Södra Vägen 32
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Personal:

Born on October 24, 1945 in Oskarshamn, Sweden
Citizen of Sweden
Married, two children (born 1973 and 1976)

Languages:

Native speaker of Swedish
Speaks, reads and writes English fluently
Speaks, reads and writes French almost fluently
Can read, and participate in dialogue in German
Can read everyday ("newspaper") and technical texts in Italian

Education:

Graduation examination ("studentexamen", baccalauréat equivalent) from *Katedralskolan i Uppsala*, 1963
Filosofie kandidatexamen, Uppsala university, Sweden, 1964
Filosofie licentiatexamen, Uppsala university, Sweden, 1966
Filosofie doktorsgrad, Uppsala university, Sweden, 1969

Honors:

Royal Swedish Academy of Sciences, Award to outstanding young researcher, 1969
Royal Swedish Academy of Engineering Sciences, Chester Carlson Prize, 1985

Positions:

Member of 'Forskningsberedningen', the Research Advisory Committee of the Swedish Minister of Education
Prorector of Linköping University
Vice-chair of Section XII (Information Technology) of the Swedish Academy of Engineering Sciences
Member of the Scientific Advisory Committee of the INRIA, Institut National de Recherche en Informatique et en Automatique, France
Member of the Scientific Advisory Committee of the DFKI, Deutsches Forschungsinstitut für Künstliche Intelligenz, Germany
Member of the Board of the SITI, Swedish Information Technology Institute.

Academic Memberships:

Member, Royal Swedish Academy of Engineering Sciences
Member, Royal Swedish Academy of Sciences
Fellow, American Association for Artificial Intelligence
Fellow of the ECCAI (European Coordinating Committee for Artificial Intelligence)
Member of professional organisations including the IEEE and the ACM

Present employment:

Professor of Computer Science (full professorship position), Linköping University, Sweden, since 1975

Employment history:

Teaching assistant, Uppsala University, 1965-66
Research assistant, Stanford University, 1966-67
Research assistant, Uppsala University, 1967-69
Assistant professor ("docent"), Uppsala University, 1969-74

Extended visits at other universities:

Visiting researcher, Stanford University, March-July, 1970
Visiting associate professor, M.I.T., 1974-75
Visiting researcher, Stanford University, June-August, 1975
Visiting researcher, Stanford University, June-August, 1988
Visiting researcher, LAAS-CNRS, Toulouse, Nov 1993–Oct 1994

Conferences:

General chairman, International Joint Conference on Artificial Intelligence, 1975 (Tbilisi)

Local arrangements chairman, European Conference on A.I., 1990

Co-program chair, International Conference on Knowledge Representation and Reasoning, 1991

General chair, International Conference on Knowledge Representation and Reasoning, 1994

Also conference chair for several smaller conferences or workshops.

Editorial board membership for scientific journals:

Electronic Transactions on Artificial Intelligence (Editor-in-Chief)

Artificial Intelligence

Artificial Intelligence Communications

Computational Intelligence

Fundamenta Informaticae

Journal of Applied Non-Classical Logics

Applied Artificial Intelligence

Decision Support Systems

Information Systems

Present Research Activities

My scientific activity at present (1999) is devoted to two main goals:

The WITAS Project:

I am the director of the Wallenberg Laboratory for Information Technology and Autonomous Systems (WITAS), where we do research on *intelligent, autonomous airborne vehicles.* This includes research on autonomous decision-making, knowledge representation for the purpose of modelling road-traffic scenes being observed by the UAV, computer vision techniques for use in the on-board system, computer architecture for the same purpose, human-machine interaction for the dialogue with the on-board computer system, simulation and visualization techniques, and more.

The project started in 1997 and is scheduled to end at the end of 2003. The total funds for the project were 40 MSEK (million Swedish Crowns) for the three-year period of 1997-1999, and 105 MSEK for the four-year period of 2000-2003.

As principal investigator it is my responsibility to define the overall goals and modes of operation of the project, to present the project to its sponsors and to other interested parties, and to negotiate the participation of research groups, both in Linköping and elsewhere.

For additional information about WITAS, please refer to the project's web page at `http://www.ida.liu.se/ext/witas/`.

The Electronic Transactions on Artificial Intelligence:

The Electronic Transactions on Artificial Intelligence (ETAI) is a novel kind of electronic journal, where we integrate the journal in the classical sense with an open reviewing system, on-line discussions about each submitted article, and information and communication services for researchers in participating research specialties. For additional information about the ETAI, please refer to its web page at `http://www.etaij.org/`, and in particular to reference [72] which is published in that journal itself.

The development of the ETAI has also caused me to be involved of related issues, ranging from principles of quality control principles, copyright, and preservation in on-line electronic publishing, and to the design of software systems that can support modern, web-based publishing of scientific journals.

Past and Recent Research Contributions

I have been actively involved in basic research in the following topics areas within computer science.

- Knowledge representation, especially non-monotonic logic, temporal reasoning, and planning (1970-1974 and 1984-present). This has been my major research interest through the years.
- Heuristic-search approaches to planning (1968-1972)
- Computational paradigms for A.I. (Logic-based PLANNER-like languages; partial evaluation) (1968-1975)
- Design of programming environments and software development environments (1975-1980)
- Design of "intelligent" office information systems (1975-1983)
- Research communication software (1997-present)

In addition I have been involved in industrial application projects in several areas, including most recently in manufacturing robotics (1984-1986) and in co-driver systems for automobiles in the PROMETHEUS project (1987-1991).

Main achievements in knowledge representation:

`Reasoning about actions and change.`

My work on reasoning about actions and change, or the so-called "frame problem" in artificial intelligence, has produced the following results:

1. The first identification, in 1972, of the use of non-monotonic logic for dealing with the "frame problem", and of the difficulties which result such as the occurrence of multiple extensions[17].
2. The "action structures" approach to planning of discrete actions while also allowing concurrent actions [27], and the use of this approach for analysis of cyclic plans with concurrency [28].
3. A novel non-monotonic entailment method for dealing with the frame problem in the presence of non-initial observations, namely *filter preferential entailment* [30]. This method is now widely accepted.
4. Extension of standard approaches to the frame problem, which apply for discrete time and discrete-valued fluents, to the case of continuous time and continuous-valued fluents. The approach was to embed differential calculus in a first-order, non-monotonic temporal logic [29,30,32].
5. The method of *occlusion* for representing the effects of nondeterministic actions evolved in the context of the previous item. It has later been adopted by several key researchers in the field (Lifschitz, del Val, others).

`Systematic methodology for reasoning about actions and change.`

In 1994 I finished a book on nonmonotonic logic for temporal reasoning and planning, entitled Features and Fluents. The book, which was published by Oxford University Press [1], contains a systematic and crisp exposition of the topic as well as an in-depth overview of major current approaches. Most importantly, however, it proposes a new (at the time) methodology for research in the area, and the new approach is defined, motivated, and used extensively in the book.

Briefly, I address the following question: 'For a given, proposed nonmonotonic logic of actions and change, what is the range of correct applicability of this logic?'. In other words, the results are *assessments of the range of applicability* for a number of logic-based methods, previously proposed ones as well as new ones. This approach is based on precise definitions of intended models, and on the establishment of a taxonomy of reasoning problems whereby the range of applicability can be expressed.

Since a new methodology is only interesting when new results have been obtained with it, it was necessary to choose the monograph form for the presentation of this work. The book therefore constitutes the original publication of a number of new results, in place of the usual publication by conference or journal articles. (This is the reason for the small number of publications especially in the 1991-1992 period).

The book also subsumes and extends some of my own previous results in the area, in particular those reported in the papers [8], [17], and [27] through [32]. Additional, original results from the book then appeared in conference articles [33,63,66], a journal article [34], and an article in the *Handbook of Artificial Intelligence and Logic Programming*.

The range of applicability results in the book were all concerned with the case of strict inertia, without ramifications or qualifications. Later articles use the same technique for addressing entailment methods for ramification [62,68,69,71].

`Characterization of autonomous agents.`

My most recent development of the work on reasoning about actions and change, as described above, has been to use it for characterizing the architecture and design of autonomous agents, in particular robotic agents (agents in the real world). This topic was first addressed in [64,65,67] besides in the introductory chapters of the book "Features and Fluents". The systematic derivation or validation of a high-level, discrete action description from a low-level, continous action description was addressed in [57] and [70]. An approach to the description of hierarchical, goal-directed behavior was described in [59].

The logic-based approach to robotic agents that has evolved through the works described so far has been condensed and stated in closed form in an ETAI reference article [60].

`Other aspects of logic in KR and AI.`

1. A comprehensive encoding of natural language information in first order logic [4,15,37].
2. A characterization of a restricted non-normal default logic [8] and its use for expressing multiple inheritance with exceptions [9].
3. Development of discontinuity equations as a method for precise characterization of the transformation from continuous to discrete description in hybrid systems [31].
4. Initial work on the semantics for a non-monotonic logic with an explicit default operator **D** [48,49].
5. A computational method for planning, based on partial temporal models [31].

Main achievements in other areas:

`Heuristic search and planning.` This work [2] developed methods for heuristic search in a stochastic environment. Done in 1969, it extended the General Problem Solver (one of the earliest Artificial Intelligence research systems) in a way that the modern reader will recognize as a Markov Decision Process approach. This work passed unnoticed at the time, but Markovian techniques have been applied to the STRIPS problem solver (a successor of the GPS) since the mid 1980's.

In [36] I addressed heuristic search where one problem (seen as a state) may result in a conjunction of sub-problems which all must be solved.

`Computational paradigms for A.I.` This work addressed the question of efficient and systematic implementations for the logic based techniques that were developed and used in the previous topic area.

1. The early publication [10] decribes a PLANNER-like (i.e. rule-based) system based on what is today understood as a terminological language with a recursion capability.
2. Proposal for a practical implementation technique for function closures in LISP (`funarg`:s)[35]. This proposal was adopted in most major LISP implementations, and a similar solution is used in the modern COMMONLISP standard.
3. In connection with our use of first-order logic to encode natural language information in the early 1970:s (previous area, item 1), I developed methods to automatically translate a subset of FOPC (essentially Horn clauses) to corresponding LISP programs [16,5]. The use of function closures (see previous item) is crucial for the method.
4. As one of several concurrent and independent researchers, I also developed partial evaluation as a technique for compilation of (special purpose) programming languages [5,6,7].

The work on partial evaluation was continued by several researchers in our department (Haraldsson, Emanuelsson, Komorowski), and [6] is a standard reference in its field. My own active involvement ended in 1976.

`Programming environments and software development environments.` This work concerns how A.I.-style computational paradigms on different levels can also be used in practical circumstances. The issue includes both A.I.-style programming languages such as LISP, and higher-level computational paradigms in A.I. such as those based on logic.

1. Overview papers on LISP programming systems [7,18,19,33].
2. An implemented software system architecture consisting of a number of "environments" which serve one user each, and which communicate by message-sending [23,24]. This architecture was developed for the purposes of intelligent OIS as described next below.
3. Design of a concise software architecture for a general purpose command handler, based on multiple inheritance principles [25].

`Prototyping, Workflow, Intelligent office information systems.` Our work in this area actually started early with the development (and local promotion) of prototyping as a system development technique already in 1973-75. (At the time we did not think it was worth publishing internationally, but of course it has become more popular since). The research continued with several aspects including methodology, software tools, and formal specification techniques. The following were the main items.

1. Development of a specification method and software development tool for "information transport" systems, i.e. systems where an information object is moved along a chain of successive stations or offices in the organization, with some processing and/or delay taking place at each station[21,46]. This method was then transferred to practical use in the university hospital[41,42,43,44]. This work was done in 1979-1982, and introduced several essential concepts of what is today recognized as 'workflow' techniques.
2. Development of stepwise structuring as an appropriate technique in particular for situations involving multiple presentation media[26].
3. Development of a prototype OIS, based on the software development environment of the previous topics [22,40,46].
4. A method for formal description of operations in information management systems, i.e. editing operations in a data structure [45].

Work in this area has continued in our department with other group leaders; my own involvement ended in 1983.

`Research communication software.`

The introduction of the Electronic Transactions on Artificial Intelligence, ETAI, and its associated communication and bibliographic services has required the development of a range of software tools. It is yet too early to report on this as research; so far it has had mostly an instrumental character. To some extent it may be seen as a continuation of my earlier work on intelligent office information systems, but it differs through the use of a new application angle and, very importantly, because of new and much more favorable conditions that are offered by the World-Wide Web. Reference [58] is a first article that arguably belongs to this category; it described how we proposed to integrate structured data in an HTML-like framework.

Research leadership:

I was in charge of general research coordination in our department since Computer Science started in Linköping in 1975, and until 1990. During that period the department grew from zero to a department with more than 20 faculty members and guest researchers, and 150 employees, most of them graduate students.

Publications: Monographs

[1] Erik Sandewall. *Features and Fluents.* Oxford University Press, 1994.

Own journal articles until 1994

[2] Erik Sandewall. A planning problem solver based on look-ahead in stochastic game trees. *Journal of the ACM*, 16(3), July 1969.

[3] T. Groth, W. Schneider, J.-C. Vuille, and E. Sandewall. Computer simulation of ferrokinetic models. *Computer Programs in Biomedicine*, 1(2), June 1970.

[4] Erik Sandewall. Formal methods in the design of question-answering systems. *Artificial Intelligence*, 2, 1971.

[5] Erik Sandewall. Conversion of predicate-calculus axioms, viewed as non-deterministic programs, to corresponding deterministic programs. *IEEE Transactions on Computers*, C-25(4):342–346, April 1976.

[6] Lennart Beckman, Anders Haraldsson, Östen Oskarsson, and Erik Sandewall. A partial evaluator, and its use as a programming tool. *Artificial Intelligence*, 7:319–357, 1976.

[7] Erik Sandewall. Programming in the interactive environment: The LISP experience. *Computing Surveys*, 10(1):35–71, March 1978.

[8] Erik Sandewall. A functional approach to nonmonotonic logic. *Computational Intelligence*, 1(4), November 1985. Also in the Proceedings of IJCAI 1985.

[9] Erik Sandewall. Nonmonotonic inference rules for multiple inheritance with exceptions. *Proceedings of the IEEE*, October 1986.

[10] Erik Sandewall. Towards a logic of dynamic frames. *International Journal of Expert Systems*, 3(4):355–370, 1990. .

[11] Erik Sandewall. Knowledge-based systems, Lisp, and very high level implementation languages. *The Knowledge Engineering Review*, 7(2):147–155, 1992.

[12] Erik Sandewall. The range of applicability of some nonmonotonic logics for strict inertia. *Journal of Logic and Computation*, 4(5), October 1994.

Own articles at conferences with strict reviewing, until 1993

[13] Erik Sandewall. LISP A, A LISP-like system for incremental computing. In *Proc. Spring Joint Computer Conference*, 1968.

[14] Erik Sandewall. A set-oriented property-structure representation for binary relations, SPB. In *Machine Intelligence 5*. Edinburgh University Press, 1970.

[15] Erik Sandewall. Representing natural language information in predicate calculus. In *Machine Intelligence 6*. Edinburgh University Press, 1971.

[16] Erik Sandewall. PCDB, a programming tool for management of a predicate calculus oriented data base. In *International Joint Conference on Artificial Intelligence*, pages 159–166, 1971.

[17] Erik Sandewall. An approach to the frame problem, and its implementation. In *Machine Intelligence, Vol. 7*, pages 195–204. Edinburgh University Press, 1972.

[18] Erik Sandewall. Ideas about management of LISP data bases. In *International Joint Conference on Artificial Intelligence*, 1975.

[19] Erik Sandewall. Some observations about conceptual programming. In *Machine Intelligence 8*. Edinburgh University Press, 1977.

[20] Erik Sandewall. Biological software. In *International Joint Conference on Artificial Intelligence*, 1979.

[21] Erik Sandewall. A description language and pilot-system executive for information-transport systems. In *Proc. Fifth International Joint Conf. on Very Large Data Bases, Rio de Janeiro*, 1979.

[22] Erik Sandewall, Claes Strömberg, and Henrik Sörensen. Provisions for flexibility in the Linköping Office Information System, LOIS. In *Proceedings of the National Computer Conference, Los Angeles*, 1980.

[23] Erik Sandewall, Claes Strömberg, and Henrik Sörensen. A system of communicating residential environments. In *Proc. of the 1980* LISP *Conference*, 1980.

[24] Erik Sandewall, Claes Strömberg, and Henrik Sörensen. Software architecture based on communicating residential environments. In *Proc. of the Fifth International Conference on Software Engineering, San Diego*, 1981.

[25] Erik Sandewall. Unified dialogue management in the CAROUSEL system. In N. Naffah, editor, *Office Information Systems. Proceedings of the second international workshop*, pages 175–199. North-Holland, 1982.

[26] Erik Sandewall, Sture Hägglund, Christian Gustafsson, Lars Jonesjö, and Ola Strömfors. Stepwise structuring – a style of life for flexible software. In *Proceedings of the National Computer Conference, Anaheim, CA*, 1983.

[27] Erik Sandewall and Ralph Rönnquist. A representation of action structures. In *National (US) Conference on Artificial Intelligence*, pages 89–97, 1986.

[28] Erik Sandewall. The pipelining transformation on manufacturing cells with robots. In *International Joint Conference on Artificial Intelligence*, pages 1055–1062, 1987.

[29] Erik Sandewall. Combining logic and differential equations for describing real-world systems. In *Proc. International Conference on Knowledge Representation, Toronto, Canada*, 1989. .

[30] Erik Sandewall. Filter preferential entailment for the logic of action in almost continuous worlds. In *International Joint Conference on Artificial Intelligence*, pages 894–899, 1989.

[31] Erik Sandewall. A decision procedure for a theory of actions and plans. In Zbigniew Ras, editor, *Methodologies for Intelligent Systems, IV*. North-Holland, 1989.

[32] Erik Sandewall. Reasoning about the world as perceived by an agent. In *Proc. European Conf. on A.I. (ECAI)*, 1990. .

[33] Erik Sandewall. LISP as a Very High Level Implementation Language. In *Proc. First European Conf. on the Practical Applications of* LISP *(EuroPAL)*, 1990. .

[34] Erik Sandewall. The range of applicability of nonmonotonic logics for the inertia problem. In *International Joint Conference on Artificial Intelligence*, 1993.

Selected other published articles, until 1994

[35] Erik Sandewall. A proposed solution to the FUNARG problem. *SIGSAM Bulletin*, (17), 1971.

[36] Erik Sandewall. Heuristic search: concepts and methods. In N. Findler and B. Meltzer, editors, *Artificial Intelligence and Heuristic Programming*. Edinburgh University Press, 1971.

[37] Erik Sandewall. Deductive search in a semantic net. In *Symposium "Organismic Information Processing"*. Gesellschaft für Psychologie der DDR, 1973.

[38] Erik Sandewall. Current trends in Artificial Intelligence. In W. Schneider and A.-L. Sågvall Hein, editors, *Computational Linguistics in Medicine*. North-Holland, 1977.

[39] Erik Sandewall. A survey of Artificial Intellligence with respect to computer-aided design. In J.-C. Latombe, editor, *Artificial Intelligence and Patter Recognition in computer-aided design*. North-Holland, 1978.

[40] Erik Sandewall. LOIS, an overview of facilities and design. DATA, 9(1-2), February 1979.

[41] E. Jungert, G. Lönnemark, E. Sandewall, K. Sunnerud, and O. Wigertz. A tool for the design and development of medical data processing systems. In *Proc. 2nd Congress on Medical Informatics, Europe*, West Berlin, 1979.

[42] H. Karlsson, R. Lindvall, O. Rosin, E. Sandewall, H. Sörensen, and O. Wigertz. Experience from computer supported prototyping for information flow in hospitals. *ACM Sigsoft Software Engineering Notes*, 7(5):67–70, 1982.

[43] H. Gill, R. Lindvall, O. Rosin, E. Sandewall, and O. Wigertz. A method for interactive design of communicating information information sys-

tems. In H. E. Peterson and A. I. Isaksson, editors, *Communication Networks for Health Care*. North-Holland, 1982.

[44] H. Gill, B. Kågedahl, H. Sörensen, L. Tegler, and O. Wigertz. A notation for information flow models supporting interactive systems development. In *Proceedings of the 6th Annual Symposium on Computer Applications in Medical Care*, Washington, D.C., November 1982.

[45] Erik Sandewall. Formal specification and implementation of operations in information management systems. In J. Heering and P. Klint, editors, *Colloquium Programmeeromgevingen, MC Syllabus*. Mathematisch Centrum, Amsterdam, 1983.

[46] Erik Sandewall. Systems development environments. In Ian Benson, editor, *Intelligent Machinery: Theory and Practice*. Cambridge University Press, Cambridge, England, 1985.

[47] Erik Sandewall. Specification environments for information management systems (position paper). In *Congress of International Federation of Information Processing (IFIP)*, 1986.

[48] Erik Sandewall. An approach to non-monotonic entailment. In Z.W. Ras and L. Saitta, editors, *Methodologies for Intelligent Systems, III*, pages 391–397. North-Holland, 1988. .

[49] Erik Sandewall. The semantics of non-monotonic entailment defined using partial interpretations. In M. Reinfrank et al., editor, *Non-Monotonic Reasoning*, pages 27–41. Springer-Verlag, 1988. LiTH-IDA-R-88-31, LAIC-IDA-88-TR32.

[50] Erik Sandewall. Artificial intelligence techniques for complex information processing in vehicles. In *Proceedings, XXXVI Convegno Internazionale delle Comunicazioni, Genoa*, pages 431–437, 1988. LAIC-IDA-88-TR22.

Book editor contributions

[51] Pierpaolo Degano and Erik Sandewall, editors. *Integrated interactive computing systems*. North-Holland, 1983.

[52] David R. Barstow, Howard E. Shrobe, and Erik Sandewall, editors. *Interactive Programming Environments*. McGraw Hill, 1984.

[53] Michael Reinfrank, Johan de Kleer, Matthew L. Ginsberg, and Erik Sandewall, editors. *Non-Monotonic Reasoning. Proceedings of the Second International Workshop*. Number 346 in Lecture Notes in Artificial Intelligence. Springer Verlag, 1988.

[54] James Allen, Richard Fikes, and Erik Sandewall, editors. *Principles of Knowledge Representation and Reasoning. Proceedings of the second international conference*. Morgan-Kaufmann, 1991.

[55] Erik Sandewall and Carl Gustaf Jansson. *Proceedings of Scandinavian Conference on Artificial Intelligence*. IOS Press, 1993.

[56] Christer Bäckström and Erik Sandewall. *Current trends in AI planning (Workshop proceedings)*. IOS Press, 1994.

Own journal articles since 1995

[57] Erik Sandewall. Towards the validation of high-level action descriptions from their low-level definitions. *Artificial Intelligence Communications*, December 1996. Also Linköping University Electronic Press, http://www.ep.liu.se/cis/1996/004/.

[58] Erik Sandewall. Towards a world-wide database. *Computer Networks and ISDN Systems*, 28:1513–1522, 1996.

[59] Erik Sandewall. A logic-based characterization of goal-directed behavior. *Electronic Transactions on Artificial Intelligence*, 1:105–128, 1997.

[60] Erik Sandewall. Cognitive robotics logic and its metatheory: Features and fluents revisited. *Electronic Transactions on Artificial Intelligence*, 2:307–329, 1998.

[61] Erik Sandewall. An early use of continuations and partial evaluation for compiling rules written in first-order predicate calculus. *Higher-Order and Symbolic Computation*, 12:105–113, 1999.

Own articles at conferences, since 1993

[62] Erik Sandewall. Causal qualification and structure-based ramification. In *Common Sense 93 – The Second Symposium on Logical Formalizations of Commonsense Reasoning*, 1993.

[63] Erik Sandewall. Systematic assessment of temporal reasoning methods for use in autonomous agents. In J. Komorowski and Z.W. Ras, editors, *International Symposium on Methodologies for Intelligent Systems*, pages 558–570. Springer Verlag Lecture Notes in Artificial Intelligence, no. 689, 1993.

[64] Erik Sandewall. The role of temporal reasoning subsystems in the architecture of autonomous robots. In G. Rzevski, J. Pastor, and R.A. Adey, editors, *Artificial Intelligence in Engineering VIII*, pages 3–6. Computational Mechanics Publications/ Elsevier, 1993.

[65] Erik Sandewall. Nonmonotonic temporal logics and autonomous agents: each contributes to the rigorous basis of the other. In O. Herzog et al, editor, *Grundlagen und Anwendungen der Künstlichen Intelligenz. Proc. German A.I. conference*. Springer Verlag, 1993.

[66] Erik Sandewall. Systematic assessment of temporal reasoning methods for use in autonomous agents. In Z. Ras, editor, *Proceedings of ISMIS 1993*. Springer Verlag, 1993.

[67] Erik Sandewall. La sémantique des agents autonomes. In *9e Congrès Reconnaissance des Formes et Intelligence Artificielle*. AFCET, Paris, 1994.

[68] Erik Sandewall. Reasoning about actions and change with ramification. In J. van Leeuwen, editor, *Computer Science Today*. Springer Verlag, Berlin. Lecture Notes in Computer Science, Anniversary Volume 1000,

1995.

[69] Erik Sandewall. Assessments of ramification methods that use static domain constraints. In *International Conference on Knowledge Representation and Reasoning.* Morgan Kaufmann, 1996.

[70] Erik Sandewall. Relating high-level and low-level action descriptions in a logic of actions and change. In Oded Maler, editor, *Hybrid and Real-Time Systems*, pages 3–17. Springer Verlag, 1997.

[71] Erik Sandewall. Transition cascade semantics and first assessments results for ramification. In Oliviero Stock, editor, *Spatial and Temporal Reasoning.* Kluwer Publishing Company, 1997.

Own articles about research publication

[72] Erik Sandewall. Publishing and reviewing in the etai. editorial note. *Electronic Transactions on Artificial Intelligence*, 1:1–12, 1997.

Invited Lectures, 1992-1994

Invited lectures since 1994 to be added (apologies for the incompleteness).

Invited tutorial lectures:

Summer School on Partial Semantics and Non-monotonic Reasoning, Linköping, 25–29 May, 1992: Dynamic reasoning in A.I: Aspects of partial descriptions and non-monotonic reasoning.

Summer School on Temporal Reasoning, Bolzano, Italy, 13–17 July, 1992: Dynamic reasoning in A.I: Reasoning about time and action in dynamical systems with inertia.

Fourth European Summer School in Logic, Language, and Information, University of Essex, England, 24-28 August, 1992: Nonmonotonic reasoning about time and action.

First International Conference on Temporal Logic, Bonn, Germany, 11-14 July, 1994: Reasoning about actions and change.

Invited lectures at conferences:

ECAI'88 (European Conference on Artificial Intelligence), Munich, Germany, 10 June 1988: Future Developments in Artificial Intelligence.

AICS'92 (Annual meeting of the Irish A.I. society), Limerick, Ireland, 10 September 1992: The Frame Problem – Past, Present, and Future.

*III Convegno AI*IA (Italian Annual A.I. meeting), Genoa, 5 November, 1992:* The role of logic in the design of intelligent real-time systems.

ISMIS'1993 (International Symposium of Methodology of Intelligent Systems), Trondheim, Norway, 15-18 June, 1993: Systematic assessment of temporal reasoning methods for use in autonomous agents.

AIENG 93 (8th International Conference on Artificial Intelligence in Engineering), Toulouse, France, 29 June – 1 July, 1993: The role of temporal reasoning subsystems in the architecture of autonomous robots.

KI 93 (German A.I. conference), Bonn, September 15, 1993: Nonmonotonic temporal logics and autonomous agents: each contributes to the rigorous basis of the other.

RFIA (9^e Congrs Reconnaissance des Formes et Intelligence Artificielle), Paris, France, 11–14 January, 1994: La smantique des agents autonomes.

Invited lectures at other research institutes and research projects (1992-1994):

LAAS-CNRS, Toulouse, France, 6 November 1992: Systematic assessment of non-monotonic entailment criteria for reasoning about time and action.

Pontificia Universidad Católica de Chile, Santiago, Chile, 5 and 6 January, 1993: Intelligent Autonomous Systems: How to combine the perspectives of artificial intelligence, control engineering, and real-time systems.

GIA, Universit de Marseille – Luminy, France, 25 January, 1994: Evaluation systmatique de certains logiques pour l'action et le changement.

IRIT, Toulouse, France, 27 January, 1994: La recherche contemporaine sur le frame problem, la ramification, la qualification et le traitement des surprises.

LIPN, Université Paris-Nord, France, 3 May, 1994: Same topic as the previous one.

Département d'Informatique, Université de Technologie de Compiègne, France, 4 May, 1994: La représentation arborescente du temps metrique.

InterPRC project, Toulouse, France, 2 June, 1994: Persistence non-stricte: quelles sont les suppositions naturelles et par lesquelles sera possible une analyse systematique?.