

Robert T. Casey

Curriculum Vitae

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Education

2nd year graduate student, Computer Engineering, Univ. of California, Santa Cruz, 2009-
Current

- Autonomous Systems Lab
- Research focus: Embedded and Autonomous systems
- Adviser: Gabriel Elkaim

B.S. Computer Engineering (Mathematics Minor), DigiPen Institute of Technology,
2009; GPA: **3.93**/4.0 (Top of Class)

B.A. Theatre, Louisiana State University, 1998

General GRE: Q – 800, V – 730, AW – 5.5, August 2008

Honors and Awards

Regent's Fellowship, UC Santa Cruz, 2009-2010

Student Research Award, DigiPen, May 2009

Dean's List, DigiPen, all semesters (Fall 2005 – Spring 2009)

Coverage in DigiPen Newsletter

- January 2009, "Student Spotlight"
- March 2007, "DigiPen Students Publish Journal Article"
- April 2008, "Successes of DigiPen's Computer Engineering Program"

Research Experience

Master's Thesis work, UC Santa Cruz, 2010 – Current

Using a complementary Kalman Filter framework, my thesis research focuses on combining image tracking data with GPS/INS sensor data to improve the localization of autonomous ground vehicles. This work will integrate control theory with computer vision and may incorporate the dsPIC, a digital signal processing microcontroller which has proven useful in experiments with embedded, autonomous systems such as UAVs.

3D Virtual and Mixed Environments Summer Intern, Naval Research Laboratory / ITT-AES, 2010.

I worked with Dr. Mark Livingston developing C/C++ software for computer vision, graphics, and advanced visualization. The main thrust of the project is to develop a markerless, computer vision-based user interface for a 60-monitor, U-shaped display wall. I developed a multiple camera volume simulator and set up routines for camera calibration, noise model evaluation, image correction and restorations, segmentation, contour-finding, stereo matching, and tracking.

Research Assistant, Autonomous Systems Lab, UC Santa Cruz, 2009 – Current.

This research revolves around the Overbot, an Autonomous Robotic Vehicle INstrument. This vehicle was donated to the University of California by contestants participating in the 2005 DARPA Grand Challenge, an autonomous robot competition. Tasks involve verifying the various actuators and sensor suites on the vehicle, including integrated autonomous navigational capabilities.

Research Assistant, Infrared Video Matting and Depth Estimation, Microsoft Research and DigiPen Institute of Technology, 2007 – 2009.

I worked with Dr. Sing Bing Kang, a computer vision researcher who serves on the review committee of ACM SIGGRAPH Asia. The goal of this project was to offer a viable, cost-effective approach to image and video matting and depth estimation which yields results on par or better than results typically achieved via blue-screen matting. The core of our approach dealt with the use of infrared lighting coupled with a joint Bayesian approach. My work with this project took place at the first stage of the imaging process, specifically image acquisition and lighting. One aspect of my research involved infrared lighting, which included design, acquisition, and experimentation. I also performed electronic circuit design and building. One of my key tasks was synchronizing the external lighting with the frame rate of a digital camera. My work also extended into software analysis. This work was supervised by Dr. Rania Hussein.

Lead Engineer, *FieldNAV* mobile autonomous robot, personal research project, 2007 – 2009.

This project involved research in the design and implementation of small-scale autonomous vehicles. I began with an off-the-shelf radio-controlled truck for the mobile base. Next, I extended this base through motor controllers and a high-power servo for steering control. I subsequently added a wide array of sensors, such as an optical encoder to aid odometry, a GPS unit and a digital compass for localization, several infrared and ultrasonic rangefinders for obstacle detection, and a color camera for target tracking. Finally, I linked all the sensors and actuators to the brains of the robot, which involved three interconnected, multi-core microcontrollers. This hybrid-CPU facilitated research into various robotics-related control algorithms, such as path-finding, computer vision, and parallel programming techniques. Dr. Charles Duba served as an advisor for this project. The resulting robot was entered into the 2009 RoboGames / RoboMagellan competition in San Francisco, CA, where it came in 4th place out of 11 entries.

Student Researcher, autonomous robotics, Course Project – Fuzzy Sets and Logic, 2006.

This project involved an extension of previous work with autonomous vehicles. The project goal was to improve the steering responsiveness of a small r/c vehicle through the application of fuzzy sets and logic to the low-level controller. The work was later published in a peer-reviewed journal (see below), and was supervised by Dr. Michael Aristidou.

Teaching Experience

GRE Instructor, Powerscore Test Preparation, Fall 2008 - Current

Powerscore is an educational service provider offering students intensive instruction via weekend workshops in concepts and strategies helpful for quickly improving general GRE scores.

Teaching Assistant, Technical Writing, UC Santa Cruz, Fall 2010/Winter 2011

Here I review writings and poster presentations by engineers and other scientists (over 50 students), writings targeted toward engineers as well as management.

Teaching Assistant, Engineering Ethics, UC Santa Cruz, Spring 2010/2011

In this class, I graded weekly in-class writings, proctored exams, and maintained the course grading sheet for nearly 150 students. Key topics included process, virtue, and material ethics.

Teaching Assistant, Computer Environment II – Hardware / Software Interfacing, DigiPen Institute of Technology, Spring 2007

In this course, I assisted students with autonomous vehicle control through assembly language programming. I also provided aid with electronic circuit implementation.

Statistical and Computer Experience

- Relevant Courses taken: Probability & Statistics (including Bayesian), Image Processing & Computer Vision, Linear Control systems.
- MATLAB: image processing/computer vision, linear algebra, linear control and dynamical systems, neural networks, systems simulation.
- OpenCV and OpenGL: computer vision and graphics.

Publications

Casey, R., and Hensler, M. 2006. Fuzzy Steering for Autonomous MCU-based Mobile Robotics. *WSEAS Transactions on Systems and Control*, Athens, Greece, 1, vol. 1, 64-69.

Conference Presentations

WSEAS CIMMACS (Computational Intelligence, Man-Machine Systems, and Cybernetics), *Application of Fuzzy Sets to Autonomous Robot Vehicle Navigation Using the PIC18F452 Microcontroller*, Venice, Italy, November 2006.

Professional Affiliations

- Student Member, IEEE, since 2007
- Student Member, IEEE-RAS, since 2008
- Professional Member, ACM, since 2008

Research Interests

Computer vision, autonomous robotics, embedded systems, sensor fusion, machine learning, control systems, methods to handle uncertainty, computer graphics.

Extracurricular

DigiPen Student Association Member, Curriculum Committee Member, 2008-2009

References

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