Larry D. Pyeatt
Research Statement

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I have a broad background in symbolic and computational AI methods. I have done research in neural networks, speech recognition, genetic algorithms, reinforcement learning, and planning. My main research interest is in robust control and learning in partially observable, uncertain, and non-stationary environments. The techniques can be applied in robots and other agents, such as web services. My research is concerned with both theory and applications. My research interests can be divided into three general areas:

Probabilistic Techniques: My main research thrust is in POMDP techniques. My research in this area is aimed at efficiently finding exact and approximate policies for POMDP problems. So far, the main application domain for this work has been autonomous mapping and navigation of indoor environments. Recently, I have begun using POMDP techniques for intention prediction in the game of Go. I have selected bioinformatics as another application domain and have begun initial investigation in that area. In the robotics domain, my next goal is to extend the current techniques to work in large outdoor environments. Outdoor robotics pose several grand challenges.

Sensor Modeling: In order to use the probabilistic mapping techniques, it is necessary to convert a stream of sensor data into a stream of local maps. Data from multiple local maps, possibly generated from different sensors, can be fused to form a global map. For some sensors, such as laser and sonar, the sensor model is well understood and easy to implement. However, no good model for stereo vision exists. Students in my lab are working on this problem.

Learning Actions: The area of research that most interests me is in the automatic learning of low-level behaviors. I believe that the behaviors that humans perform are quite often either completely reflexive or were learned at an early age and have since become reflexive in nature. Higher level behaviors are ordered sets of these sub-cognitive behaviors. I am very interested in developing methods for learning these low-level sub-cognitive behaviors in intelligent agents. For my dissertation work, I developed a framework for using POMDP based navigation with reinforcement learning (RL) to provide adaptive low-level actions. This work was a proof of concept and was done completely in simulation. Much of my current work is aimed at extending the architecture for use on a real robot.

My future research plans involve continued effort in learning and control, and application of probabilistic techniques in domains other than robotics. In particular, I am interested in applying probabilistic machine learning techniques in adversarial environments. I have also begun investigating distributed computing and adaptive wireless networks to support computation and communication between computers, sensors, and robots. I would also enjoy working on issues of human-robot interaction, including gesture recognition, learning through imitation, and understanding high-level spoken commands.

Larry D. Pyeatt
Teaching Statement

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I take teaching very seriously and strive to excel. I have worked in industry and routinely bring that experience to the classroom to help prepare students to enter the work-force. Several students have attributed their success in industry to taking one or more of my classes. My overall philosophy of teaching can be described as follows:

Continuous Improvement: Not only is Computer Science a rapidly changing field, but new pedagogies are being developed all of the time. If a course does not change, then it becomes outdated. This is true of any field, but especially true for Computer Science. Thus, I work for continuous improvement in my course materials, content, and teaching style.

Active Learning: Active learning gets the student involved so that they learn the material at a deeper level than rote memorisation. In-class discussions and course projects are excellent ways to involve the students. The homework and projects should be chosen carefully to reinforce the most important concepts in the course. As students progress and mature, they should take more of the responsibility for learning. At some point, they can become their own teachers. That is the point at which they are truly educated.

Appropriate Rewards: Students should get the grade they earn. What most students want is to get the highest possible grades for the least amount of work. That is natural and should be expected. However, teachers have a responsibility to display fairness and integrity. It is important to set expectations, tell the students what the expectations are and tie grades to how well the students meet those expectations.

Courses that I enjoy teaching include robotics, artificial intelligence, digital logic, architecture, operating systems, assembly language, Markov devision processes, and real-time systems. Courses that I would like to teach if given the opportunity include genetic algorithms, speech recognition, planning, machine vision, discrete mathematics, data structures, system administration, and compiler construction. In addition to these preferences, I am competent and willing to teach any traditional computer science core course at either the undergraduate or graduate level.

My greatest teaching achievement involves a student who had a low GPA and was in danger of dropping out of the program. He confided in me that his dream was to be a mission controller for NASA. He also indicated that he was interested in robotics, so I told him that I would work with him on two conditions: he was to make a 4.0 GPA in the coming semester, and meet with me weekly for an independent study in reinforcement learning. At the end of the semester, he had achieved all A's and had a good basic understanding of reinforcement learning. More than that, our relationship had developed into a mentorship. By Fall of his senior year, he was doing research. He published his first paper as a senior and published another in his first year of graduate school. Not only did he blossomed academically, but he also decided to work towards a PhD.

About one year into his dissertation, we were working on a research project with a group from NASA and he got the opportunity of a lifetime. He was offered a position as a mission controller on the International Space Station. I was sad to see him take the position, but also happy for him. Not many people get to achieve their dreams. My mentorship of him has given me a new perspective on teaching and advising: Some students need a teacher to get them interested and involved, and I can be that teacher. Nothing could be more personally rewarding.