# John Hallam
# Curriculum Vitae

1 October, 2001

## Work Address

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## Personal Data

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| Date of Birth | March 20th, 1958 |
| Place of Birth | St. Helier, Jersey C. I. |
| Citizenship | British |
| Marital Status | Married, 2 children. |

## Summary

I am an established teacher and researcher, and director of a substantial group working in Mobile Robotics. My catholic interests include biomimetic robotics, evolutionary robotics, connectionist computing, computer vision, and electronic sensors and hardware. A mathematician by training, I have many years experience of electronic systems design, both academic and commercial, and familiarity with engineering language and methods. I enjoy travel and working in other countries.

## Education

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| Ph. D. in Artificial Intelligence | University of Edinburgh | Jul 1985 |
| B. A. in Mathematics<br>First Class Honours | University of Oxford | Jul 1979 |

# Employment

| Post-Doctoral Fellow | Department of Artificial Intelligence, University of Edinburgh | Oct 83–Oct 85 |
| Lecturer | Department of Artificial Intelligence, University of Edinburgh | Nov 85–Sep 96 |
| Senior Lecturer | Department of Artificial Intelligence, University of Edinburgh | Oct 96–Jul 97 |
| Senior Lecturer | Division of Informatics, University of Edinburgh | Aug 97–present |
| Guest Researcher | Institutionen för Systemteknik University of Linköping | Jan 90–Sep 90 |
| Guest Researcher | Department of Computer Science University of Århus | Jun 99–Sep 99 |
| Guest Professor | Maersk Mc-Kinney Möller Institute University of Southern Denmark at Odense | Sep 01–Jul 02 |

# Research Achievements

○ Devised, investigated and tested the first simultaneous localisation and mapping techniques for mobile robot navigation (1979–1989);

○ Encouraged the development of the field of biomimetic robotics, working particularly on modelling the cricket, high-duty-cycle bats, and lamprey (1994–present);

○ Introduced mobile robotics at the University of Edinburgh (1979) and responsible for the growth and direction of the Mobile Robotics Research Group — 2.5 faculty members, c. 2 post-doctoral researchers, c. 20 research students, 15 Masters students (1991–present).

# Research Experience

○ 15 years of experience of successful doctoral student supervision: principal(secondary) supervisor of 14(10) successful graduates

○ 21 postgraduate research (doctoral) students examined, for two Swedish, one French & various British universities;

○ a similar number examined for University of Edinburgh (as internal examiner);

○ Completed research grants from the British EPSRC and MRC and the EU totalling c. £1,000,000;

○ Served on numerous programme committees, particularly for the Simulation of Adaptive Behaviour conference series; programme chair for AISB95; co-organiser of SAB2002;

○ Reviewer for the AI Journal, International Journal of Robotics Research, Journal of Adaptive Behaviour, and others, and for the British EPSRC, the Australian National Research Council, the German von Helmholtz foundation, and the British Council.

# Teaching Experience

○    Taught, administered and examined courses at all undergraduate levels on topics including foundational artificial intelligence, knowledge representation, experimental methodology, mobile robotics, computational vision, connectionist computing, and evolutionary computation (1985–present). Class sizes vary between 20 (vision) through 90 (evolutionary computation) to 180 (first year artificial intelligence).
○    Taught the last four of the above topics at Masters level (1985–present).
○    Supervised undergraduate and Masters level project work for around 120 students.
○    External Examiner for several undergraduate courses in Computer Science and Artificial Intelligence at the University of Leeds, UK (1998–present).

# Summary of Publications

17    Journal papers published (JASA, Adaptive Behaviour, Neural Computation, Artificial Life)
10    Chapters contributed to edited books
49    Conference papers
14    Refereed Workshop papers

# Other Skills and Activities

○    A member of the IEE, the London Mathematical Society, the International Society for Adaptive Behaviour, and the Society for the Study of Artificial Intelligence and the Simulation of Behaviour.
○    President of the International Society for Adaptive Behaviour (2001–present);
○    A capable electronic (analog, digital and microcontroller) designer with some 25 years experience — most notably I designed, in the early 1990s, the bulk of the electronics in the LEGO kits used for teaching robotics at the University of Edinburgh over the past 10 years; I have designed a wide variety of sensors and electronic systems for student and grant-funded robotics projects, and an active light-emitting ball for use with LEGO Mindstorms sensors (in use at the University of Odense).
○    A Director of 3 Lions Design Ltd., a company that does commercial electronic design and software work, and designer of the EV4000 series of commercial Data Loggers (http://www.eventlogger.omniinstruments.co.uk/).
○    An experienced computer systems manager for networked Linux and Unix systems with programming skills in, amongst others, various assembler languages, C, PERL, and HTML. I designed and wrote the kernel for the University of Edinburgh LEGO robotics kits and various other pieces of embedded software.
○    A fluent native speaker of (British) English; adequate in French and Swedish; and with some passive comprehension skills in Germanic languages, Italian, Spanish and Portuguese.

# Full List of Publications

## Refereed Journal Publications [17]

Carmena, J. M., Kämpchen, N., Kim, D. and Hallam, J. C. T. (2001). Artificial ears for a biomimetic sonarhead: from multiple reflectors to surfaces, *Artificial Life* **7**(2): 147–169.

Cavaco, S. and Hallam, J. (1999). A biologically plausible acoustic motion detection neural network, *International Journal of Neural Systems* **9**(5): 453–459.

Daku, B. L. F., Grant, P. M., Cowan, C. F. N. and Hallam, J. (1988). Intelligent techniques for spectral estimation, *Journal of the Institution of Electronic and Radio Engineers* **58**(6): 275–283.

Gadanho, S. C. and Hallam, J. (2001a). *Adaptive Behavior*.

Gadanho, S. C. and Hallam, J. (2001b). Emotion-triggered learning in autonomous robot control, *Cybernetics and Systems* **32**(5): 531–559.

Hallam, B., Halperin, J. and Hallam, J. (1994). An ethological model for implementation in mobile robots, *Journal of Adaptive Behavior* **3**(1): 51–79.

Hallam, J. C. T. and Malcolm, C. A. (1994). Behaviour: Perception, action and intelligence — the view from situated robotics, *Philosophical Transactions of the Royal Society of London* **349**(1689): 29–42.

Ijspeert, A. J., Hallam, J. and Willshaw, D. (1999). Evolving swimming controllers for a simulated lamprey with inspiration from neurobiology, *Journal of Adaptive Behavior* **7**(2): 151–172.

Lee, W.-P. and Hallam, J. (1999). Evolving reliable and robust controllers for real robots by genetic programming., *Soft Computing* **3**(2): 63–75.

Lund, H. H., Webb, B. and Hallam, J. (1998). Physical and temporal scaling considerations in a robot model of cricket calling song preference, *Artificial Life* **4**(1): 95–107.

Orr, M. J. L., Hallam, J., Murray, A. and Leonard, T. (2000a). Assessing RBF networks using DELVE, *International Journal of Neural Systems* **10**(5): 397–416.

Orr, M. J. L., Hallam, J., Takezawa, K., Murray, A., Ninomiya, S., Oide, M. and Leonard, T. (2000b). Combining regression trees and radial basis function networks, *International Journal of Neural Systems* **10**(6): 453–465.

Peremans, H. and Hallam, J. C. T. (1998). The spectrogram correlation and transformation receiver, revisited, *Journal of the Acoustical Society of America* **104**(2(1)): 1101–1110.

Peremans, H., Walker, V. A. and Hallam, J. C. T. (1997). A bionic sonarhead, *Bioacoustics*.

Walker, V. A., Peremans, H. and Hallam, J. C. T. (1998a). Good vibrations: Exploiting reflector motion to partition an acoustic environment, *Journal of Robotics and Autonomous Systems* **24**(1–2): 43–55.

Walker, V. A., Peremans, H. and Hallam, J. C. T. (1998b). One tone, two ears, three dimensions: A robotic investigation of pinnae movements used by rhinolophid and hipposiderid bats, *Journal of the Acoustical Society of America* **104**(1): 569–579.

Willshaw, D., Hallam, J., Gingell, S. and Lau, S. L. (1997). Marr's theory of the neocortex as a self-organising neural network, *Neural Computation* **9**(4): 911–936.

## Books Edited [2]

Hallam, J. and Mellish, C. (eds) (1987). *Advances in Artificial Intelligence*, John Wiley, Chichester.

Hallam, J. (ed.) (1995). *Hybrid Problems, Hybrid Solutions*, IOS, Amsterdam.

## Chapters in Edited Books [10]

Chagas, N. C. and Hallam, J. (1998). A learning mobile robot: theory, simulation and practice, *in* A. Birk and J. Demiris (eds), *Learning Robots: A Multi-Perspective Exploration*, Vol. 1545 of *Lecture Notes in Artificial Intelligence*, Springer Verlag, pp. 142–154.

Hallam, B., Hallam, J. and Hayes, G. (1997). A dynamic net for robot control, *in* O. Omidvar and P. van der Smagt (eds), *Neural Systems for Robotics*, Academic Press, San Diego, pp. 227–269.

Hallam, J. (1986). Analysing specular echoes in active acoustic range data, *in* A. Cohn and R. Thomas (eds), *Artificial Intelligence and Its Applications*, John Wiley, pp. 165–177.

Hallam, J. (1987). Computational descriptions for interdisciplinary research in vision, *in* J. L. Casti and A. Karlqvist (eds), *Real Brains, Artificial Minds*, Elsevier, New York, pp. 107–133.

Hallam, J. (1989). Artificial intelligence and signal understanding, *in* Y. T. Chan (ed.), *Underwater Acoustic Data Processing*, Vol. NATO-ASI of *E*, Kluwer.

Hallam, J. (1990). Blackboard systems, *in* A. R. Mirzai (ed.), *Artificial Intelligence: Concepts and Applications in Engineering*, Chapman and Hall, London, pp. 35–64.

Hallam, J. (1994). Hybrid problems need hybrid solutions? Tracking and controlling toy cars, *in* C. M. Brown and D. Terzopoulos (eds), *Real-Time Computer Vision*, Cambridge University Press, Cambridge, pp. 209–229.

Hallam, J. (1995). Autonomous robots : A question of design?, *in* L. Steels and R. Brooks (eds), *The Artificial Life Route to Artificial Intelligence: Building Embodied, Situated Agents*, Laurence Erlbaum, New Jersey, pp. 217–226.

Lee, W.-P., Hallam, J. and Lund, H. H. (1998). Learning complex robot behaviour by evolutionary computing with task decomposition, *in* A. Birk and J. Demiris (eds), *Learning Robots: A Multi-Perspective Exploration*, Vol. 1545 of *Lecture Notes in Artificial Intelligence*, Springer Verlag, pp. 155–172.

Walker, V., Peremans, H. and Hallam, J. (1999). Active[2] echo-location: An investigation of active reception mechanisms which may be involved in target localisation, *in* J. Thomas, C. Moss and M. Vater (eds), *Advances in the Study of Echolocation in Bats and Dolphins*, University of Chicago Press.

## Refereed Conference Publications [49]

Carmena, J. and Hallam, J. (1999). Improving performance in a multi-robot task through minimal communication, *in* H. Araújo and J. Dias (eds), *SIRS'99, Proceedings of the 7th International Symposium on Intelligent Robotic Systems*, pp. 329–337.

Carmena, J. and Hallam, J. (2000). Estimating Doppler shift with a coarse cochlear filterbank, *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2000)*, Vol. 1, IEEE Press, Japan, pp. 221–226.

Carmena, J. and Hallam, J. (2001a). A comparison of methods for estimating Doppler-shift using bat-inspired cochlear filterbank models, *in* R. Siegwart and C. Balkenius (eds), *EUROBOT'01, Proceedings of the European Workshop on Mobile Robotics*, Vol. 86 of *Lund University Cognitive Studies*, University of Lund, pp. 9–16.

Carmena, J. and Hallam, J. (2001b). A Doppler-based motion controller for an echolocating mobile robot, *in* U. Nehmzow and C. Melhuish (eds), *TIMR01 — Towards Intelligent Mobile Robots: Proceedings of the 3rd British Conference on Autonomous Mobile Robotics and Autonomous Systems*, number UMCS–01–4–1 in *Technical Report Series*, Dept. of Computer Science, University of Manchester.

Carmena, J., Kim, D. E. and Hallam, J. C. T. (2000). Designing artificial ears for animat locomotion, *in* J.-A. Meyer, A. Berthoz, D. Floreano, H. L. Roitblat and S. W. Wilson (eds), *From Animals to Animats 6: Proceedings of the Sixth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 73–80.

Gadanho, S. C. and Hallam, J. (1998a). Emotion-driven learning for animat control, *in* R. Pfeifer, B. Blumberg, J.-A. Meyer and S. W. Wilson (eds), *From Animals to Animats 5: Proceedings of the Fifth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 354–359.

Gadanho, S. C. and Hallam, J. (1998b). Exploring the role of emotions in autonomous robot learning, *in* D. Canamero (ed.), *Emotional and Intelligent: The Tangled Knot of Cognition — Papers from the AAAI Fall Symposium*, AAAI Press, pp. 84–89.

Hallam, J. (1985). Analysing specular echoes in active acoustic range data, *Proceedings of AISB-85*.

Hallam, J. and Hayes, G. (1997). Benchmarks for mobile robotics?, *in* U. Nehmzow, M. Recce and D. Bisset (eds), *TIMR97 – Towards Intelligent Mobile Robots: Scientific Methods in Mobile Robotics*, number UMCS–97–9–1 in *Technical Report*, Dept. of Computer Science, University of Manchester.

Hallam, J. C. T. (1983). Resolving observer motion by object tracking, *Proceedings of the 8th International Joint Conference on Artificial Intelligence*, Vol. 2, William Kaufmann, Karlsruhe, pp. 792–798.

Hallam, J. C. T., Kwa, J. B. H. and Howe, J. A. M. (1986a). Knowledge-based surface classification using specular sonar reflections, *in* F. C. A. Groen and L. O. Hertzberger (eds), *Proceedings of the Conference on Intelligent Autonomous Systems*, Amsterdam.

Hallam, J. C. T., Kwa, J. B. H. and Howe, J. A. M. (1986b). Rule-based surface classification using specular sonar reflections, *Proceedings of the BCS Expert Systems Conference*, pp. 164–174.

Hallam, J., Forster, P. and Howe, J. (1989). Map-free localisation in a partially moving 3d world: the edinburgh feature-based navigator, *in* T. Kanade, F. C. A. Groen and L. O. Hertzberger (eds), *Proceedings of Intelligent Autonomous Systems 2*, Vol. 2, IOS, Amsterdam, pp. 726–736.

Huang, X. and Hallam, J. (1995). Spring-based negotiaton for conflict resolution in AGV scheduling, *Proceedings of the IEEE Conference on Systems, Man and Cybernetics: Intelligent Systems for the 21st Century*, IEEE Press, Vancouver, pp. 789–794.

Ijspeert, A. J., Hallam, J. and Willshaw, D. (1997). Artificial lampreys: Comparing naturally and artificially evolved swimming controllers, *in* P. Husbands and I. Harvey (eds), *Proceedings of the European Conference on Artificial Life*, MIT Press, Brighton, pp. 256–265.

Ijspeert, A. J., Hallam, J. and Willshaw, D. (1998a). Evolution of a central pattern generator for the swimming and trotting gaits of the salamander, *Proceedings of the Third International Conference on Computational Intelligence and Neurosciences (ICCIN98)*, Research Triangle Park, NC.

Ijspeert, A. J., Hallam, J. and Willshaw, D. (1998b). From lampreys to salamanders: Evolving neural controllers for swimming and walking, *in* R. Pfeifer, B. Blumberg, J.-A. Meyer and S. W. Wilson (eds), *From Animals to Animats 5: Proceedings of the Fifth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 390–399.

Kim, D. and Hallam, J. C. T. (2000). Neural network approach to path integration for homing navigation, *in* J.-A. Meyer, A. Berthoz, D. Floreano, H. L. Roitblat and S. W. Wilson (eds), *From Animals to Animats 6: Proceedings of the Sixth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 228–235.

Kim, D. and Hallam, J. C. T. (2001). Mobile robot control based on boolean logic with internal memory, *Proceedings of the sixth European Conference on Artificial Life*, Lecture Notes in Computer Science, Springer Verlag.

Kim, D., Carmena, J. M. and Hallam, J. (2000). Towards an artificial pinna for a narrow-band biomimetic sonarhead, *in* J. Millar, A. Thompson, P. Thomson and T. C. Fogarty (eds), *ICES2000: From Biology to Hardware*, number 1801 in *Lecture Notes in Computer Science*, Springer Verlag, pp. 113–122.

Kortmann, R. and Hallam, J. (1999). Studying animals through artificial evolution: the cricket case, *in* D. Floreano, J.-D. Nicoud and F. Mondada (eds), *Advances in Artificial Life: Proceedings of the fifth European Conference on Artificial Life*, Vol. 1674 of *Lecture Notes in Computer Science*, Springer Verlag, pp. 215–224.

Lee, W.-P., Hallam, J. and Lund, H. H. (1996). A hybrid GA/GP approach for co-evolving controllers and robot bodies, *Proceedings of the Third IEEE Conference on Evolutionary Computation*, IEEE Press, pp. 384–389.

Lee, W. P., Hallam, J. and Lund, H. H. (1997). Applying genetic programming to evolve behaviour primitives and arbitrators for mobile robots, *Proceedings of the Fourth IEEE Conference on Evolutionary Computation*, IEEE Press, pp. 501–506.

Li, M., Chan, S. V., Chong, K. W. and Hallam, J. (1996a). Agent-oriented urban traffic control simulation, *Proceedings of the First Annual International Conference on Industrial Engineering Applications and Practice*.

Li, M., Hallam, J., Pryor, L., Chan, S. V. and Chong, K. W. (1996b). A cooperative intelligent system for urban traffic problems, *Proceedings of the IEEE International Symposium on Intelligent Control*, IEEE Press, pp. 162–167.

Lund, H. H. and Hallam, J. (1997). Evolving sufficient robot controllers, *Proceedings of the Fourth IEEE Conference on Evolutionary Computation*, IEEE Press, pp. 495–499.

Lund, H. H., Hallam, J. and Lee, W.-P. (1997a). Evolving robot morphology, *Proceedings of the Fourth IEEE Conference on Evolutionary Computation*, IEEE Press, pp. 197–202.

Lund, H. H., Webb, B. and Hallam, J. (1997b). A robot attracted to the cricket species *gryllus bimaculatus*, *in* P. Husbands and I. Harvey (eds), *Proceedings of the European Conference on Artificial Life*, MIT Press, Brighton, pp. 246–255.

Lund, H. H., Webb, B. and Hallam, J. (1998). Physical and temporal scaling considerations in a robot model of cricket calling song preference, *in* C. Adami, R. K. Belew, H. Kitano and C. Taylor (eds), *Proceedings of the 6th International Conference on Artificial Life*, MIT Press, UCLA, pp. 63–71.

Malcolm, C., Smithers, T. and Hallam, J. (1989). An emerging paradigm in robot architecture, *in* T. Kanade, F. C. A. Groen and L. O. Hertzberger (eds), *Proceedings of Intelligent Autonomous Systems 2*, Vol. 2, IOS, Amsterdam, pp. 545–564.

McKerrow, P. J. and Hallam, J. C. T. (1990). An introduction to the physics of echolocation, *Proceedings of the Third National Conference on Robotics*, Melbourne, pp. 198–209.

Nehmzow, U., Hallam, J. and Smithers, T. (1989). Really Useful Robots, *in* T. Kanade, F. C. A. Groen and L. O. Hertzberger (eds), *Proceedings of Intelligent Autonomous Systems 2*, Vol. 1, IOS, Amsterdam, pp. 284–293.

Or, J. and Hallam, J. (2000). A study on the robustness of the lamprey swimming controllers, *in* J.-A. Meyer, A. Berthoz, D. Floreano, H. L. Roitblat and S. W. Wilson (eds), *SAB2000 Proceedings Supplement, Sixth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 68–76.

Orr, M. J. L., Fisher, R. B. and Hallam, J. C. T. (1991). Computing with uncertainty: Intervals versus probability, *in* P. Mowforth (ed.), *Proceedings of the 1991 British Machine Vision Association Conference*, Springer Verlag, pp. 351–354.

Orr, M. J. L., Hallam, J. and Fisher, R. B. (1992). Fusion through interpretation, *in* G. Sandini (ed.), *Proceedings of the second European Conference on Computer Vision*, number 588 in *Lecture Notes in Computer Science*, Springer Verlag, pp. 801–805.

Peremans, H., Müller, R., Carmena, J. M. and Hallam, J. (2000). A biomimetic platform to study perception in bats, *in* G. T. McKee and P. S. Schenker (eds), *Proceedings of SPIE2000: Sensor Fusion and Decentralized Control in Robotics Systems III*, Vol. 4196, SPIE, Boston, MA, pp. 168–179.

Peremans, H., Walker, V. A. and Hallam, J. C. T. (1998a). 3D object localisation with a binaural sonarhead, inspirations from biology, *Proceedings of the IEEE International Conference on Robotics and Automation*, Vol. 4, IEEE Press, pp. 2795–2800.

Peremans, H., Walker, V. A., Papadopoulos, G. and Hallam, J. C. T. (1998b). Evolving batlike pinnae for target localisation by an echolocator, *in* M. Sipper, D. Mange and A. Perez-Uribe (eds), *Second International Conference on Evolvable Systems: From Biology to Hardware (ICES98)*, Vol. 1478 of *Lecture Notes in Computer Science*, Springer Verlag, pp. 230–239.

Pérez-Miñana, E., Ross, P. and Hallam, J. (1995). Multi-layer perceptron design using delaunay triangulations., *Proceedings of the 1995 IEEE Workshop on Fuzzy Logic and Neural Networks/Evolutionary Computation*, IEEE Press, pp. 104–109.

Reeve, R. and Hallam, J. (1995). Control of walking by central pattern generators, *in* U. Rembold, R. Dillmann, L. O. Hertzberger and T. Kanade (eds), *Proceedings of Intelligent Autonomous Systems 4*, IOS, Karlsruhe, pp. 695–701.

Smart, W. and Hallam, J. (1994). Location recognition in rats and robots, *in* D. Cliff, P. Husbands, J.-A. Meyer and S. W. Wilson (eds), *From Animals to Animats: Proceedings of the Third International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 174–178.

Takiguchi, J. and Hallam, J. (1999). A study of autonomous mobile system in outdoor environment. III. local path planning for a nonholonomic mobile robot by chained form., *Proceedings of the IEEE International Vehicle Electronics Conference*, IEEE Press, pp. 485–490.

Taylor, T. and Hallam, J. (1997). Studying evolution with self-replicating computer programs, *in* P. Husbands and I. Harvey (eds), *Proceedings of the European Conference on Artificial Life*, MIT Press, Brighton, pp. 550–559.

Taylor, T. and Hallam, J. (1998). Replaying the tape: an investigation into the role of contingency in evolution, *in* C. Adami, R. K. Belew, H. Kitano and C. Taylor (eds), *Proceedings of the 6th International Conference on Artificial Life*, MIT Press, UCLA, pp. 256–265.

Waite, M., Orr, M. J. L., Fisher, R. B. and Hallam, J. (1993). Statistical partial constraints for 3D model matching and pose estimation problems, *Proceedings of the British Machine Vision Conference*, pp. 105–114.

Walker, A., Hallam, J. and Willshaw, D. (1993a). Bee-havior in a mobile robot: The construction of a self-organizing cognitive map and its use in robot navigation within a complex, natural environment, *Proceedings of the IEEE International Conference on Neural Networks*, Vol. 3, IEEE Press, pp. 1451–1456.

Walker, A., Hallam, J. and Willshaw, D. (1993b). Simple spatial memories for a mobile robot: A bee-haviour based approach, *in* P. W. H. Chung, G. Lovegrove and M. Ali (eds), *Proceedings of the 6th International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems*, Gordon and Breach, pp. 407–410.

Webb, B. and Hallam, J. (1996). How to attract females: Further robotic experiments in cricket phonotaxis, *in* P. Maes, M. J. Mataric, J.-A. Meyer, J. Pollack and S. W. Wilson (eds), *From Animals to Animats 4: Proceedings of the Fourth International Conference on Simulation of Adaptive Behavior*, MIT Press, pp. 75–83.

Westhead, M. and Hallam, J. (1996). Modelling hybrid systems as the limit of discrete computational processes, *Proceedings of the 13th IEEE International Conference on Robotics and Automation*, Vol. 1, IEEE Press, pp. 603–608.

## Refereed Workshop Papers [14]

Carmena, J. and Hallam, J. (1999a). A robotic platform for investigating the usage of acoustic flow in cf-bats, *138th Meeting of the Acoustical Society of America, J. Acoust. Soc. Amer.* **106**(4): 2191. *abstract.*

Carmena, J. and Hallam, J. (1999b). The role of pinna motion in cf-bats: Experiments with a robotic model, *Proceedings of the Workshop Biomechanics meets Robotics: Modelling and Simulation of Motion*, Heidelberg (Germany), p. 42. *abstract.*

Carmena, J. and Hallam, J. (1999c). Using bat biosonar as a biological approach for mobile robot navigation, *Proceedings of the Workshop on Biologically-inspired Machine Learning, ACAI'99*, Crete, Greece, pp. 48–50. *abstract.*

Cavaco, S. and Hallam, J. (1999). A biologically plausible acoustic azimuth estimation system, *in* H. G. Okuno and F. Klassner (eds), *Working notes of the Workshop on Computational Auditory Scene Analysis, CASA'99*, IJCAI.

Gadanho, S. C. and Hallam, J. (1998). Emotion-triggered learning for autonomous robots, *Proceedings of the SAB98 Workshop on Grounding Emotions in Adaptive Systems*.

Gomes, H. M., Fisher, R. B. and Hallam, J. C. T. (1998). A retina-like image representation of primal sketch features using a neural network approach, *Proceedings of the Noblesse Workshop on Non-Linear Model Based Image Analysis*, pp. 251–256.

Hallam, J. (1998). Can we mix robotics and biology?, *in* M. A. Lewis, S. Shastri, M. A. Arbib and M. E. Nelson (eds), *Proceedings of the IROS98 Workshop WT1: Defining the future of biomorphic robots*, IEEE.

Hayes, G. and Hallam, J. (1995). Teaching robotics with LEGO robots, *Proceedings of the IEE Colloquium on Robotics and Education*, number 072 in *IEE Colloquium (Digest)*, IEE, pp. 2/1–2/2.

Lee, W.-P., Hallam, J. and Lund, H. H. (1997). Learning complex behaviours by evolutionary approaches, *in* J. Demiris and A. Birk (eds), *Proceedings of the 6th European Workshop on Learning Robots*, pp. 42–51.

Nehmzow, U., Smithers, T. and Hallam, J. (1990). Steps towards intelligent robotics, *Third International Workshop on Software Engineering and its Applications*, Toulouse.

Nehmzow, U., Smithers, T. and Hallam, J. (1991). Location recognition in a mobile robot using self-organising feature maps, *in* G. Schmidt (ed.), *Information Processing in Autonomous Mobile Robots*, Springer Verlag, pp. 267–277.

Ribeiro, M. I., Dias, J. and Hallam, J. (2001). Roboticwebook: an electronic book initiative, *in* A. Casals and A. Grau (eds), *Proceedings of the 1st Workshop on Robotics Education and Training RET2001*, European Robotics Research Network, Technical University of Catalonia, Weingarten, Germany, pp. 127–130.

Westhead, M. D. and hallam, J. (1996). Modelling mode-switching systems as the limit of discrete computational processes, *Proceedings of the 1997 IEE Colloquium on Hybrid Control for Real-Time Systems*, number 256 in *IEE Colloquium (Digest)*, IEE, pp. 2/1–2/6.

Wyatt, J., Hayes, G. and Hallam, J. (1996). Investigating the behaviour of $Q(\lambda)$, *Proceedings of the IEE Colloquium on Self-Learning Robots*, number 026 in *IEE Colloquium (Digest)*, IEE, pp. 5/1–5/3.

# Postgraduate Students Supervised and Examined

## Postgraduate Students Supervised:

Anagnostopoulou, S. (1997). *Efficient constructive algorithms for self-organising neural networks*, MSc by Research, Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Bryson, J. J. (2000). *The study of sequential and hierarchical organisation of behaviour via artificial mechanisms of action selection*, M. Phil., Department of Psychology, University of Edinburgh. Second Supervisor.

Cavaco, S. (1997). *A biologically inspired acoustic azimuth estimation and motion detection system for a robotic cat*, MSc by Research, Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

do Carmo Gadanho, S. P. C. (1999). *Reinforcement learning in autonomous robots: an empirical investigation of the role of emotions*, Ph. D., Division of Informatics, University of Edinburgh. Principal Supervisor.

Donnett, J. G. (1992). *Analysis and synthesis in the design of locomotor and spatial competences for a multisensory mobile robot*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Huang, X. (1996). *Metaphor-based negotiation and its application in AGV movement planning*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Ijspeert, A. J. (1998). *Design of artificial neural oscillatory circuits for the control of lamprey- and salamander-like locomotion using evolutionary algorithms*, Ph. D., Division of Informatics, University of Edinburgh. Principal Supervisor.

Kortmann, L. J. (1998). *Evolving phonotaxis in a robot cricket — an investigation in bio-robotics*, MSc by Research, University of Gröningen / Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Kwa, J. B. H. (1988). *Planning Automated Guided Vehicle Movement in a Factory*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Lee, W.-P. (1997). *Evolving robots: from simple behaviours to complete systems*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Reeve, R. E. (1999). *Generating walking behaviours in legged robots*, Ph. D., Division of Informatics, University of Edinburgh. Principal Supervisor.

Taylor, T. J. (1999). *From artificial evolution to artificial life*, Ph. D., Division of Informatics, University of Edinburgh. Principal Supervisor.

Walker, V. A. (1997). *One tone, two ears, three dimensions: an investigation of qualitative echolocation strategies in synthetic bats and real robots*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Westhead, M. D. (1998). *Continuous automata: bridging the gap between discrete and continuous time system models*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Principal Supervisor.

Cai, L. D. (1990). *Scale-based Surface Understanding using Diffusion Smoothing*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Guest, E. (1994). *Automatic reconstruction from serial sections*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Hughes, H. W. (1991). *Recogniton of three-dimensional objects using deformable models*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Kim, T. (1996). *Development of PVDF tactile dynamic sensing in a behaviour-based assembly robot*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Nehmzow, U. (1992). *Experiments in competence acquisition for autonomous mobile robots*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Reece, G. A. (1994). *Chaacterisation and design of rational competent execution agents for use in dynamic environments*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Tyrrell, T. (1993). *Computational mechanisms for action selection*, Ph. D., Centre for Cognitive Science, University of Edinburgh. Secondary Supervisor.

Webb, B. H. (1993). *Perception in real and artificial insects: a robotic implementation of cricket phonotaxis*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Williams, C. P. (1990). *Predicting the approximate functional behaviour of physical systems*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

Wyatt, J. L. (1996). *Exploration and inference in learning from reinforcement*, Ph. D., Department of Artificial Intelligence, University of Edinburgh. Secondary Supervisor.

## Postgraduate Students Examined:

Cameron, A. J. (1989). *A bayesian approach to optimal sensor placement*, D. Phil., Faculty of Physical Sciences, University of Oxford. External Examiner.

D'Cruz, B. (1997). *Reinforcement Learning in Intelligent Control: a Biologically-inspired Approach to the Re-learning Problem*, Ph. D., Department of Computer Science, University of Plymouth. External Examiner.

Evans, D. P. (1993). *Identification and analysis of acoustic features in ultrasonic echoes*, MSc (Hons), University of Wollongong, Australia. External Examiner.

Forsberg, J. (1998). *Mobile Robot navigation using Non-Contact Sensors*, Ph. D., Faculty of Engineering, University of Luleå. External Examiner.

Gilkerson, P. (2000). *Digital signal processing for time of flight sonar*, D. Phil., Faculty of Engineering Science, University of Oxford. External Examiner.

Hague, A. (1993). *Motion Planning for Autonomous Guided Vehicles*, D. Phil., Faculty of Physcial Sciences, University of Oxford. External Examiner.

Harper, N. L. (1998). *Classification of Plants by the Interpretation of CTFM Sonar Data*, Ph. D., School of Information Technology and Computer Science, University of Wollongong, Australia. External Examiner.

Harris, K. D. (1999). *Spatial function in animals and robots*, Ph. D., Department of Anatomy, University College, London. External Examiner.

Hughes, N. (1998). *Mobile Robot Control Using a Hybrid Behavioural Architecture*, Ph. D., Department of Computer Science, University of Wales at Aberystwyth. External Examiner.

Kodjabachian, J. (1998). *Développement et evolution de réseaux de neurones artificiels: application au contrôle d'un animat hexapode*, Ph. D., l'Université Pierre et Marie Curie, Paris VI. External Examiner.

Lee, D. C. (1995). *The map building and exploration strategies of a simple, sonar-equipped mobile robot; an experimental quantitative evaluation*, Ph. D., Department of Anatomy, University College, London. External Examiner.

Lots, J.-F. (2001). *Application of Visual Servoing to the Dynamic Positioning of an Underwater Vehicle*, Ph. D., Department of Computing and Electronic Engineering, Heriot-Watt University. External Examiner.

Manyika, J. M. (1993). *An information-theoretic approach to data fusion and sensor management*, D. Phil., Faculty of Physical Sciences, University of Oxford. External Examiner.

North, P. R. J. (1992). *The Reconstruction of Visual Appearance by Combining Stereo Surfaces*, D. Phil., School of Congintive Science, University of Sussex. External Examiner.

Pebody, M. (1995). *Autonomy in the Real World: A behaviour-based View of Autonomous Systems Control in an Industrial Product Inspection System*, Ph. D., Department of Computer Science, University College, London. External Examiner.

Piggott, P. (1997). *A Fuzzy Controller Prototyping Shell, and its Application in a Sonar-Sensing Mobile Robot Control System*, Ph. D., University of Wollongong, Australia. External Examiner.

Pipe, A. (1997). *Architectures for Reinforcement Learning and Knowledge Transformation in Mobile Robotics*, Ph. D., University of the West of England. External Examiner.

Prescott, T. (1994). *Explorations in Reinforcement and Model-based Learning*, Ph. D., Department of Psychology, University of Sheffield. External Examiner.

Söderman, U. (1995). *On Conceptual Modelling of Mode Switching Systems*, Ph. D., Department of Computer and Information Science (IDA), University of Linköping. External Examiner.

Spier, E. (1997). *From Reactive Behaviour to Adaptive Behaviour*, D. Phil., Faculty of Zoology, University of Oxford. External Examiner.

Vaughan, R. (1998). *Experiments in animal-interactive robotics*, D. Phil., Faculty of Mahematical Sciences, University of Oxford. External Examiner.