Dr. Timothy William Hnat

CONTACT INFORMATION

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CITIZENSHIP

United States

DISSERTATION

A System for Tracking People in Homes for Smart Home Applications – People spend 62 percent of their time within the confines of their home. However, localization technologies such as GPS fail to accurately identify their indoor location. A key requirement of creating a smart home is both identifying each person and their current room location. This work addresses these challenges with a new hardware and software solution for indoor tracking.

INTERESTS

Cyber-Physical Systems, Distributed Optimization, Distributed Systems, Machine Learning, Mobile Health (mHealth), Networking, Programming Abstractions, Smart Environments, Wireless Sensor and Embedded Networks

EDUCATION

University of Virginia, Charlottesville, Virginia USA

Ph.D., Computer Science **2012**

- Advisor: Professor Kamin Whitehouse

University of Louisville, Louisville, Kentucky USA

M.Eng., Computer Engineering and Computer Science **2006**

- Advisor: Professor Rammohan K. Ragade

B.S., Computer Engineering and Computer Science **2005**

SELECTED PROJECTS

Smart home tracking (University of Virginia) **2009-2012**

- Developed a hardware and software system that mounted at the top of doorways to track people in their homes
- Does not require cameras or for individuals to carry anything special
- Resulted in 90+% tracking accuracy
- This deployment and software I developed resulted in over 2TB of data being produced and logged in a reliable manner
- Demo: https://www.youtube.com/watch?v=wAluI_uniK8

MacroLab (University of Virginia) **2007-2009**

- Developed a complete tool chain for running Matlab-like code on a distributed wireless sensor network.
- Deployed and tested the system on a 50-node testbed
- Resulting developed code size was reduced by a factor of 100
- Additionally, developed a debugging environment to support the new programming abstraction

K-Sense (University of Memphis) **2013-present**

- Advised and employed a graduate student to develop a wearable sensor platform for determining the kinematics of a human body

- Designed to monitor and estimate calories in obese populations and during light-intensity activities
- Future applications include various medical diagnostic systems

SlamDroid (University of Memphis) **2013-present**

- Advised an undergraduate student (now at Amazon) to develop an indoor localization and mapping (SLAM) technique for Android devices
- This system has the potential to bring Google map style technology to indoor environments

Lifesense (University of Memphis) **2013**

- Advised and employed an undergraduate student to develop a complete sensor logging platform for Android devices
- Designed to validate a user's identify on a smartphone based on weak-biometrics
- Future applications include personel physical security, multi-factor computer authentication, or remote-validation of identity for banking.

Traffic Optimizer (University of Memphis) **2012**

- Advised and employed an undergraduate student (now at Wayfair) to develop a simulation framework to test theories about real-time control of vehicle route planning and traffic light control

Advisory Board

University of Memphis, Memphis, Tennessee USA

- Center for Information Assurance **2012–present**

Awards and Honors

University of Memphis, Memphis, Tennessee USA

- mHealth Scholar **2013**
- Ralph E. Powe Junior Faculty Enhancement Nomination **2013**

University of Virginia, Charlottesville, Virginia USA

- Frank Anger Memorial ACM SIGBED/SIGSOFT Student Award, **2009**
- SenSys Student Travel and Conference Funding Award, **2009**
- SenSys Student Conference Funding Award, **2008**
- IPSN Student Travel and Conference Funding Award, **2008**
- UVA Fellowship, **2006–2011**

University of Louisville, Louisville, Kentucky USA

- Fischer Family Scholarship, University of Louisville, **2001–2006**
- ACM Distinguished Student Award, **2005**
- Speed School Alumni (Scholarship), **2001–2002**

Academic Experience

University of Memphis, Memphis, Tennessee USA

Assistant Professor **August 2011 to Present**

- Research focused on indoor tracking and navigation systems, mobile health interventions, and body sensor networks.

University of Virginia, Charlottesville, Virginia USA

Graduate Student Researcher **August 2006 to August 2011**

- Research focusing on programming systems, languages, and data analysis for large scale wireless embedded networks with Professor Whitehouse.

Guest Lecturer **January 2008 to May 2011**

- Computer Networks (CS 457)

Teaching Assistant **August 2006 to May 2007**

- Computer Networks (CS 457), Program and Data Representation (CS 216), and Computer Architecture (CS 333)
- Provided support to engineering students.
- Responsible for running lab sessions.
- Graded homework assignments and exams.

Teaching Experience

University of Memphis, Memphis, Tennessee USA

Undergraduate Courses **August 2011 to present**

- COMP 3825 - Computer Networking and Information Assurance (2011–present)
- COMP 3410 - Computer Organization (2012–present)
- COMP 4310 - Wireless Mobile Computing (2012–present)

Graduate Courses **August 2011 to present**

- COMP 6310 - Wireless Mobile Computing (2012–present)
- COMP 7212 - Operating Systems (2012–present)

University of Virginia, Charlottesville, Virginia USA

Ballroom Dance Technique Instructor **January 2008 to May 2010**

- Augmented basic instruction for beginning dancers with technical details of the dances.

Community Service

Computer Science Research Day **2012–present**

- Judged and/or organized this event.

ACM 3D Printer Workshop **2013**

- Helped guide the student ACM group to apply for funding to build a 3d printer
- Taught the basics of 3d modeling to grades 9-12.

Computer Science Day **2007–present**

- Demonstrated wireless sensor network technology to the general public.

Google-Rise Camp **June 2009,2010**

- Presentation and demonstration of Wireless Sensor Networks to 7th and 8th graders.

Engineering Day **2005–2006**

- Demonstration of my current research to the general public.

Computing Workshop for Kids **July 2004**

- Designed and taught a half-day workshop that introduced kids to programming and web design.

Publications

- Kazi I. Zaman, Anthony White, Sami Yli-Piipari, **Timothy W. Hnat** *K-Sense: A Kinematic Approach to Measuring Human Energy Expenditure for Daily Living Activities.* Proceedings of The 11th European Conference on Wireless Sensor Networks (EWSN), Oxford, United Kingdom, pp. –, Febuary 2014

- **Timothy W. Hnat**, Erin Griffiths, Raymond Dawson, Kamin Whitehouse. *Doorjamb: Unobtrusive Room-level Tracking of People in Homes using Doorway Sensors.* Proceedings of the 10th ACM Conference on Embedded Network Sensor Systems (SenSys), Toronto, Canada, pp. –, November 2012

- **Timothy W. Hnat**, Vijay Srinivasan, Jiakang Lu, Tamim Sookoor, Raymond Dawson, John Stankovic, Kamin Whitehouse. *The Hitchhiker's Guide to Successful Residential Sensing Deployments.* Proceedings of the 9th ACM Conference on Embedded Network Sensor Systems (SenSys), Seattle, WA, pp. –, November 2011

- **Timothy W. Hnat**, Kamin Whitehouse. *A Relaxed Synchronization Primitive for Macroprogramming Systems.* Proceedings of the 7th International IEEE Conference on Networked Sensing Systems (INSS), Kassel, Germany, pp. 219–226, June 2010

- **Timothy W. Hnat**, Tamim I. Sookoor, Pieter Hoomimeijer, Westley Weimer, Kamin Whitehouse. *A Modular and Extensible Macroprogramming Compiler.* Proceedings of the 1th Workshop on Software Engineering for Sensor Network Applications (SESENA) in Conjunction With ACM/IEEE International Conference on Software Engineering (ICSE), Cape Town, South Africa, pp. 49–54, May 2010

- Tamim I. Sookoor, **Timothy W. Hnat**, Pieter Hoomimeijer, Westley Weimer, Kamin Whitehouse. *Macrodebugging: Providing Abstract Views of System State.* Proceedings of the 7th ACM Conference on Embedded Network Sensor Systems (SenSys), Berkeley, CA, pp. 141–154, November 2009

- **Timothy W. Hnat**, Tamim I. Sookoor, Pieter Hoomimeijer, Westley Weimer, Kamin Whitehouse. *MacroLab: A Vector-based Macroprogramming Framework for Cyber-Physical Systems.* Proceedings of the 6th ACM Conference on Embedded Network Sensor Systems (SenSys), Raleigh, NC, pp. 225–238, November 2008

- S. Braun, W. P. Hnat, **T. W. Hnat**, H. L. Legan, *Taking the guesswork out of mandibular symphyseal distraction osteogenesis.* American Journal of Orthodontics and Dentofacial Orthopedics, Volume 119, Number 2, pp. 121–126, February 2001

- S. Braun, W. P. Hnat, B. Kusnoto, **T. W. Hnat**, *A new accurate approach to the anterior ratio with clinical applications. Part 1: A computer program.* American Journal of Orthodontics and Dentofacial Orthopedics, Volume 115, Number 4, pp. 368–372, April 1999

Conference Demos

- R. Dickerson, **T. Hnat**, E. Hoque, J. Stankovic. *Demonstration of Sleep Monitoring and Caregiver Displays for Depression Monitoring* . Wireless Health, San Diego, CA, October 2011

- **Timothy W. Hnat**, Tamim I. Sookoor, Kamin Whitehouse. *Macrodebugging with MDB Framework for Cyber-Physical Systems.* The 7th ACM Conference on Embedded Network Sensor Systems (SenSys), Berkeley, CA, November 2009

- Tamim I. Sookoor, **Timothy W. Hnat**, Kamin Whitehouse. *Demo Abstract: Programming Cyber-Physical Systems with MacroLab.* The 6th ACM Conference on Embedded Network Sensor Systems (SenSys), Raleigh, NC, November 2008
- R. Dickerson, J. Lu, B. Chantree, **Timothy W. Hnat**, J. Lu, J. Stankovic, K. Whitehouse, *MetroNet: Case Study for Collaborative Data Sharing on the World Wide Web.* Information Processing and Sensor Networks, April 2008

Professional Experience

YUM! Brands, Inc., Louisville, Kentucky USA

Software Developer Intern **January 2003 to August 2004**

- Software development and support of in-store systems for KFC restaurants.
- Designed and started the development of a plugin-based architecture to replace the aging computer interface in the stores.

Technical Skills

Wireless Sensor Networks: TinyOS, SnapPY, Contiki, Cooja, NesC, Xbow, Sentilla (Moteiv)

Wireless: Protocols, Communication, Mesh Networking

Matlab: Embedded Matlab, Compiler Design, Statistics, Visualization, Machine Learning, Signal Processing

Instrumentation and Control: Simulink, Tektronix, National Instruments (Data Acquisition, Labview, Signal conditioning)

Programming: C, C++, Java, Matlab, NesC, Perl, PHP, Python, UNIX Shell Scripting, SQL, SVN, Labview

Applications: TEX, LATEX, BIBTEX, and other common productivity packages for Windows, OS X, and Linux platforms

Operating Systems: Linux, Apple OS X, Microsoft Windows

References

Available upon request.

Last Revised: July 31, 2014