COURSE NO: ENIN 880AJ - 030 - Winter 2003

COURSE TITLE: Introduction to Intelligent Systems: Frameworks, Paradigms, and Implementations

CREDIT HOURS: 3

INSTRUCTOR: Dr. Rene V. Mayorga
ED 427; Tel: 585-4726; Cell: 591-1849; Email: Rene.Mayorga@uregina.ca

TIME TABLE: Once every two weeks (tentatively), every other Friday from 2.30 - 5.30pm

ROOM: ED-122

HOME ASSIGNMENTS: Assignments will be issued in the seminar class and submission dates announced at the time.

PROJECT: A term project from the registered students to be finished by the end of the term.

TERM GRADE: Registered students grades will be determined according to the following (tentative) scheme: 40 % of the mark will be given from the assignments; and 60 % will be given from an individual project. The assignments will be given in a regular basis. The project should start after enough material has been covered, but in any case no later than one entire calendar month prior the end of the term lectures.

NOTES: Some Dr. R. V. Mayorga's Monographs, Tutorial Notes, and other of his notes will be available as the term progresses.

REFERENCES: Copies of many articles and numerous references will be provided by Dr. R. V. Mayorga. Also some of Dr. R. V. Mayorga's publications (Edited Books/Proceedings, technical articles) will be available as the term progresses.

COURSE OBJECTIVES:

The main purpose of this directed reading course is to fully explore and thoroughly examine many of the (theoretical, and practical) aspects of Intelligent Systems focusing on suitable Frameworks, Paradigms, and including some of their implementations and applications on diverse areas such as: Robotics, Manufacturing, and Human-Computer Interaction/Interface.
It is intended to highlight those fields and conditions where the general concept of Agent proves to be useful; but at the same time to clearly expose the drawbacks and limitations of the general concept of Agent. In particular, we are interested to show that the current general concept of an Agent can not deal effectively with decision problems characterizing many dynamical systems. That is, we will emphasize the difficulty to justify Agents from a *formal* theoretical point of view. For example, we will point out that (under a general Agent concept) it is difficult to claim that the solution provided by one particular Agent is better than the one provided by other Agents and/or obtained by other conventional methods; and also the difficulty for Agents to ensure *formally* system stability.

Consequently, the previous facts will conduce us to explore the Intelligent Systems theory in order (our main objective) to establish appropriate Frameworks/Paradigms to deal effectively with those situations where the general term Agent presents serious shortcomings. Finally, we will also explore the implementations of these Frameworks/Paradigms on quite diverse areas such as: Robotics, Manufacturing and Human-Computer Interaction/Interface.

**COURSE ORIENTATION:**

The course will be open to registered graduate students and guests. The seminars will normally consist of a brief (15 - 30 min) presentation by the registered graduate students, a lecture presentation by Dr. R. V. Mayorga, and discussion by the seminar group.

The registered graduate students must carry out an *extensive and exhaustive* state of the art survey on Agents and Intelligent Systems and their implementations on Information Technology fields/areas. They must be able to *address properly* the following issues (for each issue, providing as many references as possible, copies of the pertinent references, and an appropriate synopsis):

- A proper definition of the term Agent.
  That is, what is an Agent ?

- Discuss the actual frameworks that lead to formal taxonomies and classifications of Agents.
  That is under which *(formal)*-if any- criteria are the Agents classified ? Are the classifications unique ? What are these classifications ?

- What is the structure/composition of each class of Agent ?
  That is, what makes each Agent class ? An Expert system ? Other systems based on A.I. techniques ? Which A.I. Techniques ?

- Discuss for each Agent class a (if any) formal theoretical framework.

- Discuss each class implementation and applications.
  In particular, clearly and exhaustively explain each class Agent applications.
Provide a proper definition of the general term Intelligent System.

Provide the actual frameworks for a formal Intelligent Systems classification.

Discuss the structure/composition of each class of Intelligent System.

Discuss the theoretical frameworks of each Intelligent System class.

Provide summary and conclusions for both Agents and Intelligent Systems.

*** Propose, develop, and test an Intelligent System (or, as a last resort an Agent according to the ordinary general Agent concept) for a particular Information Technology application (Robotics and/or Human-Computer Interaction/Interface).

SOME (INITIAL) BIBLIOGRAPHY

BOOKS:

Software Agents
J. Bradshaw, AAAI Press, 1999

Software Agents
J. Bradshaw, MIT Press, 1997

Internet Agents: Spiders, Wanderers, Brokers, and "Bots"

Mobile Agents
W. R. Cockayne, M Zyda, Prentice Hall, 1998

Multi-Agent Systems: An Introduction to Distributed Artificial Intelligence
J. Ferber, Addison-Wesley Pub Co., 1999

Information Systems and Technology in the International Office
B. C. Glasson, D. R. Vogel, Editors
Chapman & Hall, 1996

Software Agents for Future Communication Systems
A. L. G. Hayzelden, J. Bigham, Editors, Springer Veralag, 1999
*Principles of Neurocomputing for Science & Engineering*
F. M. Ham, I. Kostanic, McGraw Hill, 2001

*Agent Sourcebook: A Complete Guide to Desktop, Internet, and Intranet Agents*

*Readings in Agents*


*Agent Technology: Foundations, Applications, and Markets*
N. R. Jennings, M. J. Wooldridge, Editors., Springer Verlag, 1998

*Bots: The Origin of New Species*

*Artificial Intelligence, Structures and Strategies for Complex Problem Solving*
G. F. Luger, Addison Wesley Longman Inc. 3rd Ed., 1998

*Developing Intelligent Agents for Distributed Systems: Exploring Architecture, Technologies, and Applications*
M. Knapik, Jay B. Johnson (Contributor), Computing McGraw-Hill, 1997

*Neural Networks Theory and Applications*


*Artificial Neural Networks Concepts and Theory*

*Mobility: Processes, Computers, and Agents*
D. S. Milojicic, F. Dougis (Editor), R. G. Wheeler, Addison-Wesley Pub Co, 1999

*Intelligent User Interfaces Proceedings*
J. Moore, E. Edmonds, A. Puerta, IUI97, January 6-9, 1997, Orlando, Florida, USA

*Intelligent Software Agents*
Fuzzy-Neural Control Principles, Algorithms and Applications
J. Nie, D. Linkens, Prentice Hall, 1995

Evolutionary Robotics: The Biology, Intelligence and Technology of Self-Organizing Machines (Intelligent Robotics and Autonomous Agents)
S. Nolfi, D. Floreano, MIT Press, 2000

Programming Bots, Spiders, and Intelligent Agents in Microsoft Visual C++ (Microsoft Programming Series)
D. Pallman, Micorsoft Press, 1999

Artificial Intelligence: A Modern Approach
S. Russell, P. Norvig, Prentice Hall in Artificial Intelligence, 1995

Artificial Neural Networks

Heterogeneous Agent Systems

Building Intelligent Agents: An Apprenticeship Multistrategy Learning Theory, Methodology, Tool and Case Studies
G. Tecuci, Academic Press, 1998

Mobile Agents and Security
G. Vigna (Editor), (Lecture Notes in Computer Science), Springer Verlag, 1998

Foundations of Knowledge Systems - with Applications to Databases and Agents

Multiagent Systems: A Modern Approach to Distributed AI
G. Weiss Editor, MIT Press, 1999

Neural Networks and Fuzzy Logic Applications in C/C++
S. T. Welstead, John Wiley & Sons, 1994

Bots & Other Internet Beasties
J. Williams, 1999

Reasoning About Rational Agents (Intelligent Robotics and Autonomous Agents)
M. J. Wooldrige, MIT Press, 2000

Agent Theories, Architectures, and Languages: A Survey
INTERNATIONAL JOURNALS

The journals web pages may be available in the internet. However, take notice that in general the journals volumes/numbers and articles may be available only in printed form.

Artificial Intelligence in Engineering

AI magazine (In particular the issue on Intelligent Agents, Vol. 19, No. 2, Summer 1998)

Communications of the ACM

Computer

Dr. Dobb's Journal (In particular the issue on Agents and Mobile Agents, March 1997)

Engineering Applications of Artificial Intelligence


IEEE Intelligent Systems

IEEE MultiMedia

IEEE Software

IEEE Transactions on Knowledge and Data Engineering

IEEE Transactions on Robotics and Automation

IEEE Transactions on Software Engineering

IEEE Transactions on Systems, Man, and Cybernetics

International Journal of Man-Machine Studies

Knowledge Based Systems
INTERNATIONAL CONFERENCES PROCEEDINGS
The Conferences web pages may be available in the internet. However, take notice that in general the Proceedings articles may be available only in printed form.

Artificial Intelligence, Computer Graphics, and Computer Vision AI/GI/VI
Complex Systems, Intelligent Systems, & Interfaces
IASTED International Conference on Artificial Intelligence and Soft Computing
IASTED International Conference on Applied Informatics
IASTED International Conference on Intelligent Information Management Systems
IASTED International Conference on Intelligent Systems and Control
IASTED International Conference on Software Engineering
IEEE International Conference on Emerging Technologies and Factory Automation
IEEE International Conference on Robotics and Automation
IEEE International Conference on Systems, Man and Cybernetics
IEEE/RSJ International Conference on Intelligent Robots and Systems
International Symposium on Robotics and Automation
IFAC Workshop on Intelligent Manufacturing Systems
Intelligent User Interfaces Conference, IUI
International Conference on Artificial Intelligence in Design
International Conference on Human-Computer Interaction
International Conference InforMatique - 1997 Interfaces - Track: Intelligent Systems in Business
International Conference InforMatique - 1997 Interfaces - Track: The Generalized Network
International Conference InforMatique - 1997 Interfaces - Track: Man-Machine Interaction
International Conference InforMaticque - 1996/1995 - Track: Interface to Real & Virtual Worlds
International Conference on Web-Based Modelling & Simulation
SPIE International Symposium on Intelligent Systems & Advanced Manufacturing
**WEB SITES**

There is a huge number of Web pages regarding Agents and Intelligent Systems. Some interesting sites are:

http://agents.umbc.edu/

http://www.agentlink.org/


http://www.cis.udel.edu/~decker/courses/889a.html

http://www.cs.iastate.edu/~honavar/cs673.spring00.html

http://www.cs.iastate.edu/~honavar/cs673.spring98.html


http://www.csee.umbc.edu/~jklabrou/courses/spring2000_691a/CourseSpring2000_691A.htm

http://cdps.umcs.maine.edu/COS570/

http://liawww.epfl.ch/~faltings/intelligent-agents.html

http://liawww.epfl.ch/~faltings/advanced-ai.html

http://mystic.sce.carleton.ca:8080/cgi-bin/agentcourse.cgi

http://leep.lis.uiuc.edu/spring00/LIS450AMD/

http://www.biz.uiowa.edu/class/6K299_menczer/

http://www.cs.jhu.edu/~yarowsky/cs466.html


http://www.isi.edu/teamcore/tambe/cs599.html


http://www.cs.bham.ac.uk/~amw/agents/
http://www.research.ibm.com/ia/agents/
http://ai.iit.nrc.ca/subjects/Agents.html
http://www.ira.uka.de/bibliography/Ai/agents.html
http://www.research.microsoft.com/research/ui/persona/isbister.htm
http://dent.ii.fmph.uniba.sk/ui/faqs/agent_faq.html
http://www.xns.org/xns/whitepapers/webagents/
http://www.ai.univie.ac.at/oefai/agents/
http://www.botspot.com/
http://www.ai.sri.com/~oaa/main.html
http://www.ai.about.com/compute/ai/cs/mobileagents/
http://agent.cs.dartmouth.edu/
http://cetus-links.org/oo_mobile_agents.html
http://www.philb.com/bots.htm
http://www.eim.nl/uk/uk/intelligent_agents_markets_an.html
http://www.firstmonday.dk/issues/issue6_6/jonkheer/
http://home1.gte.net/pfingar/eba.htm
http://www.siliconalleyreporter.com/daily/122398.html
http://www.cse.it/ufv/leonardo/paper/telecom99.htm
http://intelligent-agent.com/intelligentagent_aboutus.html
OTHER BIBLIOGRAPHY

Some other references will be provided by Dr. R. V. Mayorga as the term progresses. The bibliography will also include some relevant articles on neural nets, fuzzy inference systems, and neuro-fuzzy inference systems and their implementations/applications on diverse Information Technology fields/areas.

STUDENTS

Some of Professor R. V. Mayorga's graduate students will definitely register for this 2003 Winter Term