Gregory T. Ling

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Interests

Microarchitecture Design

I worked in a small group of three to design a pipelined MIPS processor which was praised by the TAs for being much faster than expected. I will be optimizing an accelerator for batteryless research led by Dr. Duwe (see below) over the next semester (Spring 2023). I have the most interest in working on more microarchitecture design.

Firmware Development

This is where I have the most in-depth knowledge. In Solar Car, I am currently teaching a group of about 10 new members how to write embedded firmware when given just a datasheet and a compiler. I have written a bootloader over CAN for solar car, and have also worked in embedded linux distributions extensively for our team's telemetry unit.

Quantum Firmware

I have also taken Theory of Quantum Computing at ISU which has covered nonlocal games in both classical and quantum computing as well as quantum teleportation, quantum information theory, and complexity theory involving Kolmogorov Complexity. I'm very interested in working more in quantum computing.

Project Highlights

ISU Solar Car Club (American Solar Challenge PrISUm #9)

- Software lead of ISU's Solar Car club. I have helped the team transition to a new build system which is focused on manual management of peripherals using their registers directly using CMSIS headers and encourages programmers to read the datasheet. I also lead the team's telemetry project which is an embedded linux system running a lightweight server using C++ to transmit telemetry information back to the rest of the team.

Personal - Handheld Game Console

- Designed and assembled a handheld game console using an ATSAMD21 (32-bit ARM Cortex M0+ on Adafruit Adalogger breakout board) with an LCD display, SD card reader, analog joystick, battery and 3D-printed case
- Challenged myself to use only CMSIS header files and the datasheet; Pong and Brick Breaker currently work

Personal - NXT/EV3 Infrared Remote Control "Sensor"

- Created an infrared remote control from scratch which connects to a LEGO NXT/EV3 as a sensor to control the LEGO Power Functions system
- Designed schematic and PCB layout using a TI MSP430 microcontroller and wrote firmware in C

ISU - CPRE 381 Microarchitecture Design

- Designed a MIPS 32-bit processor in VHDL in a small group project over a span of four weeks, I specifically worked on the component integration between the adder, control logic, and the processor memory.
- Learning to implement pipelining, caching, and data forwarding to increase performance.

TKA - MidKnight Robotics (FTC #7854 MidKnight Madness, #15385 MidKnight Mayhem)

- First Tech Challenge robotics team at TKA from sophomore to senior year, software lead for one year, then team captain for two years. Taught new members how to program the robots in Java, and set up a fast wireless upload method to the robots to quickly test new code.

Education

The King's Academy (TKA)	*Sunnyvale, CA*	August 2016 - May 2020
High School - Co-Salutatorian	GPA: 4.43	
Iowa State University (ISU)	*Ames, IA*	Expected Graduation Fall 2024
B.S. Computer Engineering	GPA: 3.99	

Work Experience

IT Department, The King's Academy	*Sunnyvale, CA*	Fall 2017, Summer 2018 & 2019
IT Intern configuring new iPads and MacBooks for the school year, one unpaid semester, two paid summers		
Indpt. Contractor, Douloi Automation	*Sunnyvale, CA*	Fall 2018
Detection of the addition and removal of objects from a basket using OpenCV and Python		
ISU ITS WebDev - Software Engineer	*Ames, IA*	Oct. 2020 - Jan. 2022
Web development in PHP and Vue.JS for various ISU departments		
ISU Research Assistant (REU)	*Dr. Duwe - Ames, IA*	Summer 2022 - Current
Wrote firmware for a test setup of 5 MCUs to research wireless, intermittent, and batteryless communication		

Skills

- Experience with a wide range of processors: TM4C, ATSAMx21, ATMEGA, MSP430.
- Read and write code based on a datasheet: I've written both a websocket server on a TM4C123 over a serial connection and a websocket client for the Solar Car telemetry system using the websocket specification (RFC 6455), and most of my firmware projects use datasheets as reference
- Language experience in C, C++, ASM (8-bit AVR, some 32-bit ARM, 32-bit MIPS), Verilog, VHDL, Swift, JavaScript (Browser & Node.js), TypeScript, CoffeeScript, Vue.js, HTML, PHP, CSS, Java, Python, UNIX Command Line, and more
- California Seal of Biliteracy in English and Spanish