

Christopher R. Carlson

C: (650) 274-7213, crcarlson@gmail.com
877 Live Oak Ave, Menlo Park, CA 94025-4911

Education

MS, PhD Mechanical Engineering, Stanford University, 2000, 2003
BS Mechanical Engineering, University of California, Davis 1998
Personally financed 100% of college expenses

Areas of Expertise

- Linear and nonlinear control theory
- Digital control and system identification
- Vehicle dynamics estimation and control
- GPS implementation and product design
- Practical analog & digital circuit design
- Machining and part fabrication
- Software architecture
- Mechatronic system design

Academic Experience

Doctoral Thesis: Estimation with Applications for Vehicle Dead Reckoning and Control, 00-03

- Developed an extremely precise tire parameter estimation scheme for real vehicles. Did so using nonlinear estimation theory and numerical computing methods. Demonstrated precision experimentally on two different types of tires. Patent pending and Collegiate Inventors Competition Finalist in 2003.
- Developed a vehicle dead reckoning system using GPS and stock wheel sensors. Showed that contrary to previous work on the topic, quantization error and wheel slip are not dominating factors for this system. Road surface unevenness is the primary error source.
- Developed a nonlinear vehicle control structure using Model Predictive Control. Demonstrated control structure as an active rollover prevention system for automobiles.

Design Division Student Representative, 02-03

- Year long volunteer position responsible for organizing faculty-student events as well as providing a face to face vehicle for students to express their opinions to faculty

Teaching Assistant: System Identification of Mechanical Systems for Control 02-03

- Maintained and developed fun laboratory systems for identification and control. Also responsible for evaluation and feedback of student performance. Course received highest teaching evaluation review to date.

Teaching Assistant: Team Based Design with Corporate Sponsorship 99-00

- Acted primarily as a technical and team relationship consultant for several design teams for one academic year. Also responsible for student evaluation and project feedback.

Publications

- Christopher R. Carlson, J. Christian Gerdes, *Consistent Nonlinear Estimation of Longitudinal Tire Stiffness and Effective Radius*, IEEE Transactions on Control System Technology, November 2005.
- Christopher R. Carlson, J. David Powell and J. Christian Gerdes, *Error Sources when Land Vehicle Dead Reckoning with Differential Wheel speeds*, ION 2004
- Christopher R. Carlson and J. Christian Gerdes, *Nonlinear Estimation of Tire Longitudinal Slip Under Several Driving Conditions*, ACC2003

- Christopher R. Carlson and J. Christian Gerdes, *Optimal Rollover Prevention with Steer by Wire and Differential Braking*, IMECE 2003
- Christopher R. Carlson, J. David Powell and J. Christian Gerdes, *Practical Position and Yaw Rate Estimation with GPS and Differential Wheelspeeds*, AVEC 2002
- Samuel Y. Chang, Christopher R. Carlson, and J. Christian Gerdes, *A Lyapunov Approach to Energy Based Model Reduction*, IMECE 2000

Work Experience

Fellow, Systems and Control, Hansen Medical Inc, 2007-Present

- Codirect group of 11 people including budget and matrix modelling
- Coarchitect and manage development of next generation system including electrical, mechanical, and software engineering for safety, modularity, reliability and low cost
- Advise two Stanford PhD students working to develop advanced technology in medical robotics

Controls Group Manager, Hansen Medical Inc, 2005-2007

- Hired and led group to productize controls features and diagnostics for mainline development
- Managed advanced application development team for prototyping and human clinical evaluation of next generation product
- Led entire software team to meet very aggressive first customer shipment milestones
- Supported first product definition prototyping including human clinical evaluation
- Managed to within 10% of group budget

Sr. Staff Engineer, Hansen Medical Inc, 2004-2005

- Developed novel algorithms for control and diagnostics of flexible robotic platform
- Primary architect for production robotic and electromechanical safety system design, personally coded 1/3 of system code base in C++
- Designed and implemented first human use prototype robotic software and safety algorithms based upon XPC operating system

Robotics Consultant, Velocity 11, 2006

- Developed parameterized dynamic simulation of robot arm to aid motor selection and power rating of joints for arbitrary path trajectories
- Verified system analysis with both energy and Newtonian dynamics analysis

Advanced vehicle state estimation theory and application for Daimler Chrysler, 2003

- Worked as independent contractor for DaimlerChrysler Stuttgart demonstrating GPS based vehicle state estimation theory and practice

Team design of heavy truck transmission simulator via Stanford's ME310 98-99

- High level system design for a very open ended problem
- Control system design including actuator selection, sensor selection
- Mechanical design, material selection and machining of prototype and final parts
- Testing and tuning of final system
- Received silver medal in Lincoln Arc Welding national design competition

System design of hybrid electric EV1 for General Motors, 97-98

- Pioneered and proved viability of Continuously Variable Transmission (CVT) control methodologies
- Simulated a dynamic vehicle model including CVT
- Experimentally identified second order model of CVT shifting system
- Designed and built mechatronic system for control of CVT pressure and shifting systems
- Implemented closed loop digital control for coupled pressure and shifting loops

System consultant, Edelbrock R&D, 97

- Designed and aided implementation of a real time shock dynamometer for trade show exhibits to demonstrate design with separate jounce and rebound mechanisms
- Coded and integrated embedded processor, power electronics, output display

System designer, hybrid electric sedan for FutureCar competition, 94-97

- Team swept national competition taking first place overall (1997)
- Design and implementation of analog control system for electric powered air conditioning system including printed circuit board
- Design and manufacture of hydraulic-electric automotive power steering system to replace conventional hydraulic system
- Design and manufacture of automotive high mechanical advantage manual braking system to replace conventional vacuum assist system
- Design and manufacture of analog servo system for electric control of IC engine throttle
- Design, manufacture, maintenance and tuning of chassis and suspension for national champion (94-95) hybrid electric vehicle

Site Administrator, UC Davis information technology centre, academic years 94-97

- Assisted and instructed users in computing clusters and classrooms with mixture of apple, windows and unix machines
- Maintained and troubleshot clusters, assisted with technology integrations

Object Oriented Database Designer, Moller International, Summer 96

- Designed and implemented and object oriented database to track inventory of parts and assemblies using Visual Basic and SQL in MS Access
- Created several custom reports such as inventory demand for modelled product ramp, current stock by assembly or part number, etc
- Acted as IT administrator for windows machines

Production Line Engineer, Packard Bell, Summer 95

- Proactively maintained and troubleshot computer production lines
- Developed MS DOS based scripts for configuration verification and diagnostics

President, Carlson Enterprises, 94-95

- Sole proprietorship founded to produce mechanical components for an active GPS antenna targeting the weekend warrior and high technology geek markets
- Preliminary prototype constructed and small scale tooling specified

Class A Truck Driver, Calisota Express, Summer 94

- Hauled produce from LA to Minnesota and airmail from Minnesota to LA

- Emphasized the values of entrepreneurship and perseverance

Cable Television Installer and Trouble Shooter, McKellar Development, Summer 93

- Installed and maintained cable television connections on a per drop basis for several hundred customers

Paper Carrier, San Diego Union-Tribune, 89-91

- Reliably delivered 140 papers 7 days a week, 365 days a year
- Managed paper inventory, accounting and bill collection

Honors / Awards

- Engaged to Shannon Miller, 2006
- Samuel M. Burka Award winner recognizing contribution to the advancement of navigation and space guidance for "Error Sources when Land Vehicle Dead Reckoning with Differential Wheelspeeds." Presented June 2005.
- Best paper of session, for "Nonlinear Estimation of Tire Longitudinal Slip Under Several Driving Conditions," ACC 2003.
- Selected as a top collegiate inventors competition finalist for work using GPS as a tire condition monitor, 2003
- Silver medal, Lincoln Arc Welding national design competition for "Heavy Truck Transmission Simulator," 1999
- 1st place team, national computer science problem solving competition, 1989

Hobbies / Current Interests

- World Travel
- Swimming
- Cooking
- Enology
- Electronics
- Precious metalsmithing
- Drawing
- Investment Strategy