

Anthony Rowe

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Research Interests

I have a broad range of research interests that include real-time systems, distributed systems, operating systems, embedded computer vision and robotics. My current work focuses on large-scale embedded sensing systems with real-time properties for supporting applications related to building energy optimization, critical infrastructure monitoring, mobile computing and rural electrification. I am currently the director of the Wireless Sensing and Embedded Systems Lab (WiSE Lab <http://wise.ece.cmu.edu>) at Carnegie Mellon University. I have also applied my research in sensor networks as a co-founder of SparkMeter Inc., a company that strives to design cost-effective technologies to support rural electrification in developing nations. Founded in 2014, they currently have grids deployed in more than five countries including Haiti, Tanzania, India, Nepal and Uganda.

Education

Ph.D. Electrical and Computer Engineering Carnegie Mellon University
Thesis advisor: Dr. Ragnathan (Raj) Rajkumar.
Thesis title: *A Resource-Centric Design Paradigm for Scalable Sensor networks*. Jan 2004- Dec 2009

B.S. Electrical and Computer Engineering Carnegie Mellon University, May 2003

Work Experience

Associate Professor, Electrical and Computer Department, Carnegie Mellon University. July 2015 - present

Assistant Research Professor, ECE Department, Carnegie Mellon University. June 2010 - Jul 2015

Bosch Research and Technology Center Internship: Developed a performance modeling and exploration tool for an automotive distributed mechatronic system capable of estimating worst case latencies given new components or changed communication parameters. The system primarily focused on modeling LIN and CANbus communication. Supervisor: Christoph Stoermer May 2004 – Sep 2005

Mobile Robot Programming Lab Research Assistant: Developed CMUcam, CMUcam2, and CMUcam3. CMUcam is a commercially available (20000+ units sold) low-cost embedded vision hardware platform capable of color tracking, motion tracking, edge detection and histogramming in real-time. Advisor: Professor Illah Nourbakhsh. June 2001- Present

NASA Ames Research Center Internship: Summer intern at the IC division under the supervision of Maria Bualat, Created a new interface for the K9 rover contingent executive which allowed it to control a low cost robotics testbed for educational outreach. Developed a user interface to generate Lisp scripts for this executive. Jul 2002 – Aug 2002

Harvard-Smithsonian Center for Astrophysics Research Assistant: Worked under the supervision of Dr. Eric Keto in the Radio and Geoastronomy Division on Sub-Millimeter Array Telescope software. Developed a Cluster Parallel Computing System to enhance radiative transfer models of astronomical molecular clouds. Jun 1999 – Sep 2000

Awards

Dr. William D. and Nancy W. Stecker Early Career Chair 2016

CMU CIT Steven J. Fenves Award for Systems Research 2015

CMU CIT Early Career Fellowship 2014

Lutron Joel and Ruth Spira Excellence in Teaching Award 2013

Best Paper in 2018 in *the International Conference on Information Processing in Sensor Networks (IPSN)*. “Charm: Exploiting Geographical Diversity Through Coherent Combining in Low-Power Wide-Area Networks”

Best Paper Nomination in the 2012 *ACM Conference on Embedded Networked Sensor Systems (SenSys)* “Indoor Pseudo-ranging of Mobile Devices using Ultrasonic Pulse Compression”

Best Paper Honorable Mention in the 2012 *IEEE International Conference on Computational Photography (ICCP 2012)* “Fast Reactive Control for Illumination through Rain and Snow”

Best Poster in the 2011 *ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings (BuildSys)* “Appliance Classification and Energy Management Using Multi-Modal Sensing”

Best Paper in the 2010 *ACM Workshop on Embedded Sensing Systems for Energy-Efficiency in Buildings (BuildSys)* “Contactless Sensing of Appliance State Transitions”

Best Paper in the 2009 *ACM Conference on Embedded Networked Sensor Systems (SenSys)* “Low-Power Clock Synchronization using Electromagnetic Energy Radiating from AC Power Lines”

Best Paper in the 2006 *IEEE Conference on Sensors, Mesh and Ad-hoc Communication and Networks (SECON)* “RT-Link: A Time-Synchronized Link Protocol for Energy Constrained Multi-hop Wireless Networks”

2003 Carnegie Mellon University’s David Tuma Laboratory Project Award: Undergraduate Laboratory Award for work on a fault tolerant encrypted voice over IP SoC system.

Peer-Reviewed Conferences and Workshops

1. Adwait Dongare, Revathy Narayanan, Akshay Gadre, Anh Luong, Artur Balanuta, Swarun Kumar, Bob Iannucci, Anthony Rowe, “Charm: Exploiting Geographical Diversity Through Coherent Combining in Low-Power Wide-Area Networks”, *The International Conference on Information Processing in Sensor Networks (IPSN)*, April 2018, Porto Portugal (pdf) **(Best Paper Award)**
2. Niranjini Rajagopal, Patrick Lazik, Nuno Pereira, Sindhura Chayapathy, Bruno Sinopoli, Anthony Rowe, “Enhancing Indoor Smartphone Location Acquisition using Floor Plans”, *The International Conference on Information Processing in Sensor Networks (IPSN)*, April 2018, Porto Portugal (pdf)
3. Anh Luong, Peter Hillyard, Alemayehu Solomon Abrar, Charissa Che, Thomas Schmid, Anthony Rowe, Neal Patwari, “A Stitch in Time and Frequency Synchronization Saves Bandwidth”, *The International Conference on Information Processing in Sensor Networks (IPSN)*, April 2018, Porto Portugal. (pdf)
4. Luis Ramos Pinto, Luís Almeida and Anthony Rowe, “Aerial Video Stream over Multi-hop using Adaptive TDMA Slots”, *IEEE Real-Time Systems Symposium (RTSS 2017)*, Paris, France 2017 (pdf)
5. Adwait Dongare, Anthony Rowe, “Pulsar: A Wireless Propagation-Aware Clock Synchronization Platform”, *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2017)*, April 2017, Pittsburgh, PA.
6. L. Pinto, A. Moreira, L. Almeida and A. Rowe, “Characterising Multi-hop Aerial Networks of COTS Multi-rotors” in *IEEE Transactions on Industrial Informatics*, 2017
7. Sirajum Munir, Ripudaman Singh Arora, Craig Hesling, Juncheng Li, Jonathan Francis, Charles Shelton, Christopher Martin, Anthony Rowe, Mario Berges, “Real-Time Fine Grained Occupancy Estimation using Depth Sensors on ARM Embedded Platforms”, *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2017)*, April 2017, Pittsburgh, PA.

8. Adwait Dongare, Craig Hesling, Khushboo Bhatia, Artur Balanuta, Ricardo Lopes Pereira, Bob Iannucci, Anthony Rowe, "OpenChirp: A Low-Power Wide-Area Networking Architecture", The first International Workshop on Smart Edge Computing and Networking (SmartEdge 2017) in conjunction with PerCom 2017, Hawaii, USA.
9. L. R. Pinto, L. Oliveira, L. Almeida and A. Rowe, "Extendable Matrix Camera Using Aerial Networks," 2016 International Conference on Autonomous Robot Systems and Competitions (ICARSC), Braganca, 2016
10. Fatima M. Anwar, Sandeep D'souza, Andrew Symington, Adwait Dongare, Ragunathan (Raj) Rajkumar, Anthony Rowe and Mani B. Srivastava, "Timeline: An Operating System Abstraction for Time-Aware Applications", IEEE Real-Time Systems Symposium (RTSS 2016), November 29th, Porto, Portugal.
11. Oliver Shih, Patrick Lazik, Anthony Rowe, "AURES: A Wide-Band Ultrasonic Occupancy Sensing Platform", The 3rd ACM International Conference on Systems for Energy-Efficient Built Environments (BuildSys 2016), November 2016, Palo Alto, CA.
12. Niranjini Rajagopal, Sindhura Chayapathy, Bruno Sinopoli and Anthony Rowe, "Beacon Placement for Range-Based Indoor Localization", The 7th International Conference on Indoor Positioning and Indoor Navigation (IPIN 2016), October 2016, Madrid, Spain.
13. L. Pinto, A. Moreira, L. Almeida and A. Rowe, "Aerial multi-hop network characterisation using COTS multi-rotors," 2016 IEEE World Conference on Factory Communication Systems (WFCS), Aveiro, 2016
14. Maxim Buevich, Xiao Zhang, Dan Schnitzer, Tristan Escalada, Arthur Jacquiau-Chamski, Jon Thacker, Anthony Rowe, "Microgrid Losses: When the Whole is Greater Than the Sum of Its Parts", The 7th IEEE/ACM International Conference on on Cyber-Physical Systems, April 2016, Vienna, Austria
15. Maxim Buevich, Xiao Zhang, Dan Schnitzer, Tristan Escalada, Arthur Jacquiau-Chamski, Jon Thacker, Anthony Rowe, "Short Paper: Microgrid Losses: When the Whole is Greater Than the Sum of Its Parts", The 2nd ACM Conference on Embedded Systems for Energy-Efficient Built Environments (BuildSys), November 2015, Seoul, South Korea
16. Patrick Lazik, Niranjini Rajagopal, Oliver Shih, Bruno Sinopoli, Anthony Rowe, "ALPS: A Bluetooth and Ultrasound Platform for Mapping and Localization", The 13th ACM Conference on Embedded Networked Sensing Systems (SenSys). November, 2015, Seoul, South Korea.
17. Oliver Shih, Anthony Rowe, "Occupancy Estimation using Ultrasonic Chirps", *The ACM/IEEE 6th International Conference on Cyber-Physical Systems (ICCPS 2015)*, Seattle, Washington, April 13th, 2015
18. Patrick Lazik, Niranjini Rajagopal, Bruno Sinopoli, Anthony Rowe, "Ultrasonic Time Synchronization and Ranging on Smartphones", *21st IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2015)*, Seattle, Washington, April 13th, 2015
19. Lymberopoulos et al., "A Realistic Evaluation and Comparison of Indoor Location Technologies: Experiences and Lessons Learned", *ACM/IEEE 14th International Conference on Information Processing in Sensor Networks (IPSN 2015)*, Seattle, Washington, April 13th, 2015
20. Subhagato Dutta, Abhishek Chugh, Robert Tamburo, Anthony Rowe, Srinivasa G. Narasimhan, "Performance Characterization of Reactive Visual Systems", IEEE International Conference on Computational Photography (ICCP 15), Houston Texas, April 24-26, 2015
21. Niranjini Rajagopal, Patrick Lazik, Anthony, Rowe, "Is There a Place for VLC in Wireless Sensor Networks?", Poster Paper, 1st ACM Workshop on Visible Light Communication Systems, Sep 7, 2014, Maui, Hawaii
22. Niranjini Rajagopal, Patrick Lazik, Anthony, Rowe, "Hybrid Visual Light Communication for Cameras and Low-Power Embedded Devices", 1st ACM Workshop on Visible Light Communication Systems, Sep 7, 2014, Maui, Hawaii

23. Robert Tamburo, Eriko Nurvitadhi, Abhishek Chugh, Mei Chen, Anthony Rowe, Takeo Kanade, Srinivasa Narasimhan, "Programmable Automotive Headlights", European Conference on Computer Vision (ECCV 2014), Sep. 6-12, 2014, Zurich.
24. Edward A. Lee, Jan Rabaey, David Blaauw, Prabal Dutta, Kevin Fu, Carlos Guestrin, Bjoern Hartmann, Roozbeh Jafari, Douglas L. Jones, John D. Kubiatowicz, Vijay Kumar, Rahul Mangharam, Brian T. Murray, George Pappas, Kris Pister, Anthony Rowe, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia, Tajana Simunic Rosing, Ben Taskar, John Wawrzyniek, David Wessel, "The Swarm at the Edge of the Cloud", In IEEE Design and Test of Computers on Cloud Computing for Embedded Systems, 2014.
25. Niranjini Rajagopal, Patrick Lazik, Anthony Rowe, "Visual Light Landmarks for Mobile Devices", ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2014), Berlin Germany.
26. Maxim Buevich, Dan Schnitzer, Tristan Escalada, Arthur Jacquiau-Chamski, Anthony Rowe, "A System for Fine-Grained Remote Monitoring, Control and Pre-Paid Electrical Service in Rural Microgrids", ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2014), Berlin Germany.
27. Maxim Buevich, Niranjini Rajagopal, Anthony Rowe, "Hardware Assisted Clock Synchronization for Real-Time Sensor Networks", IEEE Real-Time Systems Symposium (RTSS 2013), Vancouver, CA 2013.
28. Maxim Buevich, Anne Wright, Randy Sargent and Anthony Rowe, "Respawn: A Distributed Multi-resolution Time-series Datastore", IEEE Real-Time Systems Symposium (RTSS 2013), Vancouver, CA 2013.
29. Jia Zhang, Bob Iannucci, Mark Hennessy, Kaushik Gopal, Sean Xiao, Sumeet Kumar, David Pfeffer, Basmah Aljedia, Yuan Ren, Martin Griss, Steven Rosenberg, Jordan Cao, Anthony Rowe, "Sensor Data as a Service - A Federated Platform for Mobile Data-Centric Service Development and Sharing", in Proceedings of 2013 IEEE 10th International Conference on Services Computing (SCC), Jun. 27-Jul. 2, 2013, Santa Clara, California, USA, pp. 446-453.
30. Dionisio De Niz, Lutz Wrage, Anthony Rowe and Ragunathan Rajkumar, "Utility-Based Resource Overbooking For Cyber-Physical Systems", 19th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2013), Taipei, Taiwan, 2013
31. Ilari Shafer, Raja R. Sambasivan, Anthony Rowe, Gregory R. Ganger, "Specialized Storage for Big Time Series", The 5th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage '13), San Jose, CA 2013
32. Niranjini Rajagopal, Suman Giri, Mario Berges, Anthony Rowe, "A Magnetic Field-based Appliance Metering System", The 4th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) Apr. 8th, Philadelphia, USA 2013.
33. S. Giri, M. Bergés, and A. Rowe, "Towards automated appliance recognition using an EMF sensor in NILM platforms," Advanced Engineering Informatics, iss. Special Issue EG-ICE 2012, 2013.
34. Frank Mokaya, Cynthia Kuo, Quinn Jacobson, Brian Nguyen, Anthony Rowe, Pei Zhang, "MARS: A Muscle Activity Recognition System Enabling Self-Configuring Musculoskeletal Sensor Networks", The 12th ACM/IEEE Conference on Information Processing in Sensor Networks (IPSN), April 8th, Philadelphia, USA 2013.
35. Ray Yun, Bertrand Lasternas, Azizan Aziz, Vivian Loftness, Peter Scupelli, Anthony Rowe, Ruchie Kothari, Flore Marion, Jie Zhao, "Toward the Design of a Dashboard to Promote Environmentally Sustainable Behavior among Office Workers", The 8th International Conference on Persuasive Technology, April 3-5 2013, Sydney, Australia.
36. Patrick Lazik and Anthony Rowe, "Indoor Pseudo-ranging of Mobile Devices using Ultrasonic Pulse Compression" The 10th ACM Conference on Embedded Networked Sensing Systems (SenSys). November, 2012,

Toronto, Canada. **(Nominated for Best Paper)**

37. Kyle Anderson, Adrian Ocneanu, Diego Benitez, Derrick Carlson, Anthony Rowe, and Mario Berges, "BLUED: A Fully Labeled Public Dataset for Event-Based Non-Intrusive Load Monitoring Research," in Proceedings of the 2nd KDD Workshop on Data Mining Applications in Sustainability (SustKDD), Beijing, China, August 2012. (data)
38. Raoul de Charette, Robert Tamburo, Peter Barnum, Anthony Rowe, Takeo Kanade, and Srinivasa Narasimhan, "Fast Reactive Control for Illumination through Rain and Snow" IEEE International Conference on Computational Photography (ICCP 2012), April 2012. **(Best Paper Honorable Mention Award)**
39. Dionisio de Niz, Lutz Wrage, Nathaniel Storer, Anthony Rowe and Ragunathan Rajkumar, "On Resource Overbooking in an Unmanned Aerial Vehicle," ACM/IEEE Third International Conference on Cyber-Physical Systems (ICCPS 2012), April 2012.
40. Mario Berges, Anthony Rowe, "Poster: Appliance Classification and Energy Management Using Multi-Modal Sensing," The 3rd ACM Workshop On Embedded Sensing Systems For Energy-Efficiency In Buildings (BuildSys), held in conjunction with ACM SenSys, November 2011. **(Best Poster Award)**
41. Vaishakh Rao, Anthony Rowe, "Poster: Low-Cost Continuous Thermal Sensing," The 3rd ACM Workshop On Embedded Sensing Systems For Energy-Efficiency In Buildings (BuildSys), held in conjunction with ACM SenSys, November 2011.
42. John Yackovich, Daniel Mosse, Anthony Rowe and Raj Rajkumar, "Making WSN TDMA Practical: Stealing Slots Up and Down the Tree," The 17th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2011), August 2011.
43. Yizhi Wu and Anthony Rowe, "Logic-based programming for wireless sensor-actuator networks," ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), April 2011
44. Anthony Rowe, Adam Goode, Dhiraj Goel, Illah Nourbakhsh, "CMUcam3: An Open Programmable Embedded Vision Sensor," *Submitted 2009 (under review)*.
45. Anthony Rowe, Gaurav Bhatia, Ragunathan (Raj) Rajkumar, "A Model-Based Design Approach for Wireless Sensor-Actuator Networks," *The First Analytic Virtual Integration of Cyber-Physical Systems Workshop (AVICPS)*, held in conjunction with RTSS, November 2010. PDF
46. Anthony Rowe, Vikram Gupta, Raj Rajkumar, "Low-power Clock Synchronization using Electromagnetic Energy Radiating from AC Power Lines," In *Proceedings of 7th ACM Conference on Embedded Networked Sensor Systems (SenSys)*, November 2009 **(Best Paper Award)**.
47. Branden Archer, Shivakumar Sastry, Anthony Rowe, Ragunathan (Raj) Rajkumar, "Profiling Primitives of Networked Embedded Automation," In *Proceedings of IEEE Conference on Automation Science and Engineering (CASE) 2009*, August 2009.
48. Arvind Kandhalu, Anthony Rowe, Raj Rajkumar, "Real-Time Video Surveillance over IEEE 802.11 Mesh Networks," In *Proceedings of the Real-Time Applications Symposium (RTAS)*, April 2009.
49. Anthony Rowe, Karthik Lakshmanan, Haifeng Zhu, Raj Rajkumar, "Rate-Harmonized Scheduling for Saving Energy," In *Proceedings of Real-Time Systems Symposium (RTSS)*, December 2008.
50. Anthony Rowe, Karthik Lakshmanan, Raj Rajkumar, "SAMPL: A Simple Aggregation and Message Passing Layer," In *Proceedings of Wireless Internet Conference (WICON)*, November 2008.
51. Anthony Rowe, Dhiraj Goel, Raj Rajkumar, "FireFly Mosaic: A Vision-Enabled Wireless Sensor Networking System," In *Proceedings of Real-Time Systems Symposium (RTSS)*, December 2007.

52. Nuno Pereira, Bjorn Andresson, Eduardo Tovar, Anthony Rowe, "Static-Priority Scheduling over Wireless Networks with Multiple Broadcast Domains," In *Proceedings of Real-Time Systems Symposium (RTSS)*, December 2007.
53. Anthony Rowe, Zane Starr and Raj Rajkumar, "Using Micro-Climate Sensing to Enhance RF Localization in Assisted Living Environments" In *Proceedings of IEEE Systems, Man and Cybernetics (SMC)*, Montreal Canada 2007.
54. Rahul Mangharam, Anthony Rowe, Raj Rajkumar, "Voice over Sensor Networks," In *Proceedings of the 27th IEEE Real-Time Systems Symposium (RTSS)*, December 2006.
55. Anthony Rowe, Rahul Mangharam, Raj Rajkumar, "RT-Link: A Time-Synchronized Link Protocol for Energy Constrained Multi-hop Wireless Networks," In *Proceedings of the IEEE conference on sensors mesh and ad-hoc communication and networks (SECON)*, September 2006. **(Best Paper Award)**
56. Uwe Maurer, Anthony Rowe, Asim Smailagic, Daniel Siewiorek, "eWatch: A Wearable Sensor and Notification Platform," In *Proceedings of the IEEE Body Sensor Networks Workshop (BSN)* 2006.
57. Anthony Rowe, Charles Rosenberg, Illah Nourbakhsh, "A Second Generation Low Cost Embedded Color Vision System," In *Proceedings of the IEEE Embedded Computer Vision Workshop*, (CVPR) 2005.
58. Anand Eswaran, Anthony Rowe and Raj Rajkumar, "Nano-RK: An Energy-Aware Resource-Centric Operating System for Sensor Networks," In *Proceedings of the IEEE Real-Time Systems Symposium (RTSS)*, December 2005.
59. Asim Smailagic, Daniel P. Sieworek, Uwe Maurer, Anthony Rowe, Karen Tang, "eWatch: Context Sensitive System Design Case Study," In *Proceedings of IEEE Computer Society Annual Symposium on VLSI (ISVLSI)* 2005.
60. Anthony Rowe, Charles Rosenberg, Illah Nourbakhsh, "A Low Cost Embedded Color Vision System," In *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2002.
61. Anthony Rowe, Charles Rosenberg, Illah Nourbakhsh, "A Simple Low Cost Color Vision System," Technical sketch presented at *IEEE Computer Vision Pattern Recognition (CVPR)* 2001.

Journals and Book Chapters

1. Anthony Rowe, Karthik Lakshmanan, Haifeng Zhu, Raj Rajkumar, "Rate-Harmonized Scheduling for Saving Energy," *Submitted 2009*
2. Anthony Rowe, Mario Berges, Gaurav Bhatia, Ethan Goldman, Raj Rajkumar, Lucio Soibelman, James Garrett, Jose M. F. Moura, "Sensor Andrew: Large-Scale Campus-Wide Sensing and Actuation," *Submitted 2009 (under review)*.
3. Anthony Rowe, Rahul Mangharam and Raj Rajkumar, "RT-Link: A Global Time-Synchronized Link Protocol for Sensor Networks" *Elsevier Ad hoc Networks, Special Issue on Energy-efficient design in wireless ad hoc and sensor networks*, 2007. **(Invited Journal Paper)**
4. Anthony Rowe, Rahul Mangharam, Raj Rajkumar, "FireFly: A Time Synchronized Real-Time Sensor Networking Platform," *Wireless Ad Hoc Networking: Personal-Area, Local-Area, and the Sensory-Area Networks*, CRC Press Book Chapter, November 2006.
5. Rahul Mangharam, Anthony Rowe, Raj Rajkumar, "FireFly: A Cross-Layer Platform for Wireless Sensor Networks," *Real Time Systems Journal, Special Issue on Real-Time Wireless Sensor Networks*, November 2006.
6. Uwe Maurer, Anthony Rowe, Asim Smailagic, Daniel Siewiorek, "Location and Activity Recognition Using eWatch: A Wearable Sensor Platform," *Ambient Intelligence in Every Day Life*, Springer Press Book Chapter,

LNAI 3864, November 2006.

7. Christoph Stoermer, Anthony Rowe, Liam O'Brien, Chris Verhoef, "Model-centric software architecture reconstruction," *Software- Practice and Experience*, Dec 2005.
8. B. Meyer, J. Pieper, J. Paul, J. Nelson, S. Pieper, A. Rowe, "Power-Performance Simulation and Design Strategies for Single-Chip Heterogenous Multiprocessors," *IEEE Transactions on Computers*, June 2005.

Selected Presentations

1. "Indoor Localization: Where we are? Where we are going?", SRC Seminar, May 2017
2. "Future Trends in IoT", GE Korea, , December 22th 2016
3. "Future Trends in IoT", Korea Big Data Academic Society, December 21th 2016
4. "Future Trends in IoT", KEPCO Big Data Center, December 20th 2016
5. "Future Trends in IoT", Seoul National University, December 20th 2016
6. "Precise Timing and Localization in Indoor Spaces ", Portland, September, 2016
7. "Ubiquitous Communication is the Biggest Challenge Holding us Back", Berkeley, October, 2016
8. "Microgrid Losses: When the whole is greater than the sum of its parts...", Berkeley, October, 2016
9. "The Open Chirp Project", CMU, CyLab Annual Meeting, 2016
10. "Wireless Sensing and Embedded Systems Lab Overview", 3M, May 18th, 2016
11. "IoT at CMU", CMU, Ingersoll Rand, July 12th, 2016
12. "Precise Timing and Localization in Indoor Spaces ", Stanford Distinguished Lecture, April 19, 2016
13. "Indoor Localization: or How I learned to love the clock", CMU, CyLab Seminar, April 4, 2016
14. "The promise and Perils of Connected Sensors", CMU, 2016
15. "The promise and Perils of Connected Sensors", World Economics Forum, Davos, Switzerland, 2015
16. "Indoor Localization", Google, May 5th, 2015
17. "Microgrid Losses: When the whole is greater than the sum of its parts...", CEIC Conference, October 22, 2015
18. "Microgrid Losses: When the whole is greater than the sum of its parts...", Oxford University, July 10th, 2015
19. "OpenMortar.io: An Open-Source Building Management System", Department of Energy Building Technologies Office Peer Review, Washington DC, April 2014
20. "Indoor Localization Discussion Panel," IPSN, Berlin, April 16, 2014.
21. "Large-scale sensing for building energy-efficiency," U. Mass. Amherst, Amherst, MA, November, 2014.
22. "OS Support for Quality-of-Time", UCLA, February 26th, 2014
23. "Large-scale sensing and actuation," Texas Instruments, Dallas, TX, December 2013.
24. "Semantic Localization in the Swarm," UC Berkeley, Berkeley CA, November 5, 2013.

25. "Grappling with large-scale physical data," Bosch Research Pittsburgh, Pittsburgh, PA, August 1, 2013.
26. "Sensing and Actuating the Physical World," U.C. Merced, Merced CA, February 21, 2013.
27. "Localizing Mobile Devices using Light and Sound," Carnegie Mellon University, INI Seminar 2013.
28. "Localization using Light and Sound," Carnegie Mellon University, CyLab Seminar 2013.
29. "Grappling with large-scale physical data," Intel Research, Pittsburgh, PA, August 1, 2013.
30. "Time Series Data Management," Bosch Research Pittsburgh, Pittsburgh, PA, October 2012.
31. "Techno Stress Panel," Intel Research, San Francisco, CA, August 13, 2013.
32. "C3 Dashboard," Environmental Protection Agency, EPA in Philadelphia PA, July 2012.
33. "WiSE Lab Overview," Sparkfun Inc., Sparkfun Headquarters, Boulder PA, June 2012.
34. "RESPAWN: REconfigurable Sensor Processing Across Wide-Area Networks," Intel ISTC, Pittsburgh, PA, April 2012.
35. "Empowering Occupants to Achieve Energy Efficiency in Commercial Buildings," CMU / HCI, March 2012.
36. "Wireless Sensor Networks for Building Energy Management," Texas Instruments, TI headquarters Dallas, TX, March 2012.
37. "Wireless Sensor Networks for Building Energy Management," Carnegie Mellon University, ECE Seminar 2012.
38. "A Resource-Centric Design Paradigm for Scalable Wireless Sensor Networks", Virginia Tech, 2011
39. "A Resource-Centric Design Paradigm for Scalable Wireless Sensor Networks", Univeristy of Pittsburgh, 2011
40. "Indoor Pseudo-ranging of Mobile Devices using Ultrasonic Pulse Compression" The 10th ACM Conference on Embedded Networked Sensing Systems (SenSys). November, 2012, Toronto, Canada.
41. "Low-Power Clock Synchronization using Electromagnetic Energy Radiating from Power Lines" *ACM Conference on Embedded Networked Sensor Systems (SenSys)* Berkeley CA 2009.
42. "Rate-Harmonized Scheduling for Saving Energy," *IEEE Real-Time Systems Symposium (RTSS)* Barcelona, Spain 2008.
43. "FireFly Mosaic: A Vision-Enabled Wireless Sensor Networking System," *IEEE Real-Time Systems Symposium (RTSS)* Tucson, Arizona 2007.
44. "Using Micro-Climate Sensing to Enhance RF Localization in Assisted Living Environments," *IEEE Systems, Man and Cybernetics (SMC)*, Montreal Canada 2007.
45. "Voice over Sensor Networks," *IEEE Real-Time Systems Symposium (RTSS)* Rio De Janeiro, Brazil 2006.
46. "RT-Link: A Time-Synchronized Link Protocol for Energy Constrained Multi-hop Wireless Networks," *IEEE conference on sensors mesh and ad-hoc communication and networks (SECON)*, Washington D.C. 2006.
47. "Nano-RK: An Energy-Aware Resource-Centric Operating System," *IEEE Real-Time Systems Symposium (RTSS)*, Miami 2005.

48. "A Case Study in Time Performance of a LIN based System using Software Architecture Reconstruction", Bosch Conference on Systems and Software Engineering, Munich, Germany 2004.
49. "A Simple Low-Cost Color Vision System," *Computer Vision and Pattern Recognition (CVPR)*, Hawaii 2001.

Demonstration Papers

1. Christopher Palmer, Patrick Lazik, Maxim Buevich, Jingkun Gao, Mario Berges, Anthony Rowe, Ricaro Lopes Pereira, Christopher Martin, "Mortar.io: A Concrete Building Automation System (Demo Abstract)", *Demo abstract in 1st ACM Conference on Embedded Systems for Energy-Efficient Buildings*, Nov. 5-6, Memphis, TN
2. Aksanli, Akyurek, Behl, Clark, Donze, Dutta, Lazik, Massoumy, Mangharam, Nghiem, Raman, Rowe, Sangiovanni-Vincentelli, Seshia, Rosing, Venkatesh, "Distributed Control of a Swarm of Buildings Connected to a Smart Grid (Demo Abstract)", *Demo abstract in 1st ACM Conference on Embedded Systems for Energy-Efficient Buildings*, Nov. 5-6, Memphis, TN
3. Niranjini Rajagopal, Patrick Lazik, Anthony Rowe, "How many lights do you see?", *Demo at ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN 2014)*, Berlin Germany.
4. Anthony Rowe, Mario Berges, Gaurav Bhatia, Ethan Goldman, Raj Rajkumar, Lucio Soibelman, "Demonstrating Sensor Andrew: Large-Scale Campus-Wide Sensing and Actuation," *Demonstration in Proceedings of ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN)*, April 2009

Technical Reports

1. Anthony Rowe, Mario Berges, Gaurav Bhatia, Ethan Goldman, Raj Rajkumar, Lucio Soibelman, James Garrett, Jose M. F. Moura, "Sensor Andrew: Large-Scale Campus-Wide Sensing and Actuation," Carnegie Mellon Technical Report, ECE-TR-08-11 2008
2. Anthony Rowe, Adam Goode, Dhiraj Goel, Illah Nourbakhsh, "CMUcam3: An Open Programmable Embedded Vision Sensor," Carnegie Mellon Robotics Institute Technical Report, RI-TR-07-13 2007
3. Anthony Rowe, Gaurav Bhatia, Raj Rajkumar, "SenseWeaver: Model-based design for wireless sensor-actuator networks," Carnegie Mellon Technical Report, ECE-TR-03-14 2006
4. Anthony Rowe, Rahul Mangharam, Raj Rajkumar, "RT-ink: A Time-Synchronized Link Protocol for Energy Constrained Multi-hop Wireless Networks," Technical Report CMU-ECE-TR05-08, Aug 2005

Patents

US 14/152,665 Method and System for Ultrasonic Signaling, Ranging and Location Tracking,
January 10th, 2014

US 61/751,080 Method and System for Ultrasonic Signaling, Ranging and Location Tracking
January 10th, 2013

Advising and Teaching

Spring 2017: 18-549 Embedded System Design Capstone
Fall 2016: 18-349 Introduction to Embedded Systems
Spring 2016: 18-549 Embedded System Design Capstone
Fall 2015: 18-349 Introduction to Embedded Systems
Spring 2015: 18-549 Embedded System Design Capstone
Fall 2014: 18-848 Networked Cyber-Physical Systems
Spring 2014: 15-213 Introduction to Computer Systems
Fall 2013: 18-848 Networked Cyber-Physical Systems
Spring 2013: 18-213 Introduction to Computer Systems
Fall 2012: 18-648 Real-Time Embedded Systems
Spring 2012: 15-213/18-213 Introduction to Computer Systems

Fall 2011: 18-848 Networked Cyber-Physical Systems
Spring 2011: 15-213/18-243 Introduction to Computer Systems
Fall 2010: 18-848c Networked Cyber-Physical Systems

2009 Yi-Zhi Wu, M.S. Student in Information Networking Institute, Carnegie Mellon University, M.S. Thesis Reader. Thesis: "Link Logic for wireless sensor-actuator networks"

2009: Pavan Rao, M.S. Student in Information Networking Institute, Carnegie Mellon University, M.S. Thesis Reader. Thesis: "Sensor Andrew Mobile Security: Secure Key Exchange Protocol"

2008: Aditya Bhawe, M.S. Student in Information Networking Institute, Carnegie Mellon University, M.S. Thesis Reader. Thesis: "SenseNet: Design of UDP sockets and point-to-point routing for Wireless Sensor Networks"

2008: Gurpreet Singh, M.S. Student in Information Networking Institute, Carnegie Mellon University, M.S. Thesis Reader. Thesis: "SenseSpace: Sensor Network Namespaces".

Wireless Sensor Networks (18-848), Carnegie Mellon University, Teaching Assistant Fall 2008

Wireless Sensor Networks (18-848), Carnegie Mellon University, Teaching Assistant Fall 2007

Wireless Sensor Networks (18-848), Carnegie Mellon University, Teaching Assistant and developed lab curriculum, Fall 2006

Advanced Digital Design (18-545), Carnegie Mellon University, Teaching Assistant Fall 2005

Consulting

Extensive work in building the electronics for mechatronic and sensing systems used in robotics, low level embedded software development, automotive and wireless communication systems, system level performance modeling and lightweight embedded computer vision.

Lutron Electronics: Consulted on the design of a scalable TDMA mesh communication protocol

Respirionics Inc: Developed image processing algorithm for assembly line inspection. Integrated embedded vision processor into an existing PLC system. Jul - Aug 2007.

Bossa Nova Concepts: Designed wireless robot electronics system with built-in motor controller. Jun - Aug 2007.

Intellibot Robotics: Consulted on the development and integration of a visual navigation sub-system for industrial floor cleaning robots. Dec 2006.

FIRST Robotics: Consulted on the development of a plug-and-play vision package for educational robotics. Developed a driver and automatic calibration software package. Nov 2004 - Feb 2005

Broader Impact

Co-founder and Chair of Technical Advisory Board of Sparkmeter Inc. Sparkmeter designs hardware and software solutions that allow high-fidelity management of rural micro-grid systems. To date, we have deployed electric grids in over 5 countries around the world.

The CMUcam project has grown over the years providing thousands of researchers and hobbyists a hardware and software platform for embedded computer vision. More than 20,000 units have been sold by 23 distributors in over 17 countries. CMUcam was featured in the July 2004 issue of Popular Science in an article entitled "Eat your heart out, Aibo: Why buy a robot that follows a colored ball when you can spend hundreds of hours building your own?" and appears regularly in MAKE magazine. CMUcam has been incorporated into multiple commercial products and has been a key sensor in many research as well as educational robots.

Professional Services

2017: Co-Organizer of National Science Foundation Cyber-Physical Systems Week in Pittsburgh
2016: National Science Foundation – SBIR/NeTS/CPS Program Review Panels
2016 Technical Program Committees: SenSys (co-chair), IPSN, eWSN, RTAS, HotMobile
2015: National Science Foundation – SBIR/NeTS/CPS Program Review Panels
2015 Technical Program Committees: SenSys, IPSN (co-chair), RTAS, RTSS, ICDCS
2014: National Science Foundation – SBIR/NeTS/CPS Program Review Panels
2014 Technical Program Committees: IPSN, RTSS, IWRSN, VLCS
2013 National Science Foundation Review Panel NETS (Wireless Sensor Networks)
2013 Technical Program Committees: SenSys, RTAS, RTSS, CPSNA, PWSN
2012 National Science Foundation Review Panel NETS (Wireless Sensor Networks)
2012 Technical Program Committees: SenSys, IPSN, RTAS
2011 Technical Program Committees: SenSys, BuildSys, RTSS, RTAS, ICDCS, IGCC
2010 Technical Program Committees: RTSS (WiP), SUTC

I have been a regular reviewer for ACM Transactions on Sensor Networks, INSS, IEEE Pervasive Computing and IEEE International Symposium on Wearable Computing (ISWC).

References

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Daniel Siewiorek

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