Parunak Resume

H. Van Dyke Parunak, Ph.D.

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Technical Expertise

- Applications of techniques of artificial life (especially fine-grained agents and the dynamics and emergent characteristics of their interactions); artificial intelligence, particularly knowledge representation and distributed planning and scheduling, in multiple domains including cyber security, intelligence analysis, command and control, information management, decision support, natural language processing, forecasting of dynamical systems, and tools for structured thinking and group work. Innovative applications of Monte Carlo and genetic methods to machine learning.
- Applications of statistical physics and probability theory to understanding the behavior of such systems.
- Hybrid architectures that combine subsymbolic and symbolic AI with techniques from statistics and machine learning.

Management Skills

- Superb technical communication
- Group coordination and motivation
- Concept development and articulation for seedling proposals and responses to solicitations

Employment History

2015-Present President, ABC Research, LLC. Provide R&D and technical consultation services in the area of agent-based and complex systems, with special expertise in applications of swarm intelligence and self-organizing systems.

2015-2016 Vice President for Technology Innovation, Axon Connected and AxonAI. Identify and secure resources to support R&D that will extend Axon's product offerings and markets in the area of swarm intelligence.

2013-2015 Senior Scientist, Soar Technology. Developed technical vision for narrative analytics and a comprehensive architecture for data-driven decision support, and began to conceive, win, and lead projects (DARPA, ONR, NSA) to realize that architecture, in cyber-security, decision support, UAV control, mission planning, and geospatial analysis. Developed two seedling concepts that were funded by DARPA (one in the security of cyber-physical systems, one in applications of narrative to military planning). Mentored junior engineers; provided cross-disciplinary expertise to senior scientists.

2000-2013 Chief Scientist at the Agent-Based and Complex Systems. Led group through a series of acquisitions (Altarum Institute, formerly ERIM; NewVectors, Tech Team Government Solutions, Jacobs Technology). Formulated technical and research strategy for the group. Technical lead on agent-based projects, with special expertise in natural language and stigmergic cognition. Initiated and developed new research opportunities with a wide range of clients, including DARPA, NIST, IARPA, DTO, ARDA, ONR, and commercial vendors. Application domains include manufacturing planning and scheduling, UAV planning, multi-UAV coordination, mobile ad-hoc networks, trust estimation for autonomous systems, battle forecasting, IED prediction, and advanced information management for intelligence analysis.

1990-2000 Scientific Fellow, ITI (later ERIM/CEC). Senior technical direction of marketing initiatives and projects in my own technical domain, with primary application to discrete manufacturing. Developed and executed a strategy for coherent identification, development, and marketing of ITI tools. Together with other senior technical staff, responsible for marketing to the research community.

1984-1992 Manager, Industrial Technology Institute. Founded and recruited the group, which was the focal point of AI expertise at ITI; marketed its technologies to programs and projects throughout the Institute; helped other groups plan how to benefit from AI and distributed computing technologies. Monitored academic activity in

AI, identified relevant developments, and promoted their transition into ITI. Directed research in applied artificial intelligence for manufacturing control. Originated technologies such as the fractal actor architecture for negotiated distributed control, symmetric closed knowledge representation systems, and a neural net model for material handling and factory scheduling. Participated in standards definition for factory models and data management. Subsequently responsible for formulation and execution of the Institute's technology acquisition strategy and for deployment of technologies and technical staff across projects.

1982-1984 Computer Scientist, Comshare, Inc., Ann Arbor, MI. Designed distributed decision support architectures; developed environments for data flow and object oriented programming; conceived, designed, and implemented a hypermedia front-end to integrate different information resources.

1979-1982 Assistant Professor, Department of Near Eastern Studies; and Postdoctoral Scholar, Michigan Society of Fellows, University of Michigan. Directed the Michigan Project for Computer-Assisted Biblical Studies, a text archive and consulting service at the University of Michigan. Conducted research on knowledge representation of natural language texts, and discourse and semantic analysis of dead languages.

1978-1979 Associate Investigator, Research Project on "Computer Methods for Studying Structure in Biblical Hebrew," Divinity School, Harvard University. Conducted research on computerized display of the discourse structure of natural language.

Education

PhD	Nov. 78	Near Eastern Languages and Civilizations	Harvard University
MS	Aug. 82	Computer and Communication Sciences	University of Michigan
AM	June 78	Near Eastern Languages and Civilizations	Harvard University
MA	Nov. 78	Palestinian Archaeology and Geography	Institute of Holy Land Studies (Jerusalem)
ThM	May 73	Old Testament	Dallas Theological Seminary
AB	June 69	Physics	Princeton University

PI Experience

Cognitive modeling of cyber-attackers: ONR SC2RAM SBIR
UxV Coordination: DARPA ISO/IXO JFACC; USJFCOM J9 LOE; DARPA STO PreACT SBIR
Mathematics of Multi-Agent Systems: DARPA IXO ANT, WASP Seedling
Management of Massive Data: ARDA NIMD; IARPA CASE, ACE, ONR PDS
Forcasting of Dynamical Systems: DARPA IXO RAID, DeepGreen (combat); ONR (IED prediction); SPRING

Editorial Boards

Swarm Intelligence
Journal of Autonomous Agents and Multi-Agent Systems
Journal of Intelligent Manufacturing
AI EDAM (Artificial Intelligence for Engineering Design, Analysis and Manufacturing)
International Journal of Computer Integrated Manufacturing
ACM Transactions on Autonomous and Adaptive systems
I have served on the program committees of numerous international conferences, including SASO, AAMAS, MABS, E4MAS, and others.

Community Leadership

Invited participant, ODNI C3E workshop (Computational Cyber-security in Compromised Environments), since 2011
Director, International Foundation for Multi-Agent Systems, 1999-2004
Chair, International Workshop on Multi-Agent-Based Simulation, 2009, 2013
Organizer, Workshop on Environments for Multi-Agent Systems (E4MAS, 2004, 2005)
Sponsorship Chair, AAMAS 2003, 2006, 2007
Organizer, Quantum Applications Symposium, 2001
Organizer, Workshop on Industrial Agents (WINA), 1998

Organizer, DAI Workshop (1992)
Arrangements Committee, Eleventh International Joint Conference on Artificial Intelligence, August 1989.
Organizing Committee, Society for Machine Intelligence, 1987 (Detroit area industrially-oriented society)

Invited Talks

Journées Francophones sur les Systèmes Multi-Agents (*JFSMA*) 2016 (Saint Martin do Vivier, France)
Collective Intelligence (CI) 2014 (MIT)
MIT Innovation Workshop 2014
World Congress on Social Simulation (WCSS) 2014 (Sao Paulo, Brazil)
European Conference on Artificial Intelligence (ECAI) 2000 (Berlin, Germany)
Second European Agent Systems Summer School (EASSS 2000, Saarbruecken, Germany)
Modelling Autonomous Agents in a Multi-Agent World (MAAMAW) 1989 (Cambridge, UK), 1999 (Valencia, Spain)
International Conference on the Practical Application of Intelligent Agents and Multi-Agent Systems (PAAM) 1999 (London, UK)
International Workshop on Intelligent Manufacturing Systems (IMS) 1999

Personal

Born 3 May 1947
Married, one adult son, seven grandchildren
DoD Top Secret security clearance

Publications

Over 100 publications in journals and highly-refereed conferences. Fifteen patents or patents pending in agent technology. Reprints of most papers available at http://abcresearch.org/papers. Recent publications of interest include:

Parunak, H.V.D., and R. Jones. SC2RAM: A Deployable Cognitive Model of a Cyber-Attacker. 34th Soar Workshop, Ann Arbor, MI, June 2014. http://www.abcresearch.org/papers/Soar14SC2RAM.pdf

Parunak, H.V.D., M. Huber, R. Jones, M. Quist, and J. Zaientz, CaFé: A Group Process to Rationalize Technologies in Hybrid AAMAS Systems. Proceedings, International Workshop on Engineering Multi-Agent Systems (EMAS 2014) (at AAMAS 2014). Paris, France, 2014. http://www.abcresearch.org/papers/AAMAS14CaFe.pdf

Parunak, H.V.D., and J.A. Morell. Emergent Consequences: Unexpected Behaviors in a Simple Model to Support Innovation Adoption, Planning, and Evaluation. Proceedings of the International Conference on Social Computing, Behavioral-Cultural Modeling, and Prediction (SBP 2014), pp. 179-186. Washington, DC, 2014. http://abcresearch.org/papers/SBP14EmergentConsequences.pdf

Parunak, H.V.D., A. Nickels, and R. Frederiksen. An Agent-Based Framework for Dynamical Understanding of DNS Events (DUDE). Proceedings of the First International Workshop on Agents and Cyber-Security (ACySe 2014), Paris, France, 2014. http://www.abcresearch.org/papers/ACySe14DUDE.pdf

Parunak, H.V.D., Dynamic Data Relevance Estimation by Exploring Models (D2REEM). Proceedings of Semantic Technology for Intelligence, Defense, and Security (STIDS 2013), pp. 63-70, Fairfax, VA, 2013. http://www.abcresearch.org/papers/STIDS13D2REEM.pdf .

Sauter, J.A., R. Matthews, H. V. D. Parunak, and S. A. Brueckner. Demonstration of Digital Pheromone Swarming Control of Multiple Unmanned Air Vehicles. In *Proceedings of AIAA Infotech@Aerospace*, Arlington, VA, AIAA, 2005. http://abcresearch.org/papers/aiaa05.pdf.

Parunak, H.V.D., S. A. Brueckner, R. Matthews, and J. Sauter. Pheromone Learning for Self-Organizing Agents. *IEEE SMC*, 35(3 (May)):316-326, 2005. http://abcresearch.org/papers/ParunakIEEE.pdf.

Parunak, H.V.D., and S. A. Brueckner. Analyzing Stigmergic Learning for Self-Organizing Mobile Ad-Hoc Networks (MANET's). In *Proceedings of Workshop on Engineering Self-Organizing Agent Systems (ESOA04)*, Columbia University, NY, pages 195-209, Springer, 2004. http://abcresearch.org/papers/ESOA04MANET.pdf.

Parunak,H.V.D., S. Brueckner, and J. Sauter. Digital Pheromones for Coordination of Unmanned Vehicles. In *Proceedings of Workshop on Environments for Multi-Agent Systems (E4MAS 2004)*, New York, NY, pages 246-263, Springer, 2004. http://abcresearch.org/papers/E4MAS04_UAVCoordination.pdf.

Parunak, H.V.D., S. Brueckner, and J. J. Odell. Swarming Coordination of Multiple UAV's for Collaborative Sensing. In *Proceedings of Second AIAA "Unmanned Unlimited" Systems, Technologies, and Operations Conference*, San Diego, CA, pages none, AIAA, 2003. http://abcresearch.org/papers/AIAA03.pdf.

Parunak,H.V.D., M. Purcell, and R. O'Connell. Digital Pheromones for Autonomous Coordination of Swarming UAV's. In *Proceedings of First AIAA Unmanned Aerospace Vehicles, Systems,Technologies, and Operations Conference*, Norfolk, VA, AIAA, 2002. http://abcresearch.org/papers/AIAA-2002-3446.pdf.

Sauter, J.A., R. Matthews, H. V. D. Parunak, and S. Brueckner. Evolving Adaptive Pheromone Path Planning Mechanisms. In *Proceedings of Autonomous Agents and Multi-Agent Systems (AAMAS02)*, Bologna, Italy, pages 434-440, ACM, 2002. http://abcresearch.org/papers/AAMAS02Evolution.pdf.

Sauter, J.A., H. V. D. Parunak, S. A. Brueckner, and R. Matthews. Tuning Synthetic Pheromones With Evolutionary Computing. In *Proceedings of Genetic and Evolutionary Computation Conference Workshop Program, 2001*, San Francisco, CA, pages 321-324, 2001. http://abcresearch.org/papers/ECOMAS2001.pdf.