

# Manuel Hermenegildo

## Areas of Interest

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Energy-Aware Computing, Resource / non-functional property analysis, verification, and control; Global Program Analysis, Optimization, Verification, Debugging; Abstract Interpretation; Partial Evaluation; Parallelism and Parallelizing Compilers; Constraint/Logic/Functional Programming Theory and Implementation, Abstract Machines; Automatic Documentation Tools, Execution Visualization; Sequential and Parallel Computer Architecture.

## Education

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Aug 1986      **PhD.**, Electrical and Computer Eng., University of Texas at Austin.  
Aug 1984      **M. S.**, Electrical and Computer Eng., University of Texas at Austin.  
Jun 1981      **M. S.**, Electrical Eng., Technical U. of Madrid.

## Positions

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Jan 2007-...      **Scientific Director**, *Madrid Institute for Advanced Research in Software Development Technology (IMDEA Software, software.imdea.org)*, Spain, and  
Jan 1990-...      **Full Professor** (January 1990-May 1994 **Associate Professor**), *Technical U. of Madrid*, Department of Computer Science; Spain.

Built Institute from its foundation into a world-level first-class institution. General scientific coordination of the Institute. **Director, EIT Digital Spain** (Spanish Node of the European Institute for Innovation and Technology EIT Digital KIC.) **Director, Microsoft Research – IMDEA Software Joint Research Center**. Research. PhD. student and PostDoc supervision. Graduate and undergraduate teaching. Leader of the CLIP (Computational Logic, Implementation and Parallelism) Lab. Principal investigator in a large number of EU, international, and national projects on resource-aware computing, static analysis, automatic parallelization, verification, abstraction carrying code, global analysis of programs, constraint logic programming, program debugging, next generation program development tools, and others.

Feb 03-Dec 08      **Prince of Asturias Endowed Chair** in Information Science and Technology, *U. of New Mexico*, Departments of Computer Science and Electrical and Computer Engineering; Albuquerque, NM, USA  
Research. PhD. student and PostDoc supervision. Graduate and undergraduate teaching.

May 00-Sep 02      **Director** of the *Spanish National Research Directorate* (Spanish central agency financing research in all areas of science and technology).  
Creation of the directorate from a number of previously existing units. Design and management of all programs funding projects, human resources, and infrastructures, including starting the “Ramon y Cajal” fellowship program. Coordination with regional, European, and international programs. Benchmarking of the national S&T system. Member, board of directors of the Spanish Foundation for Science and Technology, the Spanish Scientific Research Council (CSIC), and the Spanish Center for Industrial and Technological Development (CDTI). Spanish representative in the European Union Advisory Committee for Research (CREST).

- Oct 86-Dec 89 **Member, Technical Staff, MCC**, Parallel Processing Program and ACA/Systems Technology Lab.; Austin, Texas.  
Principal Investigator, PAL project: parallel and sequential high performance implementation of next generation languages and systems. Development of theoretical bases, execution models, and actual implementations of high-performance parallel logic programming systems. Design and simulation of coherent-cache, cluster-based multiprocessors. Performance studies of execution models on several parallel architectures and organizations.
- Mar 87-Jan 90 **Assistant/Associate Professor** (adjunct), *University of Texas at Austin*, Computer Science Department.  
Teaching (Computer Architecture, Logic Programming). Supervision of PhD. students working in the areas of parallel computer architecture, parallel execution model theory and design, abstract interpretation, and automatic parallelization.
- Jun 85-Aug 85 **Intern, MCC**; Austin, Texas.
- Jul 84-Aug 84 **Intern, IBM Corp.**; Austin, Texas.
- Nov 82-Aug 83 **Analyst, Philips S.A.**; Madrid, Spain.  
Technical management.
- Jun 81-Aug 81 **Design Engineer** (praktikum), *Siemens Gmbh.*; Munich, Germany.  
Electronic circuit design and embedded systems development for audio and automotive applications.
- Jan 80-Oct 82 **President, HC Electronics**; Madrid, Spain.  
Co-owned venture, involved in the development and licensing of electronic circuit designs and prototypes. Products included a Speech Scrambler marketed by Eurotronica S.A., and a Spectrum Scanning System installed at the National Optics Institute.

#### Other Selected Activities, Honors, and Awards

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- “Julio Rey Pastor” **Prize for Research in Mathematics and Information and Communication Technologies**, 2006 (highest Spanish national scientific award in the areas of mathematics and information technology). “Aritmel” **Prize for Scientific Merit in Computer Science**, 2005. Elected member of the **Academia Europaea**.
- **Invited talks and/or tutorials** at Dagstuhl’17, VPT’17, Dagstuhl’16, UninovaPhDForum’15, Dagstuhl’14, RichModelToolkit’11, RuleML’11, WLPE’11, TAPAS’10 (at SAS 2010), Datalog2.0 (2010), ProTest 09 workshop, 30 Years of Abstract Interpretation POPL’08 meeting, European Computer Science Summit’08, DAMP’07, EEAI’06, DAMP’06, ACM SAC’06, PPDP’05, EUROPAR’04, EU-IST GRIDS’04, SAS’03, ICALP’02, ERCIM/CoLogNet’02, LPAR’01, CL’00, CM-PP’00, AgentLink’99 WS, ICLP’99, AFLP’98, EUROPAR’97, ILPS’97, ICLP’97, PAAM / PAP’97, CCL’96, LPAR’94, JICSLP’92, SAS’92, IEEE CompEuro 92, ICLP’89 and at several Workshops and Summer Schools.
- **Associate Editor** of the “*Journal of New Generation Computing*” (Springer-Verlag), **Editorial Adviser** and former **Area Editor** (architecture and implementation) of “*Theory and Practice of Logic Programming*” (Cambridge U. Press) (formerly, the “*Journal of Logic Programming*”, Elsevier North-Holland), **Area Editor** of “*Journal of Applied Logic*” (Elsevier North-Holland), former **Associate Editor** of “*ACM Transactions on Programming Languages and Systems*” (ACM).
- **Program Committee Chair or Co-Chair**: “2017 Workshop on Horn Clause-based Verification and Synthesis”, HCVS 2017, Gotheborg, Sweden; “2016 Conference on Logic-based Program Synthesis and Transformation”, LOPSTR 2016, Edinburgh, UK; “2016 Compiler Construction

*Conference*”, CC 2016, Barcelona, Spain; “2013 National Computer Science Conference”, CEDI 2013, Madrid, Spain; “2012 European Computer Science Summit”, ECSS 2012, Barcelona, Spain; “2010 International Conference on Logic Programming”, 2010, Edinburgh, UK; “*Verification, Abstract Interpretation and Model Checking*” VMCAI 2010, Madrid, Spain; “2008 Declarative Aspects of Multicore Programming” (San Francisco, CA, USA); 2008 International Symposium on Functional and Logic Programming (FLOPS’08) (Ise, Japan); “2005 Practical Aspects of Declarative Programming Symposium” PADL’05 (Long Beach, CA, USA), “2002 Static Analysis Symposium”, SAS’02 (Madrid, Spain); “Parallel Symbolic Computing” track of EUROPAR’97, 1997 (Passau, Germany); “Programming Languages: Implementations, Logics, and Programs”, 1994 (Madrid, Spain) and 1995 (Utrecht, The Netherlands); “North American Conference on Logic Programming”, 1990, Austin, TX.

- **Conference Chair or Co-Chair**, “ACM Principles of Programming Languages” POPL 2010, Madrid, Spain, “International Conference on Logic Programming” ICLP 2006, Seattle, WA, USA, “2005 Symposium on Practical Aspects of Declarative Languages” PADL’05, Long Beach, CA, USA, “2002 Static Analysis Symposium” SAS’02, Madrid, Spain, Joint “Algebraic and Logic Programming” and “Programming Languages: Implementations, Logics, and Programs” conferences, 1994, Madrid, Spain, *First Spanish Conference on Declarative Programming*, PROLE’92, as well as many workshops since 1987 –latest ones the 2014-2016 Microsoft-IMDEA collaboration workshops and the “2017 Workshop on Horn Clause-based Verification and Synthesis”, HCVS 2017, Gotheborg, Sweden.
- **Program Committee or ERC Member** for many conferences including PACT’17 (ERC), ICLP’17, POPL’17 (ERC), FLOPS’16, AppLP’16, PLDI’16, TAPAS’15, LOPSTR’15, FOPARA’15, PADL’14, ECSS’14, POPL’13, ICLP’13, LOPSTR’13, Turing100’12, STOP’12, LPAR’12, PLDI’11, DAMP’11, ICLP’10, VMCAI’10, ICLP’08, SAS’08, ServiceWave’08, DAMP’08, FLOPS’08, TGC’07, SAS’07, TGC’06, FLOPS’06, PADL’06, ESOP’05, ICALP’05, PPSWR’05, AEPIA’05, PROLE’05, PADL’05, ICLP’04, EUMAS’04, PDCS’04, PROLE’04, PPDP’03, CP’03, PADL’03, EUMAS’03, PPDP’02, SAS’02, ICLP’01, SAS01, LOPSTR’01, POPL’00, LOPSTR’00, CMPP’00, ESOP’00, ECAI’00 CLPWS, PPDP’99, FLOPS’99, PADL’99, Irregular’99, POPL’97, ICLP’97, DPLE’97, CP’95, Europar’95, PLILP’94-95, PARLE’93, GULP-PRODE’92-94, PLILP’93-95, JICSLP’92, PAP’91, NACLIP’90, ICLP’90, ICLP’89. **Session chairman** and **panelist** at several conferences and workshops.
- **Member** of ISTAG, the High-level Advisory Group of the Information Society Technologies Research Program (IST) of the European Union for Framework Program VI (2002-2006). President of several working groups. Co-authored several “white books” and policy reports (not included in publications list).
- **Panel Member** ACM 50th Anniversary Workshop on Future Directions in Computer Science, the ALP Strategic Directions Meeting, and at several EU Vth, VIth, and VIIth Framework Program strategic planning meetings (“New Directions for ICTs in FP7 meeting: Grand challenges for basic research,” “Next Generation GRIDs,” “Global Computing,” “Future Software Systems,” “Advanced Embedded Systems,” etc.).
- **Invited speaker** at the Danish EU presidency high-level meeting on the need for a European Research Council.
- **Acted as scientific expert** at Spanish Senate hearings, on software patents and open source software. Expert and National Representative for the OECD on Dissemination of Scientific Data and Results.
- **Elected Vice-President** and **Member of the Executive Board** of *Informatics Europe*. **Elected President** of the *Association for Logic Programming* (ALP) and the *Spanish Research Consortium in Informatics and Mathematics* (SpaRCIM, Spain’s member in ERCIM).
- **Member of the Steering Committee** of *ACM Principles of Programming Languages Conference* (POPL) (and POPL’2011 Most Influential Paper Award committee), *Verification, Abstract Interpretation and Model Checking Conference* (VMCAI), *Static Analysis Symposium* (SAS), *Functional and Logic Programming Symposium* (FLOPS), *ACM Principles and Practice of Declarative*

*Programming Symposium (PPDP), Federated Logic Conference (FLoC), Compiler Construction (CC), and Declarative Aspects of Multicore Programming Workshop series.*

- **Elected member of the steering boards** of the *European Association for Programming Languages and Systems* (EAPLS), and (twice) of the *Association for Logic Programming*.
- **Member of the Scientific Advisory Board** of *INRIA*, the *Schloss Dagstuhl* International Center, the Spanish *National Research Council*, *ACM SIGLOG*, *IFCoLog*, the *NOVA LINCS* center, and the *Initiative de Recherche et Innovation sur le Logiciel Libre*, *IRILL* center.
- **Highest ranked paper** at PPDP 2016 (with Nataliia Stulova and José Morales). **Best paper award** at ICSOC 2011 (with Dragan Ivanovic and Manuel Carro) and at ICLP 2005 (with José Morales, Manuel Carro, and Germán Puebla).
- **Member of the winning team** at the 18th Prolog Programming contest, at ICLP 2011 in Lexington KY (with Michael Leuschel and Antonio Porto).
- Served on **tenure and promotion committees** or as a **center or department evaluator** for LERO (Ireland), K.U.Leuven (Belgium, University of Copenhagen (DIKU), T.U. Denmark (TUD), Cambridge U. (U.K.), Cyprus U., INRIA (France), Ecole Normale Supérieure (France), U. of Porto (Portugal), U. of Melbourne (Australia), New Mexico State U. (USA), Ecole Polytechnique (France), Negev U. (Israel), etc. and several Spanish universities. **President** of the Spanish national **research performance evaluation commission** for the areas of Computer Science and Electronics (CNEAI). Member of Department Evaluation Advisory Board at *Informatics Europe*.
- **Area Coordinator** (parallelism and implementation technologies) of the EU Networks of Excellence in Computational Logic COMPULOG and CoLogNet.
- **Invited Lecturer**, October 1996, in the distinguished visitor lecture series of New Mexico State University. Former **lecturer** on the “*IEEE Computer Society Distinguished Visitor Program*”.
- **Invited Scientist**, August-September 1988, at the Japanese Institute for fifth generation computing (ICOT) in Tokyo.
- **Developed a number of practical software systems**, which are in the public domain, some of them with thousands of users, including the Ciao programming system, CiaoPP, LPdoc, the PiLLoW library, CP analyzers, PLAI, automatic parallelizers, &-Prolog, VisAndOr, etc.
- Participated in more than 50 **research projects**, in most of them as principal investigator, funded by the European Union and the Spanish Ministries, as well as NSF, MITI, etc. Also in several projects funded by industry.
- **Referee** for several journals (TOPLAS, Computing Reviews, TCS, TPLP/JLP, JSC, JPDC, FGCS, TODS, LOPLAS, IJPP, IEEE-TSE, JFGC, COMPLANG, JFLP, etc.), and conferences (POPL, SAS, IJCAI, ICLP, SLP, ILPS, PPDP, NAACP, JICSLP, ICPP, DCS, CONPAR, CP, ESOP, EUMAS, PAP, PARLE, PLILP, ALP, POPL, WSA, EUROPAR, GULP, ICALP, ICPA, PODS, ASIAN, CAEPIA, PACT, PASCO, PPSWR, etc.).
- **Evaluator** and panel member for several institutions: EU (ESPRIT, IST FP IV, V, VI), NSF, DARPA, DoD, ICOT, ISF, FULBRIGHT, the Australian, Austrian, Belgian, Danish, French, Irish, Swedish, Spanish, and UK funding agencies, etc.
- **Faculty Adviser** for the ACM student chapter of the T.U. of Madrid.
- **Fulbright-Hays Scholarship** for Graduate Study in the U.S. (1983-84). **U. of Texas Graduate Research Grant** (1984-85). **MCC Graduate Research Grant** (1985-86).
- **Professional Societies**: ACM, IEEE (Computer Society), ALP (Assoc. for Logic Programming), EAPLS, ATI (Professional Computer Engineers' Assoc. of Spain), ERCIM/SpaRCIM, Informatics Europe, among others.
- **Member** of the Tau Beta Pi Engineering Honor Society.

## Students and Recent Collaborators

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### *Graduated Ph.D. Students (+ graduating university/current location):*

Kalyan Muthukumar (U.T. Austin/IBM San Jose / Apple research), Yow-Yan Lin (UT Austin/Bellcore), María García de la Banda (T.U. Madrid/Melbourne University), Francisco Bueno (T.U. Madrid), Germán Puebla (T.U. Madrid), Pedro López García (T.U. Madrid), Manuel Carro (T.U. Madrid), Daniel Cabeza Gras (T.U. Madrid), Jorge Navas (U. of New Mexico/U. of Singapore), Amadeo Casas (U. of New Mexico/Microsoft), Mario Méndez (U. of New Mexico/U.T. Austin), José Francisco Morales (T.U. Madrid/Complutense U.), Pablo Chico (T.U. Madrid).

### *Most recent collaborators (outside the IMDEA SW Institute and UPM):*

P. Stuckey (Melbourne U., Australia), R. Haemmerle (Leontech, Switzerland), M. Marron (Microsoft, USA) H. Muller (Xmos, UK) M. Rosendahl (U. of Roskilde, Denmark), K. Eder (U. Bristol, UK), K. Marriott (Monash U., Australia), E. Pontelli (New Mexico S.U., USA), G. Gupta (U.T. Dallas, USA), S. Debray (U. of Arizona, USA), U. Montanari (U. Pisa, Italy), F. Rossi (U. Pisa, Italy), K. Shen (Imperial College, UK), M. Codish (Ben Gurion U., Israel), M. Bruynooghe (K.U. Leuven, Belgium), P. Deransart (INRIA, France), J. Maluszynski (Linköping U., Sweden), V. Santos-Costa (U. of Porto, Portugal), J. Gallagher (U. of Roskilde, Denmark), D. Kapur (U. of New Mexico, USA), D. Stefanovic (U. of New Mexico, USA).

## Personal data / contact

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**Name:** Manuel V. Hermenegildo.  
**Birth date:** March 13, 1959  
**Address:** IMDEA Software Institute and  
 Universidad Politécnica de Madrid  
 Campus Montegancedo s/n  
 28223 Pozuelo de Alarcon, Madrid / SPAIN  
**Email:** manuel.hermenegildo at imdea.org  
 manuel.hermenegildo at upm.es  
**URLs:** <http://www.cliplab.org/~herme>  
**Phone:** +34-91-101-2202 (IMDEA) / +34-91-336-7435 (UPM)

## Publications (in reverse chronological order)

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### Articles in Refereed Journals:

1. U. Liqat, Z. Banković, P. Lopez-Garcia, M. V. Hermenegildo. *An Evolutionary Scheduling Approach for Trading-off Accuracy vs. Verifiable Energy in Multicore Processors*. Logic Journal of the IGPL, To Appear, Oxford Academic Press, 2017.
2. N. Stulova, J. F. Morales, M. V. Hermenegildo. *Some Trade-offs in Reducing the Overhead of Assertion Run-time Checks via Static Analysis*. Science of Computer Programming, To Appear, Elsevier North-Holland, 2017. (to appear).
3. K. Eder, J.P. Gallagher, P. Lopez-Garcia, H. Muller, Z. Banković, K. Georgiou, R. Haemmerlé, M. V. Hermenegildo, B. Kafle, S. Kerrison, M. Kirkeby, M. Klemen, X. Li, U. Liqat, J. Morse, M. Rhiger, M. Rosendahl. *ENTRA: Whole-Systems Energy Transparency*. Microprocessors and Microsystems, Vol. 47, Part B, pages 278–286, Elsevier, November 2016.
4. I. Garcia-Contreras, J. F. Morales, M. V. Hermenegildo. *Semantic Code Browsing*. Theory and Practice of Logic Programming, 32nd Int'l. Conference on Logic Programming (ICLP'16) Special Issue, Vol. 16, Num. 5-6, pages 721–737, Cambridge U. Press, October 2016.

5. P. Lopez-Garcia, M. Klemen, U. Liqat, M. V. Hermenegildo. *A General Framework for Static Profiling of Parametric Resource Usage*. Theory and Practice of Logic Programming, 32nd Int'l. Conference on Logic Programming (ICLP'16) Special Issue, Vol. 16, Num. 5-6, pages 849–865, Cambridge U. Press, October 2016.
6. J.F. Morales, M. Carro, M. V. Hermenegildo. *Description and Optimization of Abstract Machines in a Dialect of Prolog*. Theory and Practice of Logic Programming, Vol. 16, pages 1–58, Cambridge University Press, January 2016.
7. N. Stulova, J. F. Morales, M. V. Hermenegildo. *Practical Run-time Checking via Unobtrusive Property Caching*. Theory and Practice of Logic Programming, 31st Int'l. Conference on Logic Programming (ICLP'15) Special Issue, Vol. 15, Num. 04-05, pages 726–741, Cambridge U. Press, September 2015. <http://arxiv.org/abs/1507.05986>.
8. A. Serrano, P. Lopez-Garcia, M. V. Hermenegildo. *Resource Usage Analysis of Logic Programs via Abstract Interpretation Using Sized Types*. Theory and Practice of Logic Programming, 30th Int'l. Conference on Logic Programming (ICLP'14) Special Issue, Vol. 14, Num. 4-5, pages 739–754, Cambridge U. Press, 2014.
9. D. Ivanovic, M. Carro, M. V. Hermenegildo. *A Sharing-Based Approach to Supporting Adaptation in Service Compositions*. Computing, Vol. 95, Num. 6, pages 453–492, Springer Wien, June 2013. 10.1007/s00607-012-0230-z.
10. M. V. Hermenegildo, F. Bueno, M. Carro, P. López, E. Mera, J.F. Morales, G. Puebla. *An Overview of Ciao and its Design Philosophy*. Theory and Practice of Logic Programming, Vol. 12, Num. 1–2, pages 219–252, Cambridge University Press, January 2012. <http://arxiv.org/abs/1102.5497>.
11. J. F. Morales, R. Haemmerlé, M. Carro, M. V. Hermenegildo. *Lightweight compilation of (C)LP to JavaScript*. Theory and Practice of Logic Programming, 28th Int'l. Conference on Logic Programming (ICLP'12) Special Issue, Vol. 12, Num. 4-5, pages 755–773, Cambridge U. Press, 2012.
12. E. Albert, P. Arenas, G. Puebla, M. Hermenegildo. *Certificate Size Reduction in Abstraction-Carrying Code*. Theory and Practice of Logic Programming, Vol. 12, Num. 3, pages 283–318, 2012.
13. P. Chico de Guzmán, A. Casas, M. Carro, M. V. Hermenegildo. *Parallel Backtracking with Answer Memoing for Independent And-Parallelism*. Theory and Practice of Logic Programming, 27th Int'l. Conference on Logic Programming (ICLP'11) Special Issue, Vol. 11, Num. 4–5, pages 555–574, Cambridge U. Press, July 2011.
14. G. Puebla, E. Albert, M. V. Hermenegildo. *Efficient Local Unfolding with Ancestor Stacks*. Theory and Practice of Logic Programming, Vol. 11, Num. 1, pages 1–32, Cambridge U. Press, January 2011.
15. A. Stivala, P. J. Stuckey, M. García de la Banda, M. V. Hermenegildo, A. Wirth. *Lock-free Parallel Dynamic Programming*. Journal of Parallel and Distributed Computing, Vol. 70, Num. 8, pages 839–848, Elsevier, 2010.
16. P. López-García, F. Bueno, M. V. Hermenegildo. *Automatic Inference of Determinacy and Mutual Exclusion for Logic Programs Using Mode and Type Information*. New Generation Computing, Vol. 28, Num. 2, pages 117–206, Ohmsha, Ltd. and Springer, 2010.
17. D. Cabeza, M. Hermenegildo. *Non-Strict Independence-Based Program Parallelization Using Sharing and Freeness Information*. Theoretical Computer Science, Vol. 410, Num. 46, pages 4704–4723, Elsevier Science, October 2009.
18. E. Albert, G. Puebla, M. V. Hermenegildo. *Abstraction-Carrying Code: A Model for Mobile Code Safety*. New Generation Computing, Vol. 26, Num. 2, pages 171–204, March 2008.

19. M. V. Hermenegildo, G. Puebla, F. Bueno, P. Lopez-Garcia. *Integrated Program Debugging, Verification, and Optimization Using Abstract Interpretation (and The Ciao System Preprocessor)*. Science of Computer Programming, Vol. 58, Num. 1–2, pages 115–140, Elsevier North-Holland, October 2005.
20. G. Gupta, E. Pontelli, K. Ali, M. Carlsson, M. V. Hermenegildo. *Parallel Execution of Prolog Programs: a Survey*. ACM Transactions on Programming Languages and Systems, Vol. 23, Num. 4, pages 472–602, ACM Press, July 2001.
21. D. Cabeza, M. Hermenegildo. *Distributed WWW Programming using (Ciao) Prolog and the PiLLoW Library*. Theory and Practice of Logic Programming, Vol. 1, Num. 3, pages 251–282, Cambridge U. Press, May 2001.
22. M. Hermenegildo. *Parallelizing Irregular and Pointer-Based Computations Automatically: Perspectives from Logic and Constraint Programming*. Parallel Computing, Vol. 26, Num. 13–14, pages 1685–1708, Elsevier Science, December 2000.
23. M. García de la Banda, M. V. Hermenegildo, K. Marriott. *Independence in CLP Languages*. ACM Transactions on Programming Languages and Systems, Vol. 22, Num. 2, pages 269–339, ACM Press, March 2000.
24. M. V. Hermenegildo, G. Puebla, K. Marriott, P. Stuckey. *Incremental Analysis of Constraint Logic Programs*. ACM Transactions on Programming Languages and Systems, Vol. 22, Num. 2, pages 187–223, ACM Press, March 2000.
25. G. Puebla, M. V. Hermenegildo. *Abstract Multiple Specialization and its Application to Program Parallelization*. J. of Logic Programming. Special Issue on Synthesis, Transformation and Analysis of Logic Programs, Vol. 41, Num. 2&3, pages 279–316, Elsevier - North Holland, November 1999.
26. F. Bueno, M. García de la Banda, M. V. Hermenegildo. *Effectiveness of Abstract Interpretation in Automatic Parallelization: A Case Study in Logic Programming*. ACM Transactions on Programming Languages and Systems, Vol. 21, Num. 2, pages 189–238, ACM Press, March 1999.
27. K. Muthukumar, F. Bueno, M. García de la Banda, M. Hermenegildo. *Automatic Compile-time Parallelization of Logic Programs for Restricted, Goal-level, Independent And-parallelism*. Journal of Logic Programming, Vol. 38, Num. 2, pages 165–218, Elsevier - North-Holland, February 1999.
28. F. Bueno, M. V. Hermenegildo, U. Montanari, F. Rossi. *Partial Order and Contextual Net Semantics for Atomic and Locally Atomic CC Programs*. Science of Computer Programming, Vol. 30, pages 51–82, North-Holland, January 1998. Special CCP95 Workshop issue.
29. M. Codish, M. Bruynooghe, M. García de la Banda, M. V. Hermenegildo. *Exploiting Goal Independence in the Analysis of Logic Programs*. Journal of Logic Programming, Vol. 32, Num. 3, pages 247–261, Elsevier - North Holland, September 1997.
30. M. V. Hermenegildo. *Some Challenges for Constraint Programming*. The Constraints Journal, Vol. 2, Num. 1, pages 63–69, Kluwer Academic Publishers, 1997. Special issue on strategic directions in constraint programming.
31. P. Van Hentenryck, V. Saraswat, A. Borning, A. Brodski, P. Codognet, R. Dechter, M. Dincbas, E. Freuder, M. Hermenegildo, J. Jaffar, S. Kasif, J.-L. Lassez, D. McAllester, Ken McAloon, A. Macworth, U. Montanari, W. Older, J.-F. Puget, R. Ramakrishnan, F. Rossi, G. Smolka, R. Wachter. *Strategic Directions in Constraint Programming*. ACM Computing Surveys, Vol. 28, Num. 4, pages 701–726, ACM, December 1996. 50th Anniversary Issue on Strategic Directions in Computer Research.

32. M. García de la Banda, M. Hermenegildo, M. Bruynooghe, V. Dumortier, G. Janssens, W. Simoens. *Global Analysis of Constraint Logic Programs*. ACM Transactions on Programming Languages and Systems, Vol. 18, Num. 5, pages 564–615, ACM, September 1996.
33. M. Hermenegildo, M. Carro. *Relating Data-Parallelism and (And-) Parallelism in Logic Programs*. The Computer Languages Journal, Vol. 22, Num. 2/3, pages 143–163, Elsevier Science, July 1996.
34. E. Pontelli, G. Gupta, D. Tang, M. Carro, M. Hermenegildo. *Improving the Efficiency of Non-deterministic And-parallel Systems*. The Computer Languages Journal, Vol. 22, Num. 2/3, pages 115–142, Pergamon/Elsevier, July 1996.
35. P. López-García, M. V. Hermenegildo, S. K. Debray. *A Methodology for Granularity Based Control of Parallelism in Logic Programs*. Journal of Symbolic Computation, Special Issue on Parallel Symbolic Computation, Vol. 21, Num. 4–6, pages 715–734, Academic Press, 1996.
36. K. Shen, M. Hermenegildo. *High-level Characteristics of Or- and Independent And-parallelism in Prolog*. Int'l. Journal of Parallel Programming, Vol. 24, Num. 5, pages 433–478, Plenum Press, 1996.
37. M. Codish, A. Mulkers, M. Bruynooghe, M. García de la Banda, M. Hermenegildo. *Improving Abstract Interpretations by Combining Domains*. ACM Transactions on Programming Languages and Systems, Vol. 17, Num. 1, pages 28–44, ACM, January 1995.
38. M. Hermenegildo, F. Rossi. *Strict and Non-Strict Independent And-Parallelism in Logic Programs: Correctness, Efficiency, and Compile-Time Conditions*. Journal of Logic Programming, Vol. 22, Num. 1, pages 1–45, Elsevier - North Holland, 1995.
39. G. Gupta, M. Hermenegildo, V. Santos-Costa. *And-Or Parallel Prolog: A Recomputation Based Approach*. New Generation Computing, Vol. 11, Num. 3–4, pages 297–323, Springer Verlag, 1993.
40. M. Hermenegildo, R. Warren, S. K. Debray. *Global Flow Analysis as a Practical Compilation Tool*. Journal of Logic Programming, Vol. 13, Num. 4, pages 349–367, Elsevier - North Holland, August 1992.
41. K. Muthukumar, M. Hermenegildo. *Compile-time Derivation of Variable Dependency Using Abstract Interpretation*. Journal of Logic Programming, Vol. 13, Num. 2/3, pages 315–347, Elsevier - North-Holland, July 1992.
42. M. Hermenegildo, K. Greene. *The &-Prolog System: Exploiting Independent And-Parallelism*. New Generation Computing, Vol. 9, Num. 3,4, pages 233–257, Springer Verlag, 1991.
43. M. Hermenegildo, E. Tick. *Memory Referencing Characteristics and Caching Performance of AND-Parallel Prolog on Shared-Memory Architectures*. New Generation Computing, Vol. 7, Num. 1, pages 37–58, Springer Verlag, October 1989.
44. M. Hermenegildo, R. Warren. *Designing a High-Performance Parallel Logic Programming System*. Computer Architecture News, Special Issue on Parallel Symbolic Programming, Vol. 15, Num. 1, pages 43–53, ACM, March 1987.

#### Articles in Refereed Conferences:

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118. M. Hermenegildo. *Bridging the Performance Gap between Declarative and Imperative Languages*. 4th. International Symposium on Knowledge Engineering, pages 91–104, Xerox Corp., May 1990.
119. K. Muthukumar, M. Hermenegildo. *Determination of Variable Dependence Information at Compile-Time Through Abstract Interpretation*. 1989 North American Conference on Logic Programming, pages 166–189, MIT Press, October 1989.
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123. R. Warren, M. Hermenegildo, S. K. Debray. *On the Practicality of Global Flow Analysis of Logic Programs*. Fifth International Conference and Symposium on Logic Programming, pages 684–699, MIT Press, August 1988.
124. A. Guzmán, M. Hermenegildo. *Constructs and Evaluation Strategies for Intelligent Speculative Parallelism – Armageddon Revisited*. 1988 ACM Computer Science Conference, pages 106–115, ACM, February 1988.
125. M. Hermenegildo. *Relating Goal Scheduling, Precedence, and Memory Management in AND-Parallel Execution of Logic Programs*. Fourth International Conference on Logic Programming, pages 556–575, MIT Press, University of Melbourne, May 1987.
126. M. Hermenegildo, R. I. Nasr. *Efficient Management of Backtracking in AND-parallelism*. Third International Conference on Logic Programming, LNCS, Num. 225, pages 40–55, Springer-Verlag, Imperial College, July 1986.
127. M. Hermenegildo. *An Abstract Machine for Restricted AND-parallel Execution of Logic Programs*. Third International Conference on Logic Programming, Lecture Notes in Computer Science, Num. 225, pages 25–40, Springer-Verlag, Imperial College, July 1986.
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#### Invited Papers and Tutorials:

1. M. V. Hermenegildo, P. Lopez-Garcia, U. Liqat, M. Klemen. *Energy Consumption Analysis and Verification by Transformantion into Horn Clauses and Abstract Interpretation*. 5th International Workshop on Verification and Program Transformation (VPT 2017), Vol. 253, pages 4–6, EPTCS, April 2017. (Abstract of invited talk).
2. M. V. Hermenegildo. *Conferences vs. Journals in CS, what to do? Evolutionary ways forward and the ICLP/TPLP model*. Dagstuhl 12452: Publication Culture in Computing Research – Position Papers, Num. 12452, 12 pages, ICFP – Dagstuhl, November 2012. <http://www.dagstuhl.de/mat/Files/12/12452/12452.HermenegildoManuel.Paper.pdf>.
3. D. Ivanović, M. Carro, M. V. Hermenegildo. *Constraint-Based Runtime Prediction of SLA Violations in Service Orchestrations*. 22nd Workshop on Logic-based Methods in Programming Environments, 1 pages, September 2012. (abstract of invited talk).
4. M. V. Hermenegildo, F. Bueno, M. Carro, P. López-García, R. Haemmerlé, E. Mera, J. F. Morales, G. Puebla. *An Overview of the Ciao System*. Proc. of RuleML-Europe 2011, LNCS, Vol. 6826, pages 2–3, Springer-Verlag, July 2011. (abstract of invited talk).
5. M. V. Hermenegildo, T. Schaub. *Introduction to the 26th Int'l. Conference on Logic Programming (ICLP'10) Special Issue*. Vol. 10, Num. 4–6, pages 361–364, Cambridge University Press, July 2010.
6. M. V. Hermenegildo, T. Schaub. *Introduction to Technical Communications of the 26th Int'l. Conference on Logic Programming (ICLP'10)*. Technical Communications of the 26th Int'l. Conference on Logic Programming (ICLP'10), Leibniz International Proceedings in Informatics (LIPIcs), Vol. 7, pages 8–11, Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, July 2010.

7. M. V. Hermenegildo, F. Bueno, A. Casas, J. Navas, E. Mera, M. Carro, P. López-García. *Automatic Granularity-Aware Parallelization of Programs with Predicates, Functions, and Constraints*. DAMP'07, ACM SIGPLAN Workshop on Declarative Aspects of Multicore Programming, pages 1–1, ACM, January 2007. (abstract of invited talk).
8. G. Puebla, E. Albert, P. Arenas, M. V. Hermenegildo. *On Abstraction-Carrying Code and Certificate-Size Reduction*. 1st International Workshop on Emerging Applications of Abstract Interpretation (EAAI 2006), 15 pages, March 2006.
9. G. Puebla, E. Albert, M. Hermenegildo. *Abstract Interpretation-based Verification/Certification in the CiaoPP System*. Mobile Code Safety and Program Verification Using Computational Logic Tools (MoveLog'05), 9 pages, October 2005.
10. M. V. Hermenegildo, E. Albert, P. López-García, G. Puebla. *Abstraction Carrying Code and Resource-Awareness*. 7th ACM-SIGPLAN International Symposium on Principles and Practice of Declarative Programming (PPDP'05), pages 1–11, ACM Press, July 2005.
11. M. V. Hermenegildo, E. Albert, P. López-García, G. Puebla. *Some Techniques for Automated, Resource-Aware Distributed and Mobile Computing in a Multi-Paradigm Programming System*. Proc. of EURO-PAR 2004, LNCS, Num. 3149, pages 21–37, Springer-Verlag, August 2004.
12. G. Puebla, M. V. Hermenegildo. *Abstract Specialization and its Applications*. ACM Partial Evaluation and Semantics based Program Manipulation (PEPM'03), pages 29–43, ACM Press, June 2003. Invited talk.
13. M. V. Hermenegildo, G. Puebla, F. Bueno, P. López-García. *Program Development Using Abstract Interpretation (and The Ciao System Preprocessor)*. 10th International Static Analysis Symposium (SAS'03), LNCS, Num. 2694, pages 127–152, Springer-Verlag, June 2003.
14. M. V. Hermenegildo, G. Puebla, F. Bueno, P. López-García. *Abstract Verification and Debugging of Constraint Logic Programs*. Recent Advances in Constraints, LNCS, Num. 2627, pages 1–14, Springer-Verlag, January 2003.
15. M. V. Hermenegildo, F. Bueno, G. Puebla, P. López-García. *Program Debugging and Validation Using Semantic Approximations and Partial Specifications*. 29 th. International Colloquium on Automata, Languages, and Programming (ICALP), LNCS, Num. 2380, pages 69–72, Springer-Verlag, July 2002.
16. M. Hermenegildo. *Parallelizing Irregular and Pointer-Based Computations Automatically: Results in Logic and Constraint Programming*. Constructive Methods for Parallel Programming, Advances in Computation: Theory and Practice, 1 pages, Nova Science, 2002. (abstract of invited talk).
17. F. Bueno, D. Cabeza, M. Carro, J. Correias, J. Gómez, M. V. Hermenegildo, P. López, G. Puebla, C. Vaucheret. *Agent Programming in Ciao Prolog*. 10 th. Portuguese Conference on Artificial Intelligence (EPIA), LNAI, Num. 2258, 2 pages, Springer-Verlag, December 2001.
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19. M. Hermenegildo, The CLIP Group. *Programming with Global Analysis*. Proceedings of ILPS'97, pages 49–52, MIT Press, October 1997. (abstract of invited talk).
20. M. Hermenegildo. *Automatic Parallelization of Irregular and Pointer-Based Computations: Perspectives from Logic and Constraint Programming*. Proceedings of EUROPAR'97, LNCS, Vol. 1300, pages 31–46, Springer-Verlag, August 1997.
21. F. Bueno, P. Deransart, W. Drabent, G. Ferrand, M. V. Hermenegildo, J. Maluszynski, G. Puebla. *On the Role of Semantic Approximations in Validation and Diagnosis of Constraint Logic Programs*. Proc. of the 3rd. Int'l Workshop on Automated Debugging-AADEBUG'97, pages 155–170, U. of Linköping Press, May 1997.

22. M. V. Hermenegildo, G. Puebla. *Applying Multiple Abstract Specialization to Program Parallelization (abstract)*. Partial Evaluation– Dagstuhl Seminar Report, Num. 134, 1 pages, IBF1 – Dagstuhl, February 1996.
23. S.K. Debray, P. López-García, M. V. Hermenegildo, N.-W. Lin. *Estimating the Computational Cost of Logic Programs*. Static Analysis Symposium, SAS'94, LNCS, Num. 864, pages 255–265, Springer-Verlag, September 1994.
24. M. García de la Banda, M. V. Hermenegildo. *A Practical Application of Sharing and Freeness Inference*. 1992 Workshop on Static Analysis WSA'92, BIGRE, Num. 81–82, pages 118–125, IRISA-Beaulieu, September 1992.

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1. M. V. Hermenegildo, P. Lopez-Garcia (Eds.). *Logic-Based Program Synthesis and Transformation - 26th International Symposium, LOPSTR 2016, Edinburgh, UK, September 6-8, 2016, Revised Selected Papers*. Lecture Notes in Computer Science, Num. 10184, 330 pages, Springer, July 2017.
2. A. Zaks, M. V. Hermenegildo. *Proceedings of the 25th International Conference on Compiler Construction (CC 2016)*. ACM, March 2016.
3. M. V. Hermenegildo, T. Schaub. *Theory and Practice of Logic Programming. 26th Int'l. Conference on Logic Programming (ICLP'10) Special Issue*. Vol. 10 (4–6), pages 361–778, Cambridge University Press, July 2010.
4. M. V. Hermenegildo, T. Schaub. *Technical Communications of the 26th Int'l. Conference on Logic Programming (ICLP'10)*. Leibniz International Proceedings in Informatics (LIPIcs), Vol. 7, Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik, July 2010.
5. M. V. Hermenegildo, J. Palsberg. *Proceedings of the 37th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL 2010)*. ACM, January 2010.
6. G. Barthe, M. V. Hermenegildo. *Verification, Model Checking, and Abstract Interpretation, 11th International Conference, VMCAI 2010*. LNCS, Vol. 5944, Springer, January 2010.
7. J. Garrigue, M. V. Hermenegildo. *Functional and Logic Programming, 9th International Symposium, FLOPS'08*. LNCS, Num. 4989, Springer, April 2008.
8. M. V. Hermenegildo. *ACM SIGPLAN-Intel Workshop on Declarative Aspects of Multicore Programming, DAMP'08, Informal Proceedings*. January 2008.
9. M. Hermenegildo, D. Cabeza. *Practical Aspects of Declarative Languages – 7th. International Symposium, PADL 2005*. LNCS, Num. 3350, 278 pages, Springer-Verlag, January 2005.
10. M. Hermenegildo, G. Puebla. *Static Analysis – 9th. International Symposium*. LNCS, Num. 2477, 528 pages, Springer-Verlag, September 2002.
11. L. Sterling, L. Naish, M. V. Hermenegildo. *Theory and Practice of Logic Programming – Special Issue: Logic Programming and the INTERNET*. Vol. 1, Num. 3, 131 pages, Cambridge U. Press, May 2001.
12. P. Deransart, M. V. Hermenegildo, J. Maluszynski. *Analysis and Visualization Tools for Constraint Programming*. LNCS, Num. 1870, 350 pages, Springer-Verlag, September 2000.
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15. P. López-García, M. V. Hermenegildo. *Proceedings of the Third COMPULOG-NET Area Workshop on Parallelism and Implementation Technologies*. 108 pages, U. of Utrecht, September 1995.
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20. F. Bueno, M. Hermenegildo, J. Moreno-Navarro. *Proceedings of the First COMPULOG-NET Area Workshop on Parallelism and Implementation Technologies*. 78 pages, FIM/UPM, Madrid, Spain, May 1993.
21. M. Hermenegildo, J. Moreno-Navarro. *Actas del Primer Congreso Nacional de Programación Declarativa*. 398 pages, FIM/UPM, Madrid, Spain, September 1992.
22. S. K. Debray, M. V. Hermenegildo. *Logic Programming – Proc. of the North American Conference*. 850 pages, MIT Press, Cambridge, MA, October 1990.
23. M. Hermenegildo. *Proc. of the Workshop on Future Directions in Logic Programming*. 210 pages, MCC, Austin, TX, April 1987.
24. M. Hermenegildo. *An Abstract Machine Based Execution Model for Computer Architecture Design and Efficient Implementation of Logic Programs in Parallel*. Ph.D. Thesis, Dept. of Electrical and Computer Engineering (Dept. of Computer Science TR-86-20), University of Texas at Austin, Austin, Texas 78712, 244 pages, UMI, Boston, MA and U. of Texas, August 1986.
25. M. Hermenegildo. *Computational Models for Sequential and Parallel Execution of Logic Programs on a Reconfigurable Architecture*. Ms. Thesis, The University of Texas at Austin, ENS Bldg. 515, Austin, TX 78712, 122 pages, June 1984.

#### Articles in Books and Other Collections:

1. P. Lopez-Garcia, M. V. Hermenegildo, M. Klemen, U. Liqat. *Energy Consumption Analysis and Verification using CiaoPP*. The ALP Newsletter, Vol. 30, Num. 3, The Association for Logic Programming, September 2017.
2. U. Liqat, K. Georgiou, S. Kerrison, P. Lopez-Garcia, M. V. Hermenegildo, J. P. Gallagher, K. Eder. *Inferring Parametric Energy Consumption Functions at Different Software Levels: ISA vs. LLVM IR*. Foundational and Practical Aspects of Resource Analysis: 4th International Workshop, FOPARA 2015, London, UK, April 11, 2015. Revised Selected Papers, Lecture Notes in Computer Science, Vol. 9964, pages 81–100, Springer, 2016.
3. P. Lopez-Garcia, L. Darmawan, F. Bueno, M. V. Hermenegildo. *Interval-Based Resource Usage Verification: Formalization and Prototype*. Foundational and Practical Aspects of Resource Analysis. Second International Workshop FOPARA 2011, Revised Selected Papers, Lecture Notes in Computer Science, Vol. 7177, pages 54–71, Springer-Verlag, 2012.
4. M. Carro, M. V. Hermenegildo. *Logic Languages*. Encyclopedia of Parallel Computing, pages 1057–1068, Springer, 2011.

5. M. V. Hermenegildo, F. Bueno, M. Carro, P. López, J.F. Morales, G. Puebla. *An Overview of The Ciao Multiparadigm Language and Program Development Environment and its Design Philosophy*. Festschrift for Ugo Montanari, LNCS, Vol. 5065, pages 209–237, Springer-Verlag, June 2008.
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13. M. Carro, M. V. Hermenegildo. *Tools for Constraint Visualization: The VIFID/TRIFID Tool*. Analysis and Visualization Tools for Constraint Programming, LNCS, Num. 1870, pages 253–272, Springer-Verlag, September 2000.
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15. M. V. Hermenegildo, F. Bueno, D. Cabeza, M. Carro, M. García de la Banda, P. López-García, G. Puebla. *The CIAO Multi-Dialect Compiler and System: An Experimentation Workbench for Future (C)LP Systems*. Parallelism and Implementation of Logic and Constraint Logic Programming, pages 65–85, Nova Science, April 1999.
16. K. Shen, M. Hermenegildo. *Divided We Stand: Parallel Distributed Stack Memory Management*. Implementations of Logic Programming Systems, pages 185–203, Kluwer Academic Publishers, 1994.
17. M. Hermenegildo. *The Role of Computational Logic as a Hinge Paradigm among Deduction, Problem Solving, Programming, and Parallelism*. Knowledge Oriented Software Design, pages 207–221, North-Holland, September 1993.
18. M. Hermenegildo. *Research on Parallel Logic Language Implementation and Architecture at ICOT*. The ICOT Research Exchange Report, Vol. 2, pages 157–174, Institute for New Generation Computer Technology (ICOT), June 1992.
19. M. Hermenegildo. *Fundamentos y Aplicación Automática del Paralelismo en Inteligencia Artificial*. Inteligencia Artificial: Fundamentos Teóricos y Aplicaciones, pages 127–153, Real Academia de Ciencias Exactas, Físicas y Naturales, March 1992.

**Publications in Refereed Workshops:**

1. U. Liqat, Z. Banković, P. Lopez-Garcia, M. V. Hermenegildo. *Inferring Energy Bounds via Static Program Analysis and Evolutionary Modeling of Basic Blocks*. Pre-proceedings of the 27th International Symposium on Logic-Based Program Synthesis and Transformation (LOPSTR'17), October 2017.
2. N. Stulova, J. F. Morales, M. V. Hermenegildo. *Towards Run-time Checks Simplification via Term Hiding (Extended Abstract)*. Technical Communications of the 33rd International Conference on Logic Programming (ICLP 2017), Vol. 58, 3 pages, OASlcs, August 2017. (To appear).
3. U. Liqat, Z. Banković, P. Lopez-Garcia, M. V. Hermenegildo. *Inferring Energy Bounds Statically by Evolutionary Analysis of Basic Blocks*. Workshop on High Performance Energy Efficient Embedded Systems (HIP3ES 2016), 2016. arXiv:1601.02800.
4. R. Haemmerle, M. V. Hermenegildo, M. Klemen, U. Liqat, P. Lopez-Garcia. *Energy Analysis and Verification by Translation to Horn Clauses and Abstract Interpretation*. Workshop on Horn Clauses for Verification and Synthesis (HCVS'2015), July 2015.
5. P. Lopez-Garcia, R. Haemmerlé, M. Klemen, U. Liqat, M. V. Hermenegildo. *Towards Energy Consumption Verification via Static Analysis*. Workshop on High Performance Energy Efficient Embedded Systems (HIP3ES), arXiv:1501.03064, 11 pages, 2015. arXiv:1512.09369.
6. J.F. Morales, M. V. Hermenegildo. *Pre-Indexed Terms for Prolog*. Pre-proceedings of the 24th International Symposium on Logic-Based Program Synthesis and Transformation (LOPSTR'14), 15 pages, September 2014.
7. J.F. Morales, M. V. Hermenegildo. *Towards Pre-Indexed Terms*. 14th International Colloquium on Implementation of Constraint and Logic Programming Systems (CICLOPS-WLPE 2014), 14 pages, RWTH Aachen University, July 2014. <http://sunsite.informatik.rwth-aachen.de/Publications/AIB/2014>.
8. N. Stulova, J. F. Morales, M. V. Hermenegildo. *Towards Assertion-based Debugging of Higher-Order (C)LP Programs (Extended Abstract)*. Theory and Practice of Logic Programming, 30th Int'l. Conference on Logic Programming (ICLP'14) Special Issue, On-line Supplement, Vol. 14, Num. 4-5, pages 209–210, Cambridge U. Press, July 2014.
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10. A. Serrano, P. Lopez-Garcia, M. V. Hermenegildo. *Towards an Abstract Domain for Resource Analysis of Logic Programs Using Sized Types*. 23rd Workshop on Logic-based Methods in Programming Environments (WLPE 2013), 15 pages, August 2013. CoRR abs/1308.3940.
11. Z. Drey, J.F. Morales, M. V. Hermenegildo. *Reversible Language Extensions and their Application in Debugging*. 12th International Colloquium on Implementation of Constraint and Logic Programming Systems (CICLOPS 2012), 15 pages, September 2012.
12. E.J. Gallego-Arias, R. Haemmerlé, M. V. Hermenegildo, J.F. Morales. *The Ciao CLP(FD) Library: A Modular CLP Extension for Prolog*. 12th International Colloquium on Implementation of Constraint and Logic Programming Systems (CICLOPS 2012), 15 pages, September 2012.
13. D. Ivanovic, M. Carro, M. V. Hermenegildo. *Analyzing Service-Oriented Systems Using Their Data and Structure*. European Software Services and Systems Research – Results and Challenges (ICSE Workshop), July 2012.
14. D. Ivanović, M. Carro, M. V. Hermenegildo. *Exploring the Impact of Inaccuracy and Imprecision of QoS Assumptions on Proactive Constraint-Based QoS Prediction for Service Orchestrations*. Proceedings of the 4th International Workshop on Principles of Engineering Service-Oriented Systems, PESOS 2012, pages 931–937, IEEE Press, June 2012.

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