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February 28, 2011

Advanced Engineering Research Position
Present Expertise: Intelligent Control and Distributed Multi-Agent Systems
Background: Electrical Engineering, Computer Science, Mechanical Engineering, and Applied Mathematics

Hiring Committee:

Thank you for considering me as a candidate for an engineering position in your company. I believe my background and publishing record in both engineering and behavioral ecology align well with departments looking for a multi-disciplinary cross-cutting researcher with emphasis on intelligent control, optimization, networks, and distributed systems. I received my doctorate in Electrical and Computer Engineering from The Ohio State University (OSU) in August of 2010 under the direction of Professor Kevin M. Passino, and I am currently a postdoctoral researcher in OSU's Computer Science and Engineering department. I am looking forward to starting an engineering position where I can continue making contributions to science, technology, and engineering.

As described in my *curriculum vitae* [1], my background is in electrical engineering, computer science, and behavioral ecology. I have significant experience designing and building autonomous robots, and, in my present academic appointment, I study formal methods in computer science applied to cyber-physical systems and autonomous urban vehicles. However, much of my recent personal research generalizes methods from behavioral ecology to inspire biomimetic solutions amenable to distributed control problems. These solutions are applicable in robotics (e.g., search and prosecution behaviors in autonomous air vehicles) as well as more general autonomous systems, like distributed algorithms for smart lighting. Not only have I had success porting these ecological results to engineering, but I have uncovered new explanations for animal behaviors that had previously been thought to be irrational. Some of these successes as well as a description of my present work are described in my research statement [2].

Information about my research papers can be found in my publication list [3], and accepted research papers of mine can be found at http://pubs.tedpavlic.com/. The article, "Generalizing foraging theory for analysis and design", was recently accepted to a special issue of the *International Journal of Robotics Research* on stochasticity and biological systems, and a preprint will soon be released when publication details are finalized. It presents a generalization of optimal foraging theory that improves the performance of existing biomimetic solitary-agent behavior designs, and it uses a particular autonomous air vehicle (AAV) application as a central example. A different article, "When rate maximization is impulsive", is an engineering-inspired paper recently published in the biological journal *Behavioral Ecology and Sociobiology*; a preprint is already available for review. Starting from a behavioral heuristic algorithm for implementing efficient foraging-like behaviors on AAV's, it shows how the operant laboratory can induce animals into apparently irrational behaviors not seen in nature. Furthermore, chapter 5 of my dissertation includes a reformulation of the ecological ideal free distribution (IFD) for smart lighting that I am particularly excited about. This IFD reformulation suggests new ways of solving constrained resource allocation problems in a distributed manner. Other possible applications of this work include distributed solutions to the economic dispatch problem in power systems. One article that does not yet have a preprint available, "Cooperative task processing", was recently submitted to *IEEE Transactions on Automatic Control*. It is motivated by both a multi-

agent AAV application as well as a conceptual model of cooperative breeding in unrelated cichlid fish. Combining game theory, parallel computation, and networks, the manuscript formulates a task-processing problem among distributed autonomous agents as a Cournot oligopoly on a graph, and it presents a design for an asymptotically stable parallel numerical algorithm that asynchronously converges to a unique Nash equilibrium that has cooperative features. Each of these articles is strongly influenced by optimization, game theory, and complex agent-based systems.

I also have significant experience teaching and mentoring undergraduate and graduate as well as primary- and secondary-school students, and I look forward to mentoring young engineers in my future career. In the classes I have taught over the last several years, I have produced hundreds of pages of new course content, and I have freely distributed the source code for that content under open-source licenses. Consequently, this material has been used by other instructors in my professional circle as well as other instructors who have found the material via the Internet. Links to these materials can be found at http://www.tedpavlic.com/engjobsearch/. Presently and in the recent past, I have helped oversee the progress of graduate students doing algorithmic and hardware development projects, and I am looking forward to similar relationships in the future. Furthermore, I have a long history of engineering outreach work to curricular and extra-curricular populations from both primary and secondary public schools. That work includes a year of in-classroom teaching assistance to children in an inner-city public school that primarily enrolls children of ethic minorities (i.e., 98% non-white, 99% free lunch). I would be happy to contribute to the public outreach efforts of my future employer.

The faculty from *The Ohio State University* below have agreed to serve as references for me. They come from *Electrical and Computer Engineering* (ECE), *Computer Science and Engineering* (CSE), *Evolution, Ecology, and Organismal Biology* (EEOB), and *Mathematics* (Math).

- Dr. Kevin M. Passino (passino.1@osu.edu; 614-312-2472)............................Professor, ECE
  Dr. Passino was my graduate adviser.
- Dr. Bruce W. Weide (weide.1@osu.edu; 614-292-1517)..............Professor, Associate Chair, CSE
  Dr. Weide is a co-PI on the NSF grant that funds my current postdoctoral research position.
- Dr. Ian M. Hamilton (hamilton.598@osu.edu; 614-292-9147)......Assistant Professor, EEOB, Math
  Dr. Hamilton has been a valuable interdisciplinary resource to me.
- Dr. Andrea Serrani (serrani.1@osu.edu; 614-292-4976)...................Associate Professor, ECE
  Dr. Serrani was a member of my doctoral committee.
- Dr. Paolo A. G. Sivilotti (sivilotti.1@osu.edu; 614-292-5835)............Associate Professor, CSE
  Dr. Sivilotti is a co-PI on the NSF grant that funds my current postdoctoral research position.

This list can also be found in my list of references [4] and my *curriculum vitae* [1].

More information can be found at http://www.tedpavlic.com/engjobsearch/. If there is anything else that you need from me, please let me know; e-mail (pavlic.3@osu.edu) is always a good way to contact me. With my background in robotics, mathematics, and behavioral ecology and demonstrated success in working on interdisciplinary problems, I am sure I would be an asset to your company. Thank you for your time and consideration. I look forward to hearing from you.

Sincerely,

Theodore (Ted) P. Pavlic

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[**1**] *Curriculum vitae*, [**2**] Research statement, [**3**] Publication list, [**4**] List of references