

CHRIS MADSEN

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PROFESSIONAL EXPERIENCE

QUANTITECH / AXIENT

NOVEMBER 2017-PRESENT

Participated in the development and testing of several UAVs. Extensively modified and created new models in a 6-DOF simulation and used it for a number of studies including autopilot gain adjustments and evaluating sensor performance requirements. Developed tools for evaluating these systems at flight tests using telemetry, radar data, network traffic, and optical and RF truth sensors.

Developed signal processing algorithms to analyze data from RF sensors and measure and compensate for calibration errors. Developed tools for measuring antenna patterns.

Developed a fast RF scene generator using CUDA.

WYLE CAS GROUP

SEPTEMBER 2011-NOVEMBER 2017

Developed a 6 degree-of-freedom aerodynamic simulator that correctly models the flight dynamics of spinning rockets. Aerodynamic coefficient inputs to the simulation were estimated using Missile DATCOM and computational fluid dynamic (CFD) tools like OpenFOAM. Mass properties were estimated from CAD models or measured. Used radar data and inertial measurements from flight test to improve and validate the models.

Worked on an Integrated Flight Simulation (IFS) to evaluate the performance of missiles against hostile rockets, mortars, and artillery shells. The simulation precisely modeled radar and missile seeker performance and ran the actual missile software including GNC algorithms. I was involved in all aspects of testing and running the simulation, especially the aerodynamic model, GNC algorithms, state estimators, and signal processing. Fixed bugs in the simulation and made modifications to it as required to perform trade studies. Telemetry from each live test was used to validate the simulation.

Used optimal control theory (often with the use of PSOPT, an open source pseudospectral optimization tool) to generate optimal missile flight trajectories and control inputs for maximal performance before integrating the algorithms in the flight simulation.

Worked as a data analyst at live tests analyzing data from radars, guns, and missiles. Developed software to aid in visualization and understanding of what happened and speed up the analysis process.

PERL RESEARCH

2006-SEPTEMBER 2011

Developed native and web applications for the iPhone including ones that communicate with external hardware I designed in accordance with Apple's hardware specifications.

Wrote image processing software to detect humans in live video streams and monitor their vital signs using desktop computers and Nvidia's CUDA framework.

Created a 3D simulator in OpenGL/Delta3D to aid patients in learning to operate medical equipment.

Developed back-end web-server software to generate images of 3D CAD models using OpenGL and Povray.

Designed and built hardware to precisely control a pressure chamber for simulating internal bleeding in human subjects.

Built wireless sensors for use on a medical robot.

Developed signal-processing software to run on PDAs and medical equipment with intuitive user interfaces.

UNITED STATES ARMY AEROMEDICAL RESEARCH LABORATORY (USAARL)

2002-'03, 2006

Wrote software to track a pilot's motion and use digital filters to spatialize audio in response to pilot and vehicle motion.

Created software to perform psychoacoustic experiments on human test subjects. Most of this required software interfaces to acoustic hardware and response devices.

Developed operating procedures for a blast chamber studying hearing protection devices.

EDUCATION

MSE IN ELECTRICAL ENGINEERING—3.92 GPA

UNIVERSITY OF ALABAMA IN HUNTSVILLE

MAY 2011

Studies emphasized modern control theory, Kalman filtering, and matrix theory.

Completed additional coursework in computational fluid dynamics, aerodynamics, aircraft stability and control, and parallel programming.

BSE IN ELECTRICAL ENGINEERING—3.89 GPA

UNIVERSITY OF ALABAMA IN HUNTSVILLE

MAY 2008

Main interests were signal processing and control theory.

COMPUTER SKILLS

SOFTWARE DEVELOPMENT

Experienced with many languages. In recent years I've been focused on Python, C++, and Matlab. Very experienced with Pandas, Numpy, and Scipy. Regularly develop under Linux and Windows. Also experienced with web development.

Experienced developing for embedded platforms and microcontrollers in C and assembly language (MSP430, ATmega, ARM).

ELECTRONIC DESIGN AUTOMATION

Design most circuit boards using EAGLE but have also used FreePCB and the open-source gEDA and Kicad.

PERSONAL EXPERIENCE

HARDWARE PROJECTS

Two-wheeled balancing robot similar to the Segway scooter. Remote-controlled over a wireless bluetooth connection.

Can stand itself up from a horizontal position and use back-EMF rather than encoders to measure wheel velocity.

Adapter modules to convert wired static-display LED signs to wirelessly-programmable scrolling ones.

Hearing protection device that performs real-time digital audio filtering to reduce hearing damage while preserving one's ability to hear spatialized audio at standard hearing levels.

Digital MIDI trumpet that measures the position of actual trumpet valve stems to sense key presses. Volume is controlled by sensing the pressure of air blown through a trumpet mouthpiece.

Microcontroller-based digital audio spectrum analyzer.

OTHER EXPERIENCE

Private pilot. Very interested in aviation and related fields. Built an amateur-built airplane, performed phase 1 flight testing on it, and have flown it for hundreds of hours.

Use CAD/CAM software to design parts for production on my CNC router and 3d printer.

Learning Mandarin Chinese.