Kraig J. Andrews

CONTACT INFORMATION

Physics Ph.D. Candidate
Department of Physics and Astronomy
Wayne State University
666 W. Hancock
Detroit, MI 48201 USA

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RESEARCH INTERESTS

Complex adaptive systems in control systems engineering and behavioral science: distributed algorithms, computational agent-based modeling, hybrid dynamic systems, decentralized decision making, emergence and self organization, amorphous computing, autonomous systems, control, communications, verification, cooperation, optimization, game theory, resource allocation, parallel computation, robotics, energy systems, sustainability in the built environment, behavioral ecology, engineering education, bio-mimicry and bio-inspiration

EDUCATION

Wayne State University, Detroit, MI

Ph.D., Physics, Date TBD

- Thesis Topic: *Design and Analysis of Optimal Task-Processing Agents*
- Candidacy: *Research Problems in Distributed Control for Energy Systems*
- Adviser: Dr. Zhixian Zhou
- Area of Study: Experimental Condensed Matter Physics

M.S., Physics, February 2016

Michigan State University, East Lansing, MI

B.S., Physics, May 2010

B.S., Astrophysics, May 2010

TEACHING EXPERIENCE

Wayne State University, Detroit, MI

Lecturer **Fall 2015**

- PHY 2130: General Physics

Laboratory Instructor **Summer 2015**

- PHY 2131: General Physics Laboratory

Laboratory Instructor **Winter 2015**

- PHY 1020: Conceptual Physics: The Basic Science

Laboratory Instructor **Winter 2015**

- AST 2011: Descriptive Astronomy Laboratory

Laboratory Instructor **Fall 2014**

- AST 2011: Descriptive Astronomy Laboratory

Michigan State University, East Lansing, MI

Teaching Assistant **Winter 2014**

- PHY 232: Introductory Physics II

Teaching Assistant **Fall 2013**

- PHY 231: Introductory Physics I

Teaching Assistant **Spring 2013**

- AST 208: Planets and Telescopes

Teaching Assistant **Spring 2012**

- PHY 232: Introductory Physics II

PROFESSIONAL SERVICE

Committee Service

- Officer, IEEE Special Technical Community for Human Computation

Referee Service

- *49th Annual Conference on Decision and Control*
- *International Journal of Control*
- *ASME Journal of Dynamic Systems, Measurement, and Control*
- *IEEE Transactions on Signal Processing*
- *IEEE Transactions on Control Systems Technology*
- *IEEE Transactions on Cybernetics*
- *IEEE Transactions on Intelligent Transportation Systems*
- *The International Journal of Robotics Research*
- *Engineering Applications of Artificial Intelligence*
- *International Journal of Nonlinear Sciences and Numerical Simulation*
- *Bioinspiration & Biomimetics*
- *Swarm and Evolutionary Computation*
- *Journal of the Royal Society Interface*
- *Scientific Reports*
- *American Naturalist*
- *Biology Letters*
- *Behavioral Ecology*
- *Animal Behaviour*
- *Ecological Research*
- *Current Zoology*
- *Journal of Theoretical Biology*
- *International Journal of the Commons*

Editorial Service

- *Human Computation*, editorial board (2014–)
- *Frontiers in Robotics and AI, Computational Intelligence*, review editorial board (2014–)

Conference Service

- Program Committee: 2016 International Symposium on Intelligent Control (ISIC 2016), Buenos Aires, Argentina, September 19–22, 2016.
- Local Organizing Committee: 2015 Conference on Complex Systems (CCS'15), Tempe, AZ, September 28 – October 2, 2015.
- Co-organizer (with Yun Kang) for technical session: "Complex Systems of Social Insects in Research and Education", 2013 International Symposium on Biomathematics and Ecology Education and Research (BEER 2013), Arlington, VA, October 11–13, 2013.
- Organizer for mini-symposium: "MS19: Optimization and Rationality in Eusocial Insects", 2013 Society for Mathematical Biology Annual Meeting and Conference (SMB 2013), Tempe, AZ, June 10–13, 2013.
- Organizer/Associate Editor for invited session: "Correctness by Verification and Design", 14th IEEE Conference on Intelligent Transportation Systems (ITSC 2011), Washington, DC, October 5–7, 2011.

Professional Experience

Arizona State University, Tempe, AZ

Assistant Professor **August 2015 (upcoming)**

- Joint Appointment:
  - School of Computing, Informatics, and Decision Systems Engineering
  - School of Sustainability
- Graduate faculty in Industrial Engineering/Operations Research, Sustainability, and Animal Behavior.
- Interdisciplinary laboratory focus on decision making and organization.

Associate Research Scientist **August 2014 to present**
Postdoctoral Scholar **July 2012 to August 2014**

- Supervisor: Professor Stephen C. Pratt
- Novel application of sophisticated quantitative analysis and modeling techniques to animals, with social insects as a particular focus.
- Development of new algorithms for robotics and other autonomous systems based on animal behavior, with focus on distributed decision making.
- Supervision of graduate and undergraduate students in engineering, computer science, and biology in tasks related to biological analysis and modeling as well as technological bio-mimetic design.

The Ohio State University, Columbus, OH

Postdoctoral Researcher **September 2010 to June 2012**

- Funding: National Science Foundation Cyber-Physical Systems (ENG, ECCS)
  - "Autonomous Driving in Mixed-Traffic Urban Environments" (grant #0931669)
  - Supervisor (co-PI): Professor Paolo A. G. Sivilotti
  - PI: Professor Ümit Özgüner
- Development of new approaches to software verification in the context of hybrid-state and hybrid-time dynamical systems.
- Supervision of student design project for novel vehicle-to-vehicle communications systems to assist in adaptive cruise control.

National Instruments, Austin, TX

Hardware R&D Intern for Multifunction DAQ **June 2003 to September 2003**

- Designed final verification test fixture for use with STC2 MIO products.
- Designed and executed study of the effect of varying burn-in time on long-term drift of common industry voltage references.

Hardware R&D Intern for Multifunction DAQ **June 2002 to September 2002**

- Designed and performed validation tests for 16-bit 800 kHz NI-6120 SMIO DAQ.
- Designed high-quality source to use with NI-5411 arbitrary function generator.

IBM Network Storage, Research Triangle Park, NC

Core Systems Software Developer for FlexNAS **June 2001 to September 2001**

- Designed and implemented highly available multihop communications subsystem.
- Participated in software development of various vital box services.

CallTech Communications, Columbus, OH

Information Technology Systems Engineer **June 1997 to May 2001**

- Responsible for the acquisition, setup, and administration of all hardware and software systems supporting NetWalk Internet service and web presence provider.
- Designed and implemented state-of-the-art open-source highly available load-balancing system supporting thousands of virtual servers.
- Developed call-center software for clients such as CompuServe, AOL, and Priceline.

MegaLinx Communications, Dublin, OH

Web Developer and Support Representative **June 1995 to May 1997**

- Produced web content for commercial clients.
- Assisted in administration of UltraSPARC, x86, 680x0, and PowerPC systems.
- Developed multi-platform open-source file-sharing solution.
- Provided technical support for Internet and web presence customers.

Professional Memberships

Institute for Electrical and Electronics Engineers (IEEE), Member, 2002–present

- IEEE Control Systems Society (2004–present)
- IEEE Communications Society (2012–present)
- IEEE Computer Society (2009–present)
- IEEE Intelligent Transportation Systems Society (2011–present)
- IEEE Systems, Man, and Cybernetics Society (2011–present)
- IEEE Robotics and Automation Society (2011–present)
- IEEE Computational Intelligence Society (2013–present)
- IEEE Circuits and Systems Society (2013–present)
- IEEE Information Theory Society (2013–present)

Animal Behavior Society, Member, 2011–present

International Union for the Study of Social Insects, Member, 2012–present

- North American Section (2012–present)

Entomological Society of America, Member, 2014–present

- Southwestern and Pacific Branch (2014–present)
- Systematics, Evolution, and Biodiversity Section (2014–present)

Society for Mathematical Biology, Member, 2012–present

Other Meeting Attendance

Invited Participant

- 12th Annual National Academies Keck Futures Initiative Conference (NAKFI 2014) on Collective Behavior: From Cells to Societies, November 13–15, 2014
- 2014 Computing Community Consortium Human Computation Roadmap Summit Workshop, June 18–20, 2014
- BEYOND Center for Fundamental Concepts in Science Workshop: Complex Systems Theory and Cancer Biology, February 22–23, 2014

General Participant

- NSF Workshop on Self-organizing Particle Systems, January 8, 2014
- 1st IEEE/ACM Workshop on Signal Processing Advances in Sensor Networks, April 8, 2013
- CoMSES Workshop on ABM in Education, February 28 – March 2, 2013
- 49th IEEE Conference on Decision and Control, December 15–17, 2010

Service

Arizona State University School of Life Sciences Graduate Retreat 2014

- Panelist, "Securing a post-doc" session

Intel International Science and Engineering Fair (ISEF) 2013

- Grand Award Judge for Animal Sciences

Night of the Open Door, Arizona State University, 2013

- Staffed the "Ants of Arizona" exhibit
- Answered questions about ants and research related to them

Recent contributor to several open-source software projects, including:

- Vim-LaTeX suite
- Vimperator and Pentadactyl Firefox extensions
- Git distributed version control system
- Mercurial distributed version control system
- Personal projects archived at http://hg.tedpavlic.com/

Frequent contributor to Wikipedia

- Significant contributions to articles on control theory, electronics, and signals and systems.

Contributor to Quora

- Contributions to articles on thermodynamics, chaos theory, electronics, and evolutionary biology.

OSU FIRST Robotics Team, The Ohio State University, 2000–2004

- Introduced middle school and high school students to science and technology by participating with them in national robotics competitions.
- Led 2002 team to regional silver medal *Engineering Inspiration Award*.
- *Lead Team Mentor*, 2002–2004
- *Component Design Team Lead Mentor*, 2001–2002

Ohio Science Olympiad state competition, Robot Ramble Event, 2003

- Supervised setup and judging of event for middle-school and high-school students

Director of Computers, Engineers' Council, The Ohio State University, 2002

Linux Virtual Server Project, 1999–2000

- Early member of the team that formed the open-source project that is now an important load balancing solution for the Linux software platform.

Greater Columbus Free-Net, 1995–1997

- Provided technical support services.

CompuTeen Bulletin Board System, 1993–1995

- Administrated dial-up bulletin board system.
- Founded and administrated TeenLiNK, an international electronic mail network that spread through the United States, Canada, and Australia and delivered mail over a series of electronic dial-up drop offs.

Application Areas

Autonomous and Unmanned Vehicles, Flexible Manufacturing Systems, Distributed Power Generation, Intelligent Lighting, Power Demand Response, Microgrids, Smart Grids

Hardware and Software Skills

Analog and Digital Electronics:

- Bipolar and FET implementations of continuous and switched amplifiers, modulators, converters, and filters
- Computer-Aided Design Tools: Cadence OrCAD, NI Multisim, SPICE, pst-circ

Embedded and Real-time Systems:

- Software and hardware development with several MCU and DSP platforms (e.g., Motorola MCU's, Texas Instruments DSP's, Atmel ATmega MCU's, Microchip PIC MCU's, and others)

Instrumentation, Control, Data Acquisition, Test, and Measurement:

- dSPACE hardware (e.g., RTI1104) and Control Desk software, Simulink, LabVIEW and other National Instruments control and data acquisition hardware and software (e.g., MIO, SMIO, DSA, DMM, and others), Hewlett-Packard and Agilent bench-top equipment

Computer Programming:
- C, C++, Java, JavaScript, NetLogo, Pascal, Perl, PHP, Lisp, UNIX shell scripting (including POSIX.2), GNU make, AppleScript, SQL, MySQL, and others

Numerical Analysis:
- MATLAB, R, Maple, Mathematica

Version Control and Software Configuration Management:
- DVCS (Mercurial/MQ, Git/StGit), VCS (RCS, CVS, SVN, SCCS), and others

MATLAB skill set:
- Linear algebra, Fourier transforms, Monte Carlo analysis, nonlinear numerical methods, polynomials, statistics, N-dimensional filters, visualization
- Toolboxes: communications, control system, filter design, genetic algorithm and direct search, signal processing, system identification

Software Verification:
- KeY, PRISM, KeYmaera

Information/Internet Technology:
- Networking (UDP, TCP, ARP, DNS, Dynamic routing), Services (Apache, SQL, MediaWiki, POP, IMAP, SMTP, application-specific daemon design)

Desktop Editing and Productivity Software:
- Vim, Emacs, Eclipse
- TEX (LATEX, BIBTEX, PSTricks),
- Microsoft Office, OpenOffice.org, LibreOffice, Corel WordPerfect, Google Docs
- GIMP, InkScape

Operating Systems:
- Microsoft Windows family, Apple OS X, IBM OS/2, Linux, BSD, IRIX, AIX, Solaris, and other UNIX variants

EXPERTISE

Mathematics:
- Applied Mathematics, Real and Complex Analysis, Measure Theory, Differential Geometry, Game Theory, Graph Theory, Combinatorics

Control Theory and Engineering:
- Linear and Nonlinear Systems Theory, Feedback, Variable Structure Systems and Sliding Modes, Distributed and Intelligent Control, Dynamic Optimization, Biomimicry, Bioinspiration, Hybrid and CyberPhysical Systems

Communications and Signal Processing:
- Probability, Random Variables, Stochastic Processes, Information Theory, Estimation, Networks

Computer Science and Engineering:
- Model Checking (automated, distributed, hybrid, probabilistic), Hybrid Automata, Software Verification, Component-Based Reusable Software

Natural and Social Sciences (Biology, Neuroscience, Psychology, Anthropology):
- Behavioral Ecology, Foraging Theory, Altruism, Impulsiveness, Evolution

AWARDS

National Science Foundation
- GK-12 Graduate Fellowship, 2006–2007
- Graduate Research Fellowship Honorable Mention, 2005

The Ohio State University
- Dean's Distinguished University (DDU) Graduate Fellowship, 2004–2010
- Electrical and Computer Engineering Bradshaw Scholarship, 2002–2004
- Electrical and Computer Engineering Shafstall Scholarship, 2001–2003
- University Scholarship, 1999–2003

POPULAR MEDIA

Pavlic, Theodore P. "Cognition in Ants, Robots, and Pre-biotic Chemistries: A Science on Google+ HOA with Dr. Ted Pavlic." Interview by Chris Robinson. *Science on Google+: A Public Database*, April 15, 2015. https://plus.google.com/u/0/events/cmbuh4hdnc558tqg1p86dqna35k

Sigfried, Tom. "If the world is a computer, life is an algorithm", *Science News: Context*, June 18, 2014. https://www.sciencenews.org/blog/context/if-world-computer-life-algorithm

"The Free & Unfree: Open Source Everywhere – How a Global Coding Coalition Built an Open Source Superserver", *Wired*, 12(06), June 2004.

SECURITY CLEARANCE

Department of Defense Top Secret SCI with polygraph (expired: 2002)

REFERENCES AVAILABLE TO CONTACT

Dr. Stephen C. Pratt (e-mail: stephen.pratt@asu.edu; phone: +1-480-727-9425)
- Associate Professor, School of Life Sciences, Arizona State University
  - ◇ School of Life Sciences, PO Box 874501, Tempe, AZ 85287-4501
  - ⋆ *Dr. Pratt is my current postdoctoral supervisor.*

Dr. Spring M. Berman (e-mail: Spring.Berman@asu.edu; phone: +1-480-965-4431)
- Assistant Professor, Mechanical and Aerospace Engineering, Arizona State University
  - ◇ School for Engineering of Matter, Transport, and Energy, PO Box 876106, Tempe, AZ 85287-6106
  - ⋆ *Dr. Berman is collaborator on my bio-mimicry work.*

Dr. Paul C. W. Davies (e-mail: Paul.Davies@asu.edu; phone: +1-480-965-3240)
- Regents Professor and Director, Beyond Center for Fundamental Concepts in Science, Arizona State University
  - ◇ Beyond Center for Fundamental Concepts in Science, P.O. Box 871504, Tempe, AZ 85287-1504
  - ⋆ *Dr. Davies is collaborator on my origins-of-life work.*

Dr. Sara Imari Walker (e-mail: sara.i.walker@asu.edu; phone: +1-480-727-2394)
- Assistant Professor, School of Earth and Space Exploration, Arizona State University
  - ◇ ASU School of Earth and Space Exploration, PO Box 871404, Tempe, AZ 85287-1404
  - ⋆ *Dr. Walker is collaborator on my origins-of-life work.*

Dr. Pietro Michelucci (e-mail: pem@thinksplash.com; phone: +1-571-235-3288)
- Principal, ThinkSplash LLC, Washington, DC
  - ⋆ *I co-authored a chapter in the* Handbook of Human Computation*, for which Dr. Michelucci was the editor-in-chief.*

Dr. Paolo A. G. Sivilotti (e-mail: sivilotti.1@osu.edu; phone: +1-614-292-5835)
- Associate Professor, Computer Science and Engineering, The Ohio State University
  - ◇ 395 Dreese Laboratories, 2015 Neil Ave., Columbus, OH 43210
  - ⋆ *Dr. Sivilotti is my past postdoctoral supervisor.*

Dr. Bruce W. Weide (e-mail: weide.1@osu.edu; phone: +1-614-292-1517)
- Professor and Associate Chair, Computer Science and Engineering
  The Ohio State University
  - ◇ 395 Dreese Laboratories, 2015 Neil Ave., Columbus, OH 43210
  - ⋆ *Dr. Weide is a co-PI on the NSF grant that funded my previous postdoctoral position.*

Dr. Ian M. Hamilton (e-mail: hamilton.598@osu.edu; phone: +1-614-292-9147)
- Assistant Professor, Evolution, Ecology, and Organismal Biology and Mathematics
  The Ohio State University
  - ◇ 300 Aronoff Laboratory, 318 W. 12th Avenue, Columbus, OH 43210
  - ⋆ *Dr. Hamilton has been a valuable interdisciplinary resource to me.*

Dr. Kevin M. Passino (e-mail: passino.1@osu.edu; phone: +1-614-312-2472)
- Professor, Electrical and Computer Engineering, The Ohio State University
  - ◇ 205 Dreese Laboratories, 2015 Neil Ave., Columbus, OH 43210
  - ⋆ *Dr. Passino was my graduate adviser.*

Dr. Andrea Serrani (e-mail: serrani.1@osu.edu; phone: +1-614-292-4976)
- Associate Professor, Electrical and Computer Engineering
  The Ohio State University
  - ◇ 205 Dreese Laboratories, 2015 Neil Ave., Columbus, OH 43210
  - ⋆ *Dr. Serrani was a member of my doctoral committee.*

Dr. Richard J. Freuler (e-mail: freuler.1@osu.edu; phone: +1-614-688-0499)
- Professor of Practice, Mechanical and Aerospace Engineering
  The Ohio State University
  - ◇ 244 Hitchcock Hall, 2070 Neil Ave., Columbus, OH 43210
  - ⋆ *Dr. Freuler coordinates the Fundamentals of Engineering for Honors program in which I served as an instructor early in my academic career.*

Dr. George H. Staab (e-mail: staab.1@osu.edu; phone: +1-614-292-7920)
- Associate Professor, Mechanical and Aerospace Engineering
  The Ohio State University
  - ◇ W192 Scott Laboratory, 201 W. 19th Ave., Columbus, OH 43210
  - ⋆ *Dr. Staab is the faculty adviser for the OSU FIRST robotics and engineering outreach group of which I was a four-year member and team leader.*

Dr. Clayton Daigle (e-mail: Clayton.Daigle@silabs.com; phone: +1-512-532-5935)
- Mixed-Signal Engineer, Silicon Laboratories, Austin, TX
  - ⋆ *Dr. Daigle was my direct supervisor when I worked for National Instruments as an analog hardware R&D engineer.*

MORE INFORMATION

More information and auxiliary documents can be found at http://www.tedpavlic.com/facjobsearch/.