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Education

The University of Manchester, Manchester, UK

Ph.D. in Computer Science, 2004. Supervisor: J.L. Shapiro

Thesis: "Adaptive Landmark Symbol Learning for Route Communication Between Mobile Robots" How can a group of mobile robots learn to communicate about navigation? This thesis investigates a new robot navigation problem called the scouting task, where two robots give each other directions to target locations in a route environment. Without a priori knowledge or human-labeling, the robots must learn consistent mappings between a fixed number of shared symbols and their individual perceptions of landmarks. The thesis develops mechanisms for route description and route following, and shows that the route following algorithm is better at repeatably stopping at a goal along a route than using odometry only. Algorithms for learning consistent symbol usage by imitation are developed and evaluated, revealing that learning symbols representing landmarks has a particular problem not found in other symbol-learning tasks. To wit, the robots are unable to occupy the same location without perceiving each other, and so cannot be sure that they are speaking about the same landmark when trying to imitate each others' symbol usage. Two possible solutions are presented and evaluated in the form of algorithms that allow a robot to probabilistically estimate correct symbol usages for landmarks on a route it is traveling given another robot's description of the same route.

Colorado State University, Fort Collins, CO

M.S. in Mechanical Engineering, 1999. Adviser: W.O. Troxell

Thesis: "Biomimetic design of a cooperative mobile robot system for a foraging task." This thesis details a general design methodology for translating task-oriented animal behavior models into behavior-based robotic systems. It then presents a multi-robot foraging system designed using the process, inspired by the desert ant, *Cataglyphus*. GPA: 3.81/4.0.

Colorado State University, Fort Collins, CO

B.S. in Mechanical Engineering, 1997. Adviser: S.P. James

Design Report: "The Advanced Wear Tester: A large-cycle gait simulator for the testing of artificial hip designs." A report detailing the design and fabrication of a servo-hydraulic machine for wear testing both equine and human artificial hips. A final year group project. GPA: 3.22/4.0.

Awards and Honors

2003 - DAAD Exchange Fellowship - Freiburg University

1999 - 2002 Departmental and ATLAS Scholarships - Manchester University

1998 - 1999 Maxtor Fellowship - Colorado State University

1997 Colorado Space Grant Scholarship (CEISS/NASA) - Colorado State Univ.

1997 Inducted into Order of the Engineer

1995 Inducted into Pi Tau Sigma, The National Mech. Engr. Honor Fraternity.

Served as Secretary of the Tau Psi chapter.

- Technical Skills** Programming Languages: C/C++, MATLAB, bash, Java, LISP
Markup Languages: L^AT_EX, HTML
Natural Languages: English, German (near ZD level)
Operating Systems: MacOS, Linux, Solaris, DOS/Windows
Robotic platforms: Player/Stage, CARMEN, Nomad 200, Nomad Scout, MIT 6270, Mekatronix TJ, and several custom-made platforms requiring embedded, on-board PC, and wireless PC control.
- Academic Skills** I am familiar with a wide range of academic subject areas including: artificial intelligence, computational neuroscience, bioengineering and biomaterials, control systems and signal processing, dynamics and kinematics, embedded systems, machine learning, mechanical design, mechatronics, materials and testing, and robotics and manufacturing systems.
- Experience**
- The Neurosciences Institute, La Jolla, CA, *August 2007 - present*
Research Fellow. I am leading a team of researchers investigating how the brain controls behavior by implementing large scale, biologically plausible neural models of the mammalian brain on mobile robots.
- The Neurosciences Institute, La Jolla, CA, *February 2004 - August 2007*
Post-doctoral Fellow. I investigated how the anatomy and physiology of hippocampus and surrounding brain regions enables the formation of episodic memories using a large-scale neural simulation embodied on a mobile robot.
- Albert-Ludwigs-Universität, Freiburg, Germany, *July 2003 - December 2003*
Visiting Researcher. I was supported by the DAAD International Quality Network on Spatial Cognition to extend work in my Ph.D. thesis relating to a probabilistic estimation algorithm, which is used by robots in learning symbols to represent route landmarks.
- University of Manchester, Manchester, UK, *September 1999 - October 2002*
Sponsored Doctoral Researcher. I was supported by a departmental grant to pursue my Ph.D. research. Besides my personal research, my responsibilities also included participating in the design of a new robotics platform, teaching lectures, performing robot demonstrations for prospective students and school children, creating and maintaining the research group web site, and helping to run the TIMR 2001 academic conference.
- Maxtor Corporation, Longmont, CO, *May 1999 - September 1999*
Mechanical Engineering Intern. I performed mechanical tests and analyses on hard disk drive components as part of the main-line product development cycle. I was also responsible for organizing design meetings on several projects and for aiding the introduction of new design methods for the entire product development group.
- Colorado State University, Fort Collins, CO, *August 1997 - May 1999*
Graduate Teaching and Research Assistant. I developed robotics platforms and maintained equipment for both the ME/EE Control Systems lab and the Robotics lab. I also taught lectures, ran student laboratory sessions, assisted students, and graded papers.
- Mechanical Engineering, Colorado State University, *January 1996 - May 1996*
Research Assistant to Dr. S.P. James. I worked with a team to develop a kinematic model of a running horse using a high-speed camera and image analysis software. The model was used to design a mechanical test program for investigating cumulative bone damage in equine cadaver legs.

Pathology, Colorado State University, *May 1995 - November 1995*

Research Assistant to Dr. R.W. Norrdin. I helped in the design and execution of experiments investigating heat related fatigue effects in equine cadaver limbs. I designed and manufactured test fixtures, and also operated the MTS servo-hydraulic testing machines used for the experiments.

Teaching

University of Manchester, Manchester, UK, *September 1999 - May 2003*

Laboratory Demonstrator. I ran hands-on laboratory sessions, helped students, and marked student work in the following classes:

CS201	Algorithms and Data Structures	CS643	Machine Learning
CS202	Imperative programming in C	CS648	Neural Networks
CS503	System Software	CS649	Mobile Robotics

Colorado State University, Fort Collins, CO, *September 1997 - May 1999*

Graduate Teaching Assistant. I ran laboratory classes, taught lectures, and both created and graded student assignments.

ME325	Machine Design and Manufacturing	EE411	Control Systems
ME417	Digital Control Systems		

Cache La Poudre Junior High School, LaPorte, CO, *September 1998 - June 1998*

Classroom volunteer. I developed and taught a series of science-is-fun projects for 13 year-olds centered around robots, including hands-on activity.

Journal Articles

J.G. Fleischer and J.L. Krichmar (2007). Sensory integration and remapping in a medial temporal lobe model during maze navigation by a brain-based device. *Journal of Integrative Neuroscience*, 6(3):403–431.

D.A. Nitz, W.J. Kargo, and J.G. Fleischer (2007). Dopamine signaling and the distal reward problem. *Neuroreport*, 18(17):1833–1836.

J.G. Fleischer, J.A. Gally, G.M. Edelman, and J.L. Krichmar (2007). Retrospective and prospective responses arising in a modeled hippocampus during maze navigation by a brain-based device. *Proc Nat Acad Sci USA*, 104(9):3556–3561.

J.L. Krichmar, D.A. Nitz, J.G. Fleischer, A.K. Seth, G.M. Edelman (2005). Spatial navigation and causal analysis in a brain-based device having detailed cortical-hippocampal interactions. *Neuroinformatics*, 3(3):197–222.

Invited Book Chapters

J.G. Fleischer (2007). Neural correlates of anticipation in cerebellum, basal ganglia, and hippocampus. *Anticipatory Behavior in Adaptive Learning Systems: From Brains to Individual and Social Behavior*, Lecture Notes in Artificial Intelligence, vol. 4520, pp.19–34. Springer-Verlag, Heidelberg.

J.G. Fleischer, S.R. Marsland, and J.L. Shapiro (2003). Sensory anticipation for autonomous selection of robot landmarks. *Anticipatory Behavior in Adaptive Learning Systems: Foundations, Theories, and Systems*, Lecture Notes in Artificial Intelligence, vol. 2684, pp.201–221. Springer-Verlag, Heidelberg.

Refereed Conference Papers

J.G. Fleischer, B. Szatmáry, D.B. Hutson, D.A. Moore, J.A. Snook, G.M. Edelman, and J.L. Krichmar (2006). A neurally controlled robot competes and cooperates with humans in Segway Soccer. In Proceedings of the IEEE International Conference on Robotics and Automation, pp.3673–3678.

B. Szatmáry, J.G. Fleischer, D.B. Hutson, D.A. Moore, J.A. Snook, G.M. Edelman, and J.L. Krichmar (2006). A Segway-based human-robot soccer team. In Proceedings of the IEEE International Conference on Robotics and Automation, pp.4436–4438.

J.G. Fleischer (2004). Imitation is not enough for lexicon learning. In *Proceedings of the Eighth International Conference on Simulation of Adaptive Behavior*, pp.477–486, MIT Press.

J.G. Fleischer and S.R. Marsland (2002). Learning to autonomously select landmarks for navigation and communication. In *Proceedings of the Seventh International Conference on Simulation of Adaptive Behavior*, pages 151-160. MIT Press, Cambridge, MA.

J.G. Fleischer and U.D.F. Nehmzow (2001). Towards robots that give each other navigational directions: Learning symbols for perceptual categories. In *Proceedings of the 3rd British Conference on Autonomous Mobile Robotics and Autonomous Systems*. Dept. of Computer Science, University of Manchester Technical Report UMCS-01-4-1.

J.G. Fleischer and W.O. Troxell (1999). Biomimicry as a tool in the design of robotic systems. In *Proceedings of the 3rd International Conference on Engineering Design and Automation*. Integrated Technology Systems, Prospect, KY.

**Posters and
Abstracts**

J.G. Fleischer, J.A. Gally, G.M. Edelman, and J.L. Krichmar (2007). Different neural pathways lead to journey-dependent and journey-independent place cell activity in an embodied model of hippocampus. *Society for Neuroscience Annual Meeting*.