

ST504 Advanced Topics in Neurobotics, Behavioral Robotics, and Exoskeletons

Fall 2008, Instructor: Dr. Milos Manic
<http://www.husky.if.uidaho.edu/nbots08/>

Class description

Course outline:

Course title: CS504 Advanced Topics in Neurobotics, Behavioral Robotics, and Exoskeletons (3 cr)

Topics: This is an advanced topics course in Biologically Inspired Neurobotics and Behavioral Robotics (BINBR). The focus is on the development of relevant tools, methods, and design of such systems. The course will develop a theoretical framework for major issues in BINBR.

The principles, design, and practice of behavior-based autonomous robotic architectures through a survey of these systems will be given. Relevant biological and psychological models of behavior, knowledge building and learning in autonomous robots, reactive versus cognitive, mind and machine, modular perception, robot colonies, and future trends in robot intelligence will be covered. Programming intellect, such as reinforcement learning and self-organizing algorithms, and mathematical models of mammalian neurons will be covered. Prereq: perm. Graduate standing or instructor permission. This course is offered for the first time at the University of Idaho.

To be offered: Fall 2008 in Idaho Falls (live) and via Blackboard (outside of Idaho Falls).

Credits: 3 credit course

Schedule:

Tuesday and Thursday, 12:00pm - 01:15pm mdt

Office hours:

Tuesday and Thursday, 11:00am - 12:00pm mdt (please make an appointment)

Location:

Live in Idaho Falls (CHE 301), and via Blackboard outside.

Instructor:

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url: <http://www.cs.uidaho.edu/Faculty/Manic.html>

url: <http://husky.if.uidaho.edu>

Class web page:

<http://husky.if.uidaho.edu/nbots08/>

Blackboard url: please refer to course url.

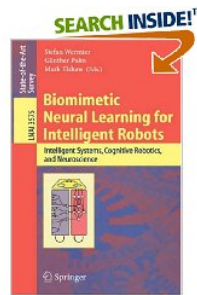
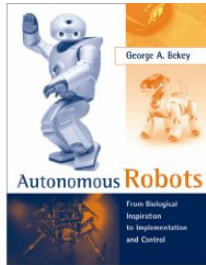
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Textbooks:

Required textbooks include:



- George A. Bekey, *Autonomous Robots: From Biological Inspiration to Implementation and Control* (Intelligent Robotics and Autonomous Agents), The MIT Press, Hardcover: 593 pages, ISBN-10: 0262025787, ISBN-13: 978-0262025782, June 1, 2005.
- Stefan Wermter, Günther Palm, Mark Elshaw (Eds.), *Biomimetic Neural Learning for Intelligent Robots: Intelligent Systems, Cognitive Robotics, and Neuroscience* (Lecture Notes in Computer Science), August 22, 2005, ISBN-10: 3540274405, ISBN-13: 978-3540274407
- José L. Pons, *Wearable Robots: Biomechatronic Exoskeletons*, ISBN: 978-0-470-51294-4, April 2008.

Reference textbooks (related more towards applications) include:

- Sadao Kawamura, Mikhail Svinin, editors, *Advances in Robot Control: From Everyday Physics to Human-Like Movements*, Springer; 1 edition, ISBN-10: 3540373462, ISBN-13: 978-3540373469, November 14, 2006.
- Joseph L. Jones, Anita M. Flynn, Bruce A. Seiger, *Mobile Robots: Inspiration to Implementation*, AK Peters, Ltd.; 2 Sub edition, ISBN-10: 1568810970, ISBN-13: 978-1568810973(Paperback), November 1998
- Li, Li, Wang, Fei-Yue, *Advanced Motion Control and Sensing for Intelligent Vehicles*, Hardcover, ISBN: 978-0-387-44407-9, Springer, 2007.
- Sara Morgan, *Programming Microsoft® Robotics Studio* (Paperback), Microsoft Press, ISBN-10: 0735624321, ISBN-13: 978-0735624320, Paperback, March 15, 2008.
- Joseph L. Jones, Anita M. Flynn, Bruce A. Seiger, *Mobile Robots: Inspiration to Implementation*, AK Peters, Ltd.; 2 Sub edition, ISBN-10: 1568810970, ISBN-13: 978-1568810973(Paperback), November 1998.
- Wermter, Stefan; Palm, Günther; Elshaw, Mark (Eds.), *Biomimetic Neural Learning for Intelligent Robots*, Intelligent Systems, Cognitive Robotics, and Neuroscience Series: Lecture Notes in Computer Science, Vol. 3575, IX, 383 p., Softcover ISBN-10: 3540274405, ISBN-13: 978-3540274407, August 22, 2005.
- Richard J. Duro, Jose Santos, Manuel Grana (Eds.), *Biologically Inspired Robot Behavior Engineering*, Physica-Verlag Heidelberg, Hardcover, ISBN-10: 3790815136, ISBN-13: 978-3790815139, 1 edition, June 30, 2004.
- Ronald C. Arkin, *Behavior-Based Robotics*, The MIT Press, ISBN-10: 0-262-01165-4, ISBN-13: 978-0-262-01165-5, May 22, 1998.

Required material will be provided through handouts and web based documentation. Also,

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there is a variety of recommended text books listed at course web page.

Helpful prerequisites
by topics:

Graduate standing or instructor permission.

Grading system:

Two exams, team project and report, in class presentations, and homework assignments.

Goal of this course:

This course provides graduates and seniors with the theoretical and practical tools for designing, simulating and implementing neurobotics, behavioral robotics, and exoskeleton systems. Course equips students with tools to attack basic research and application oriented problems in neurobotics, behavioral robotics, and exoskeletons.

Major topics:

✚ Neurobotics, behavioral robotics, and exoskeletons

Detailed list of topics:

✚ Please refer to class web page <http://husky.idaho.edu/nbots08/>

Assigned projects:
(equipment used – PC
computer with
simulation software)

✚ Please refer to class web page <http://husky.idaho.edu/nbots08/>
