Thomas R. Nabelek

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Research and Career Interests

The integration of software and hardware done in a purposeful and intelligent way, in service of a higher quality of life, and the development of technologies that build a better world and serve the endeavors of society, is what I am passionate about. I primarily enjoy working at the intersection of hardware and software, and designing devices to interact, make decisions, and act upon those decisions. I have a lot of interest in embed systems, the use of sensors and actuators, automation, integrated systems, and robotics, and would like to further my knowledge and experience in these areas.

Education

University of Missouri–Columbia
Master of Science in Computer Engineering | May 2018 (Anticipated)
Bachelors of Science in Computer Engineering and Electrical Engineering | May 2016
- Math and Computer Science minors
- *cum laude*, GPA: 3.52
- Passed the Fundamentals of Engineering (FE) exam

University of Colorado Boulder
Certificate for Embedded Systems course completion | July 2017

Work Experience

Computational Intelligence Research Laboratory, University of Missouri | 2016-Present
Graduate Research Assistant
- Working on an Office of Naval Research project doing feature extraction and image segmentation on synthetic aperture sonar imagery for the purpose of mine detection
- Have submitted a conference paper detailing research findings

NASA Langley Area Research Center | 2017
Computational Engineering Intern
- Worked as a member of the High Performance Computing (HPC) Incubator to demonstrate the use of HPC methods on computationally-intensive portions of mission codes
- Educated researchers on the use of HPC methods for efficient computational problem solving

Lawrence Livermore National Laboratory | 2015
Computational Engineering Intern
- Accelerated the solving of electromagnetic field problems by optimizing matrix-vector multiplication code for GPU devices using CUDA

Networking and Parallel Systems Lab, University of Missouri | 2013-2015
Undergraduate Researcher
- Programed for efficient parallel processing using Pthreads and OpenMP
- Developed an object-oriented software framework for graph generation and analysis
- Attended SC14 supercomputing conference as a student volunteer

MyCafeEdu, LLC. | 2013-2014
Web Developer
- Helped to build an online educational experience for people in the food service industry

- Implemented changes to a website for a major client

University of Missouri, Division of IT   2013
Computing Site Consultant
- Gained customer service experience by meeting customers' technological needs

University of Missouri Research Reactor Center, Archaeometry Laboratory   2012-2013
Research Assistant
- Analyzed and collected data on samples in an archaeometry laboratory
- Maintained sensitive equipment and handled dangerous substances
- Gained experience in a high-security facility

Central Missouri Soccer Referee Association and the United States Soccer Federation   2011-2013
Certified Soccer Referee
- Gained experience in an authoritative positions
- Managed high-tension situations and resolved conflicts

Research Experience

The research that I completed as an undergraduate student and as an intern at both Lawrence Livermore National Laboratory and at NASA Langley Area Research Center has helped to prepare me for a career in the industry. I've done extensive work with parallel processing, making use of Pthreads, OpenMP, and CUDA. I've also dealt a lot with graph theory developing a software framework for graph generation and analysis, worked on a source-to-source compiler project for a graph API, and accelerated the solving of electromagnetic field problems using GPUs. Additionally, I have applied high performance computing methods to NASA mission codes and educated researchers on the application of such methods.

As a graduate research assistant, I have had the opportunity to work on an ongoing Office of Naval Research project doing algorithm development for environmentally aware feature extraction/selection and classification of underwater objects in synthetic aperture sonar imagery for mine countermeasures.

Course Experience

I have great appreciation for my Computing for Embedded Systems, Real Time Embedded Systems, Programmable Logic Controllers, and Architectural Robotics courses in which I learned about interfacing with embedded devices, intertask communication, multithreading, realtime processing, sensor and actuator integration, data collection and logging, ladder logic, real time scheduling algorithms, and much more. It was in these courses that I found that embedded systems is an area in which I would like to gain further experience.

Secondly, I also enjoyed my Microprocessor Engineering and Computer Organization courses. These courses allowed me to much more fully understand computer architecture and to see how software really interacts with hardware, something that has always intrigued me. I learned about the different methods of resolving hazards that occur as a result of data dependencies, the organization of a cache, the architecture of GPUs, and much more – all things that piqued my interest.

I learned a lot from my circuit theory classes, particularly when I had the opportunity to design circuits. I find the application of math and physics to the engineering problems solved by circuit design to be fascinating. The solving of circuit problems using the different methods learned not only taught me about the design of electric circuits, but also how to approach engineering problems in general.

I have also taken courses dealing with computer networks, energy resources, mobile robotics, and computational intelligence, all of which I think will benefit me for work in the computer and electrical engineering field.

Proficiencies

- Programming and algorithm development using coding languages including C, C++, Matlab, Assembly Language, VHDL, Java, Swift
- Software development using intertask communication, network communication, multithreading using Pthreads and OpenMP, realtime processing, kernel modules, hardware and software interrupts

- Interfacing with embedded devices
- Device prototyping
- ROS (Robot Operating System)
- PLC (Programmable Logic Controller) ladder logic and devices
- Networking
- UNIX command line, GNU toolchain
- Nvidia GPU programming using CUDA
- Working with the instruction sets of different CPU architectures, and with different microcontroller devices
- Breadboard circuit design and construction, circuit analysis using Cadence PSpice, and experience with lab test equipment including oscilloscopes, power supplies, signal generators
- 3D modeling intended for 3D printing
- Software and project documentation
- Able to stay organized, maintain self-discipline and motivation, work cooperatively with team members and customers, work independently, communicate effectively, lead teams to accomplish goals, and complete work under pressure

Publications

My research publications include two posters and a paper:

"A Software Framework for Graph Generation and Analysis," available at nabelekt.com, was presented at the Undergraduate Research and Creative Achievements Spring Forum at the University of Missouri in April 2014 and describes a project completed in the Networking and Parallel Systems Lab.

"Using GPUs to Accelerate the Solving of Electromagnetic Field Problems," available at nabelekt.com, was presented at a student poster symposium at Lawrence Livermore National Laboratory in August 2015 and describes my work at the lab.

"Possibilistic Fuzzy Local Information C-Means for Sonar Image Segmentation," available at nabelekt.com, has been accepted to the IEEE SSCI 2017 conference

Course Projects

- Pong game written in assembly language, including high scores, use of the mouse, and more
- Speaker circuit making use of an audio isolator, transmitter driver, optical transmitter, optical receiver, receiver amplifier, and DC block
- Home automation proof of concept project; My contribution included bash scripting on a Raspberry Pi device and laptop computer
- MIPS (microprocessor without interlocked pipeline stages) data path and pipeline simulator written in C
- "Presence Detection Applied to Home Automation for the Purposes of Energy Conservation" – a proof of concept project making use of PIR (passive infrared) sensors and a Raspberry Pi device to activate and deactivate lights
- SCADA (supervisory control and data acquisition) simulator making use of TS-7250 (single board computer with a EP9302 ARM9 CPU) devices, TCP socket network communication, client-server model, multithreading, task cooperation and synchronization, intertask pipe communication, kernel modules, periodic and realtime processing, and hardware and software service interrupts; report and video available at nabelekt.com
- Capstone project: "Micro-location and Biometric Technology Applied to Home Automation for the Purpose of Security" – proof of concept project of which my contributions included UDP socket communication, a C program running on a Raspberry Pi device, and an iOS app programed in Swift; report available at nabelekt.com
- Architectural robotics project: A bedroom environment that would help a child to develop a sense of time progression throughout the day and associate various times of the day with certain activities, and to help a child fall asleep and wake in a soothing manner. This project involved the use Arduino devices, sensors and actuators,

and 3D printing; report and video available at nabelekt.com

- Architectural robotics project: An automatic medicine dispenser capable of being setup remotely by a pharmacist, dispensing the correct medication at the correct time, alerting the user when a medication is available, and alerting a caretaker if the dispensed medication is not removed from the system after a set period of time. This project involved the use a Raspberry Pi device, Arduino devices, sensors and actuators, and 3D printing; report and video available at nabelekt.com
- Computational intelligence project: Implementation of the backpropagation algorithm on a complex neural network; report available at nabelekt.com
- Computational intelligence project: Implementation of a fuzzy decision tree for the purpose of helping a consumer determine if a given car is a good purchase; report available at nabelekt.com
- Computational intelligence project: An evolutionary algorithm optimizing the position of random points to all lie on a circle; report and animation available at nabelekt.com
- Computational intelligence project: Experimentation with an implementation of the Hopfield network – a recurrent artificial neural network that uses multiple-loop feedback to function as a content-addressable associative memory system – to test its resiliency in recovering stored memories; report and poster available at nabelekt.com

Activities

- Engineers Without Borders, 2012-Present, President
- Newman Volunteer Corps, 2014-Present
- Mizzou Engineering Ambassadors, 2014-2016
- 3D Printing Club, 2012-2014
- IEEE, 2013-2014
- Columbia Aeronautics and Space Association (CASA), 2006-2012; Student Director
- Kewpie Advanced Placement Peer Association, 2011-2012, Co-founder

Awards

- Dean's List, 2013, 2014, 2015, 2016
- Lloyd E. Hightower Scholarship, 2015
- 2nd place at an IEEE Computational Intelligence Society poster contest, 2014
- Bright Flight Scholarship, 2012, 2013, 2014, 2015
- Curators Scholar Award, 2012, 2013, 2014, 2015
- Engineering Dean's Development Scholarship, 2013, 2014
- Engineering Achievement Scholarship, 2012
- AP Scholar with Distinction Award, 2012