Course Syllabus

SIE 570 Spatial Cognition and Computing

Course Description
The study of cognitive aspects within spatial information science offers new perspectives for understanding spatial representations and reasoning processes. Cognitive models are studied and related to Artificial Intelligence Systems. Mental models and pictorial representations as cognitive models of human information processing are introduced and their relevance for novel human computer interfaces are discussed.
Cr. 3.

Course Texts
There is no assigned textbook for this course. A collection of readings drawn from available online sources will be assigned during the semester.

Powerpoint slides of lecture material will be available on a course web page.

Course Goals and Objectives
- Introduce students to spatial cognition foundations
- Develop an understanding of the research methods of cognitive science
- Expose students to recent findings of spatial cognition research

Faculty Information
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Office Hours
Office hours for this course will be announced at the beginning of the semester. Alternatively, contact me by email to arrange a time to meet.

Grading, Class Policies and Course Expectations
Grades in this course will be based on the quality and completion of the course project (50%) and the homework assignments (40%). Ten percent of the course grade is dependent on attendance and participation in class. As a graduate level course, you are expected to exhibit high quality work that demonstrates sound understanding of the concepts and their complexity. Earning an “A” represents oral and written work that is of exceptionally high quality and demonstrates superb understanding of the course material. A “B” grade represents oral and written work that is of good quality and demonstrates a sound understanding of course material. A “C” grade represents a minimally adequate completion of assignments and participation demonstrating a limited understanding of course material. A “C+” grade or lower is typically unacceptable at the graduate level.

ACADEMIC INTEGRITY: Academic dishonesty includes cheating, plagiarism and all forms of misrepresentation in academic work, and is unacceptable at The University of Maine. As indicated in the University of Maine’s on-line “Student Handbook,” plagiarism (the submission of another’s work without appropriate attribution) and cheating are violations of The University of Maine Student Conduct Code. An instructor who has probable cause or
reason to believe a student has cheated may act upon such evidence, and should report the case to the supervising faculty member or the Department Chair for appropriate action.

**DISABILITIES (ADA) STATEMENT:** Students with disabilities who may need services or accommodations to fully participate in this class should contact Ann Smith, Director of Disability Services in 121 East Annex, (voice) 581-2319, (TTY) 581-2325 as early as possible in the semester.

**CLASS DISRUPTION:** In the event of an extended disruption of normal class activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

**E-Learning Approach**

**Live Broadcast:** Available at http://connect.maine.edu/sie570. Online students may view and participate in the live sessions but are not required to do so. It is recommended that you view the videos at your own leisure.

**Archived Broadcasts:** Links to the class broadcasts are made available at the end of each day through the Lectures and Assignments web page.

**End of Week Live Audio Chat:** Distance students view the lectures at times of their own choosing during the week and attempt the assignments posted on the course web site prior to the end of week evening live discussion session. The audio technology used for these sessions is through ConnectPro and/or through use of a Skype Conference call. The optional end-of-the-week late afternoon discussion session runs from 6:00-7:30 pm unless another mutually agreed upon time is arranged. (Note: Set up a personal world clock at http://www.timeanddate.com to track the equivalent time in your time zone.)

**Distance Student Live Audio Chat Process:** Simply go to the ConnectPro web site established for the course and use the audio facilities or the written chat to ask questions. This session is voluntary and is intended to allow students to ask questions about the reading assignments, written assignments, and video lectures. Assignments for the past week are then due Sunday evening. If no students join in the first half hour of the session the instructor may sign off and you may want to later consider contacting him/her by Skype for a one-on-one conversation if desired.

**Skype Requirement:** Distance students must also have a Skype account for this course (see http://www.skype.com). Please forward your Skype username to the instructor after enrolling in the course. If the ConnectPro technology fails for an evening discussion session, the instructor may initiate a conference call on Skype.

**Communications**

All students must have a FirstClass account for this course. If you do not yet have an account, see http://it.umaine.edu/support/firstclass/index.php. You will communicate with other classmates and the instructor through the SIE 570 FirstClass folder and deliver all out-of-class assignments to the FirstClass assignment folder for the course. I recommend that you download the FirstClass client software to your computer if you have not already done so. You should always be able to deliver your materials and access the materials of others by logging on to the FirstClass website or by using the client software.

**Course Topics**

Week 1
Course introduction and overview
History of cognitive science
History of artificial intelligence

Week 2
Empirical research methods
Formal spatial representations
Cognitive simulations versus artificial intelligence systems

Week 3
Visual attention
Feature integration theory
Dual pathways theory

Week 4
Cognitive theories of human memory
Visio-spatial sketch pad
Working memory

Week 5
Mental rotations
Map scanning
Cognitive collages

Week 6
Human way finding
Least angle strategy
Route Graphs

Week 7
Definition of course project
Ethics of human subject tests
Design of empirical tests

Week 8
Spatial language
Verbal, and non verbal communication
Discourse representation

Week 9
Spatial reference systems
Intrinsic, relative, and absolute references
Projective spatial expressions

Week 10
Qualitative spatial representations
Angle and distance interval representations
Oriented point theory

Week 11
Constraint-based calculi and reasoning
Constraint propagation and consistency  
Global consistency

Week 12
Conceptual neighbourhoods
Transition graphs
Event models

Week 13
Spatio-temporal reasoning
Situation calculus

Week 14
Axiomatic approaches
Reasoning tools for qualitative spatial reasoning
Computational geometry

Week 15
Integration of class projects
Presentation of class projects
Course Wrap-up