Список литературы

[Angeline93] P. Angeline and J. Pollack. Competitive environments evolve better solutions for complex tasks. pages 264–270.

[Axelrod84] R. Axelrod. *The Evolution of Cooperation.* Basic Books, 1984.

[Cliff95] D. Cliff and G. F. Miller. Tracking the red queen: Measurements of adaptive progress in co–evolutionary sumulations. In *Proceedings of the Third European Conference on Artificial Life*, pages 200–218. Springer–Verlag, 1995.

[Eriksson97] R. Eriksson and B. Olsson. Cooperative coevolution in inventory control optimisation. In G. Smith, N. Steele, and R. Albrecht, editors, *Proceedings of the Third International Conference on Artificial Neural Networks and Genetic Algorithms*, University of East Anglia, Norwich, UK, 1997. Springer.

[Ficici00] S. Ficici and J. Pollack. A game-theoretic approach to the simple coevolutionary algorithm. pages 467–476.

[Ficici00cec] S. Ficici and J. Pollack. Game–theoretic investigation of selection methods used in evolutionary algorithms. pages 880–887.

[Ficici00gecco] S. Ficici and J. Pollack. Effects of finite populations on evolutionary stable strategies. pages 880–887.

[Ficici01] Sevan Ficici and Jordan Pollack. Pareto optimality in coevolutionary learning. Technical report, Brandeis University, 2001.

[Ficici98] S. Ficici and J. Pollack. Challenges in coevolutionary learning: Arms–race dynamics, open–endedness, and mediocre stable states. In Adami et al, editor, *Proceedings of the Sixth International Conference on Artificial Life*, pages 238–247, Cambridge, MA, 1998. MIT Press.

[Fogel01:Blondie24] D. Fogel. *Blondie24: Playing at the Edge of Artificial Intelligence.* Morgan Kaufmann, 2001.

[Fogel95] David Fogel and Gary Fogel. Evolutionary stable strategies are not always stable under evolutionary dynamics. In J. R. McDonnel, R. G. Reynolds, and D. Fogel, editors, *Proceedings of the Fourth Annual Conference on Evolutionary Programming*, pages 565–577, Cambridge, MA, 1995. MIT Press.

[Fogel97] David Fogel, Gary Fogel, and Peter Andrews. On the instability of evolutionary stable strategies. *BioSystems*, 44:135–152, 1995.

[Fogel98] Gary Fogel, Peter Andrews, and David Fogel. On the instability of evolutionary stable strategies in small populations. *Ecological Modeling*, 109:283–294, 1998.

[Hillis91] D. Hillis. Co-evolving parasites improve simulated evolution as an optimization procedure. *Artificial Life II, SFI Studies in the Sciences of Complexity*, 10:313–324, 1991.

[Husbands91] P. Husbands and F. Mill. Simulated coevolution as the mechanism for emergent planning and scheduling. In R. Belew and L. Booker, editors, *Proceedings of the Fourch International Conference on Genetic Algorithms*, pages 264–270. Morgan Kaufmann, 1991.

[Husbands94] P. Husbands. Distributed coevolutionary genetic algorithms for multi–criteria and multi-constraint optimisation. In *Evolutionary Computing, AISB Workshop for Selected Papers*, pages 150–165. Springer–Verlag, 1994.

[Juille01pres] H. Juillé. Basic concepts in coevolution, 2001. Presentation at GECCO-01 Coevolutionary Workshop.

[Juille96] H. Juillé and J. Pollak. Co-evolving interwined spirals. pages 461–468.

[Kauffman91] Stuart Kauffman. Coevolution to the edge of chaos: coupled fitness landscapes, poised states, and coevolutionary avalanches. In C. Langton, C. Taylor, J. Farmer, and S. Rasmussen, editors, *Artificial Life II: Studies in the Sciences of Complexity*, volume X, pages 325–369. Addison-Wesley, 1991.

[Mayer98] H. Mayer. Symbiotic coevolution of artificial neural networks and training data sets. pages 511–520.

[Moriarty95] David E. Moriarty and Risto Mikkulainen. Discovering complex othello strategies through evolutionary neural networks. *Connection Science*, 7(3):105–209, 1995.

[Moriarty97] D. Moriarty and R. Miikkulainen. Forming neural networks through efficient and adaptive coevolution. *Evolutionary Computation*, 5(4):373–399, 1997.

[Pagie00] L. Pagie and Hogeweg P. Information integration and red queen dynamics in coevolutionary optimization. pages 1260–1267.

[Pagie01] L. Pagie and M. Mitchell. A comparison of evolutionary and coevolutionary search. pages 20–25.

[Pagie97] L. Pagie and P. Hogeweg. Evolutionary consequences of coevolving targets. *Evolutionary Computation*, 5(4):401–418, 1997.

[Pagie99] Ludo Pagie. *Coevolutionary dynamics: information integration, speciation, and red queen dynamics.* PhD thesis, University of New Mexico, Santa Fe, NM, 1999.

[Panait2002] Liviu Panait and Sean Luke. A comparison of two competitive fitness functions, 2002. Submitted to GECCO 2002.

[Paredis94] J. Paredis. Steps towards co-evolutionary classification networks. In R. A. Brooks and P. Maes, editors, *Artificial Life IV, Proceedings of the fourth International Workshop on the Synthesis and Simulation of Living Systems.*, pages 359–365. MIT Press, 1994.

[Paredis96] J. Paredis. Coevolutionary computation. *Artificial Life Journal*, 2(3), 1996.

[Pollack97] J. Pollack, A. Blair, and M. Land. Coevolution of a backgammon player. In *Artificial Life V*. MIT Press, 1997.

[Pollack98] J. Pollack and A. Blair. Coevolution in the successful learning of backgammon strategy. *Machine Learning*, 32(3):225–240, 1998.

[Potter00] M. Potter and K. De Jong. Cooperative coevolution: An architecture for evolving coadapted subcomponents. *Evolutionary Computation*, 8(1):1–29, 2000.

[Potter94] M. Potter and K. De Jong. A cooperative coevolutionary approach to function optimization. pages 249–257.

[Potter95] M. Potter and K. De Jong. Evolving neural networks with collaborative species. pages 307–317.

[Potter97] M. Potter. *The Design and Analysis of a Computational Model of Cooperative CoEvolution.* PhD thesis, George Mason University, Fairfax, Virginia, 1997.

[Potter98] M. Potter and K. De Jong. The coevolution of antibodies for concept learning. pages 530–539.

[Reynolds94] Craig Reynolds. Competition, coevolution and the game of tag. In R. A. Brooks and P. Maes, editors, *Artificial Life IV, Proceedings of the fourth International Workshop on the Synthesis and Simulation of Living Systems.*, pages 59–69. MIT Press, 1994.

[Rosin95] C. Rosin and R. Belew. Methods for competitive co-evolution: Finding opponents worth beating. pages 373–380.

[Rosin96] C. Rosin and R. Belew. New methods for competitive coevolution. *Evolutionary Computation*, 5(1):1–29, 1996.

[Rosin97] C. Rosin and R. Belew. New methods for competitive coevolution. *Evolutionary Computation*, 5(1):1–29, 1997.

[Rosin97phd] C. Rosin. *Coevolutionary Search Among Adversaries.* PhD thesis, University of California, San Diego, 1997.

[Schlierkamp94] D. Schlierkamp-Voosen and H. Mühlenbein. Strategy adaptation by competing subpopulations. pages 199–108.

[Sims94] Karl Sims. Evolving 3D morphology and behavior by competition. In R. A. Brooks and P. Maes, editors, *Artificial Life IV, Proceedings of the fourth International Workshop on the Synthesis and Simulation of Living Systems.*, pages 28–39. MIT Press, 1994.

[Sims99] K. Sims. Evolving three-dimensional morphology and behaviour. In Peter Bentley, editor, *Evolutionary Design by Computers.* Morgan Kaufmann, 1999.

[Watson01] R. Watson and J. Pollack. Coevolutionary dynamics in a minimal substrate. pages 702–709.

[Wiegand01] R. Paul Wiegand, William Liles, and Kenneth De Jong. An empirical analysis of collaboration methods in cooperative coevolutionary algorithms. pages 1235–1242.

[Wiegand01tr] R. Paul Wiegand, William Liles, and Kenneth De Jong. Multi–population symmetric game dynamics, 2001. In preparation.

[Wiegand02] R. Paul Wiegand, William Liles, and Kenneth De Jong. Analyzing cooperative coevolution with evolutionary game theory. (To appear).

[Wiegand98] R. Paul Wiegand. Applying diffusion to a cooperative coevolutionary model. pages 560–569.

[axelrod87evolution] Axelrod. The evolution of strategies in the iterated prisoner's dilemma. In Lawrence Davis, editor, *Genetic Algorithms and Simulated Annealing.* Morgan Kaufmann, 1987.

[lubberts01coevolving] Alex Lubberts and Risto Miikkulainen. Co-evolving a Go-playing neural network. In *Coevolution: Turning Adaptive Algorithms upon Themselves, (Birds-on-a-Feather Workshop, Genetic and Evolutionary Computation Conference)*, 2001.

[luke:1998:RoboCup97] S. Luke. Genetic programming produced competitive soccer softbot teams for RoboCup97. In John R. Koza, Wolfgang Banzhaf, Kumar Chellapilla, Kalyanmoy Deb, Marco Dorigo, David B. Fogel, Max H. Garzon, David E. Goldberg, Hitoshi Iba, and Rick Riolo, editors, *Genetic Programming 1998: Proceedings of the Third Annual Conference*, pages 214–222, University of Wisconsin, Madison, Wisconsin, USA, July 1998. Morgan Kaufmann.

URL `http://www.cs.gmu.edu/~sean/papers/robocupgp98.pdf`

Abstract: At RoboCup, teams of autonomous robots or software softbots compete in simulated soccer matches to demonstrate cooperative robotics techniques in a very difficult, real-time, noisy environment. At the IJCAI/RoboCup97 softbot competition, all entries but ours used human-crafted cooperative decision-making behaviors. We instead entered a softbot team whose high-level decision making behaviors had been entirely evolved using genetic programming. Our team won its first two games against human-crafted opponent teams, and received the RoboCup Scientific Challenge Award. This report discusses the issues we faced and the approach we took to use GP to evolve our robot soccer team for this difficult environment.

[smith93coadaptive] R. Smith and B. Gray. Co-adaptive genetic algorithms: An example in othello strategy. Technical Report TCGA 94002, University of Alabama, Department of Engineering Science and Mechanics, 1993.