



PROGRAM

2005 IEEE Swarm Intelligence Symposium (SIS-05)

June 8-10, 2005
Pasadena, California, USA



Swarm intelligence is an innovative computational and behavioral metaphor for solving distributed problems that originally took its inspiration from the biological examples provided by social insects such as ants, termites, bees, and wasps and by swarming, flocking, herding, and shoaling phenomena in vertebrates. The abilities of such natural systems appear to transcend the abilities of the constituent individual agents.

In most biological cases studied so far, the robust and capable high-level group behavior has been found to be mediated by nothing more than a small set of simple low-level interactions between individuals, and between individuals and the environment.

The problems social insects and swarms of vertebrates solve – for instance, discovering new food sources, dividing labor among nestmates, building sophisticated nests, reliably migrating over thousands of miles, coordinated maneuvering within narrow spaces, and, in general, robustly facing changes in the team composition and external challenges – have important counterparts in engineering and computer science.

While Nature remains a fundamental source of inspiration for researchers in swarm intelligence, new ideas originating from the most different areas in engineering and computer science are emerging and strongly influencing the field. Despite this continuous evolving of the swarm intelligence definition, key principles such as self-organization, distributedness, parallelism, and exploitation of local communication mechanisms among relatively simple individuals are emerging as invariants of this innovative computational and behavioral metaphor.

Originating in Indianapolis, Indiana in 2003, this is the second in the series of IEEE International Symposia on Swarm Intelligence. This interdisciplinary meeting aims to bring together research communities of modelers, physicists, engineers, computer scientists, biologists, ecologists, and economists, within a broad definition of swarm intelligence, to present and discuss their latest results and trends in this burgeoning field.

This year, the symposium is being held with the sponsorship of the **IEEE Computational Intelligence Society**, and the technical co-sponsorship of the **IEEE Communications Society**, and the **IEEE Robotics and Automation Society**, and in cooperation with the **Jet Propulsion Laboratory, California Institute of Technology**, and the **International Society of Artificial Life (ISAL)**.

Additional sponsorship has been provided by the following non-profit organizations and private companies: **International Society of Artificial Life (ISAL)**, **AntOptima**,

IcoSystem, Natural Selection Inc., and the **Northrop Grumman Foundation**.

The program includes two invited papers, 49 regular papers (oral presentation), and 16 short papers (poster presentation). In addition to these contributions, four tutorials will be held at the conference.

We would like to acknowledge all the authors, panelists, speakers, program committee members, and sponsors for their tremendous efforts in making IEEE SIS-05 a successful event.

Sincerely,

Payman Arabshahi
Alcherio Martinoli

VENUE

Please note that morning and early afternoon plenary sessions will be held in Fountain III and IV, whereas sessions after 4:00 pm will be held in San Gabriel and San Rafael rooms on June 9, and Plaza I and Plaza II on June 10.

INTERNET CONNECTIVITY

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June 8, 2005, Wednesday

07:00 - 09:00	Registration
09:00 - 12:00	Tutorial 3: Fundamentals and applications of ant colony optimization - <i>M. Dorigo</i> Tutorial 4: Fundamentals and applications of particle swarm optimization - <i>J. Kennedy and R.C. Eberhart</i>
12:00 - 02:00	Lunch
02:00 - 05:00	Tutorial 1: Analyzing swarms: a stochastic systems approach to studying swarm behavior - <i>K. Lerman and T. Hogg</i> Tutorial 2: Cultural algorithms: a computational framework for studying social evolution - <i>R.G. Reynolds</i>
06:00 - 09:00	Registration
07:00 - 09:00	Reception

June 9 2005, Thursday

07:00 - 08:00	Registration
08:00 - 08:30	Welcome and Opening Remarks - <i>P. Arabshahi and A. Martinoli</i>
08:30 - 09:20	Keynote Speech 1: The honey bee foraging behavior syndrome: quantifying the response threshold model of division of labor - <i>T. Pankiw</i>
09:20 - 10:00	Session 1: Swarm Intelligence Foundations and Biological Systems Modeling
Chair: K. Lerman	
1.	Bio-inspired emergent construction - <i>D. Feltell, L. Bai, and R. Soar</i>
2.	Designing collective behavior in a group of humans using a real-time polling system and interactive evolution - <i>D. Buchsbaum, P. Funes, J. Budynek, H. Koppermann, and E. Bonabeau</i>
10:00 - 10:30	Break
10:30 - 12:30	Session 2: Particle Swarm Optimization and Ant Colony Optimization
Chair: G.K. Venayagamoorthy	
1.	A proposal to use stripes to maintain diversity in a multi-objective particle swarm optimizer - <i>M.A. Villalobos-Arias, G. Toscano-Pulido, and C.A. Coello Coello</i>
2.	Understanding particle swarm optimization by evolving problem landscapes - <i>W.B. Langdon, R. Poli, O. Holland, and T. Krink</i>
3.	Why does it need velocity? - <i>J. Kennedy</i>
4.	Particle swarm optimization with area of influence: increasing the effectiveness of the swarm - <i>K.J. Binkley and M. Hagiwara</i>
5.	Unified particle swarm optimization for tackling operations research problems - <i>K.E. Parsopoulos and M.N. Vrahatis</i>
6.	An ant colony system approach for solving the at-least version of the generalized minimum spanning tree problem - <i>A.K. Das, P. Arabshahi, and A. Gray</i>

12:30 - 02:00 Lunch, Poster and Demo Session

1. A Comparison of PSO and back-propagation for training RBF neural networks for identification of a power system with STATCOM - *S. Mohagheghi, Y. del Valle, G.K. Venayagamoorthy, and R. G. Harley*
2. Distributed sensor placement with sequential particle swarm optimization - *P. N. Ngatchou, W.L.J. Fox, and M.A. El-Sharkawi*
3. FPGA implementation of particle swarm optimization for inversion of large neural networks - *P.D. Reynolds, R.W. Duren, M.L. Trumbo, and R.J. Marks II*
4. Improving the performance of particle swarm optimization using adaptive critics designs - *S. Doctor and G.K. Venayagamoorthy*
5. Niching ability of basic particle swarm optimization algorithms - *A.P. Engelbrecht, B.S. Masiye, and G. Pampara*
6. Principal component particle swarm Optimization (PCPSO) - *M.S. Voss*
7. Shape matching using fuzzy discrete particle swarm optimization - *J. Du, D. Huang, J. Zhang, and X. Wang*
8. A Simple nearest-neighbor flocking rule - *A. Di Franco and K.S. Narendra*
9. Artificial life and online flows optimization in energy networks - *M. Annunziato, M. Lucchetti, G. Orsini, and S. Pizzuti*
10. Bacterial communities: a microbiological model for swarm intelligence - *P.G. Flikkema and J.G. Leid*
11. Cognitive swarms for rapid detection of objects and associations in visual imagery - *Y. Owechko and S. Medasani*
12. Facility layout using swarm intelligence - *C.T. Hardin and J.S. Usher*
13. Resource allocation for a distributed sensor network - *M.C. Martin, I. Trifonov, E. Bonabeau, and Paolo Gaudiano*
14. Intelligent backbone swarms for scalable, disruption tolerant wireless networking - *M. Gerla, J. Park, R. Battiti, and A. Garg*
15. Swarming computer security: an experiment in policy distribution - *R. Menezes, R. Ford, and A. Ondi*
16. The effect of environmental structure on the utility of communication in hive-based swarms - *P. Schermerhorn and M. Scheutz*

02:00 - 04:00 Session 3: Particle Swarm Optimization and Ant Colony Optimization Applications

Chair: E. Sahin

1. Novel composition test functions for numerical global optimization - *J.J. Liang, P.N. Suganthan, and K. Deb*
2. Swarm intelligence for routing in mobile ad-hoc networks - *G. Di Caro, F. Ducatelle, and L.M. Gambardella*
3. Detection of multiple source locations using a glowworm metaphor with applications to collective robotics - *K.N. Krishnanand and D. Ghose*
4. Particle swarm optimization for unsupervised robotic learning - *J. Pugh, Y. Zhang, and A. Martinoli*
5. A Hybrid particle swarm/Ant colony algorithm for the classification of hierarchical biological data - *N. Holden and A.A. Freitas*
6. The Particle swarm over scene matching - *O. Sjahputera and J. M. Keller*

04:00 - 04:30 Break

04:30 - 06:30 Session 4a: Particle Swarm Optimization

Chair: J. Kennedy Location: San Gabriel

1. Fitness inheritance in multi-objective particle swarm optimization - *M. Reyes-Sierra and C.A. Coello Coello*
2. Dynamic multi-swarm particle swarm optimizer - *J.J. Liang and P.N. Suganthan*
3. CiClops: computational intelligence collaborative laboratory of pantological software - *E. S. Peer, A. P. Engelbrecht, G. Pampara, and B. S. Masiye*
4. Information exchange in multiple cooperating swarms - *M. El-Abd and M. Kamel*
5. Neural networks based non-uniform scalar quantizer design with particle swarm optimization - *W. Zha and G.K. Venayagamoorthy*
6. A particle swarm algorithm for high dimensional, multi-optima problem spaces - *T. Hendtlass*

04:30 - 06:30 Session 4b: Particle Swarm Optimization Applications

Chair: J.M. Keller Location: San Rafael

1. Comparison of particle swarm optimizations for optimal operational planning of energy plants - *S. Kitagawa and Y. Fukuyama*
2. Parameter tuning of a computed-torque controller for a 5 degree of freedom robot arm using co-evolutionary particle swarm optimization - *A. Asmara, R. A. Krohling, and F. Hoffmann*
3. Particle swarm optimization for macrocell overlap removal and placement - *S. Hsieh, C. Lin, and T. Sun*
4. DNA motif detection using particle swarm optimization and expectation-maximization - *C.T. Hardin and E.C. Rouchka*
5. Document clustering using particle swarm optimization - *X. Cui, T.E. Potok, and P. Palathingal*

07:00 - 08:00 Reception

Location: Plaza Room

08:00 - 10:00 Banquet

Location: Plaza Room

June 10 2005, Friday**08:30 - 09:20 Keynote Speech 2:** Swarm-bot: an experiment in swarm robotics - *M. Dorigo***09:20 - 10:00 Session 5: Swarm Intelligence Foundations and Artificial Systems Modeling**

Chair: R. Menezes

1. Modeling and mathematical analysis of swarms of microscopic robots - *A. Galstyan, T. Hogg, and K. Lerman*
2. Swarm robotics for a dynamic cleaning problem - *Y. Altshuler, I.A. Wagner, and A.M. Bruckstein*

10:00 - 10:30 Break**10:30 - 12:30 Session 6: Swarm Robotics I**

Chair: A. Winfield

1. Beyond swarm intelligence: the ultraSwarm - *O. Holland, J. Woods, R. De Nardi, and A. Clark*
2. MASCARILLONS: flying swarm intelligence for architectural research - *J. Nembrini, N. Reeves, E. Poncet, A. Martinoli, and A. Winfield*
3. Collective decision-making by a group of cockroach-like robots - *S. Garnier, C. Jost, R. Jeanson, J. Gautrais, M. Asadpour, G. Caprari, and G. Theraulaz*
4. Emergent collective decisions in a swarm of robots - *V. Trianni and M. Dorigo*
5. Swarms for chemical plume tracing - *D. Zarzhitsky, D. F. Spears, and W.M. Spears*

6. The utility of heterogeneous swarms of simple UAVs with limited sensory capacity in detection and tracking tasks - *M. Scheutz, P. Schermerhorn, and P. Bauer*

12:30 - 02:00 Lunch, Poster and Demo Session
Same as June 9.**02:00 - 03:40 Session 7: Swarm-Intelligent Systems and Algorithms I**

Chair: E. Bonabeau

1. Swarm approach for a connectivity problem in wireless networks - *R. Montemanni and L.M. Gambardella*
2. A stochastic automaton-based algorithm for flexible and distributed network partitioning - *Y. Wan, S. Roy, A. Saberi, and B. Lesieutre*
3. Physical deployment of digital hormones through RFID technology - *M. Mamei and F. Zambonelli*
4. On delay-dependent stability of a swarm of networked autonomous vehicles under communication constraints - *D. Garagic*
5. Swarm Reasoning - *D. Palmer, M. Kirschenbaum, J. Shifflet, and L. Seiter*

03:40 - 04:00 Break**04:00 - 05:40 Session 8a: Swarm Robotics II**

Chair: O. Holland Location: Plaza I

1. Sensor fusion for swarms of small unmanned aerial vehicles - *R.W. Deming and L.I. Perlovsky*
2. Generating contour plots using multiple sensor platforms - *F. Zhang and N. Leonard*
3. Evolving behaviors for a swarm of unmanned air vehicles - *P. Gaudiano, E. Bonabeau, and B. Shargel*
4. Probabilistic aggregation strategies in swarm robotic systems - *O. Soysal and E. Sahin*
5. Evolving aggregation behaviors for swarm robotic systems: a systematic case study - *E. Bahceci and E. Sahin*

04:00 - 05:40 Session 8b: Swarm-Intelligent Systems and Algorithms II

Chair: P. Flikkema Location: Plaza II

1. The wisdom of the hive applied to mobile ad-hoc networks - *H. Wedde and M. Farooq*
2. Threshold-based algorithms for power-aware load balancing in sensor networks - *C.M. Cianci, V. Trifa, and A. Martinoli*
3. Ant inspired server population management in a service based computing environment - *M.D. Peysakhov and W. C. Regli*
4. Diagnostic problem solving using swarm intelligence - *G C. Lapizco-Encinas and J. A. Reggia*
5. Using aggregate motion in multi-agent teams to solve search and transport problems - *A. Rodriguez and J.A. Reggia*

05:40 - 06:00 Break**06:00 - 07:00 Plenary discussion with the Industrial Research Panel**

Chair: P. Arabshahi Location: Plaza Room

Panelists: Eric Bonabeau (Icosystems Inc., Boston, USA), Rodney Goodman (InfinID Technologies Inc., Pasadena, USA), Joe Rothermich (Natural Selection Inc., USA), Enzo Lucibello (AntOptima, Lugano, Switzerland), Hobson Lane (Northrop Grumman Inc., Redondo Beach, USA)